A Roadmap towards Circular Economy of North Macedonia

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Foreword

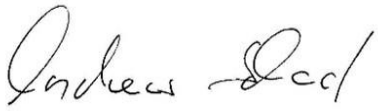
While actively pursuing sustainable development and seeking to deepen its regional and European Union (EU) integration, North Macedonia is faced with important challenges around climate change, rising resource demand and pollution. To proactively confront these issues, the country is embracing the pursuit of a circular economy – a cornerstone of the Green Agenda of the Western Balkans – which is gaining traction due to its key role in addressing pressing economic concerns, while contributing to national and regional environmental objectives.

North Macedonia's Ministry of Economy, in collaboration with other governmental bodies and stakeholders, is at the helm of the shift to a circular economy throughout Macedonian society. The government has developed national strategic documents addressing the transition and there have also been noticeable shifts in civil society and among businesses. Despite these initial strides, tangible outcomes have been restricted by infrastructure limitations, limited stakeholder awareness and knowledge, and insufficient financial support.

This roadmap applies the OECD's circular economy methodology to explore North Macedonia's approach to these challenges with the goal of assisting the government in building a strong policy foundation for an impactful circular transition. Based on a comprehensive assessment of North Macedonia's circular economy landscape, the roadmap incorporates current policy efforts, promoting synergies across the many sectors, policy measures and parties involved in this transformative journey. It offers a detailed analysis that highlights a set of crucial priority areas for developing circular economy policies in North Macedonia. Complemented by a monitoring framework, the roadmap presents concrete policy recommendations on circular business models for small and medium-sized enterprises, moving construction towards circularity, transitioning the biomass and food industries, making the textile sector more circular, and transforming the mining and metallurgy sectors.

Integrating reforms for sustainable economic growth and implementing action plans for the green agenda are vital for fostering the production of sustainable products within the Common Regional Market. This approach, and the paradigm shift driven by circular economy principles, not only paves the way for access to the EU single market, but also underlines the commitment to environmental sustainability and economic resilience in alignment with EU standards.

The roadmap was produced by the OECD's South East Europe and Environment and Economy Integration Divisions, co-ordinated by the OECD South East Europe Regional Programme. It benefitted from contributions from a broad spectrum of Macedonian circular economy stakeholders, headed by the Ministry of Economy of the Republic of North Macedonia. The work is co-funded by the European Union as part of the "EU support to Competitiveness and Sustainability in the Western Balkans and Türkiye" project, which aims to reinforce economic governance and integration, and strengthen resilient and competitive markets.



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Acronyms and abbreviations

APPRM	Agency for Promotion of Entrepreneurship of the Republic of North Macedonia
BGK	Bundesgütegemeinschaft Kompost e.V.
CDW	Construction and demolition waste
CE	Circular economy
CHF	Swiss franc (currency)
DMC	Domestic material consumption
DMI	Direct material input
ECN	European Compost Network
EEEOP	Environmental and Energy Efficiency Operational Programme
EoW	End-of-waste
EPR	Extended producer responsibility
EU	European Union
EUR	Euro (currency)
FDI	Foreign direct investment
FITD	Fund for Innovation and Technological Development
GBP	Great British pound (currency)
GDP	Gross domestic product
GERD	Gross expenditure on research and development
GHG	Greenhouse gas
GPP	Green public procurement
HUF	Hungarian forint (currency)
ICT	Information and communications technology
IPA	Instrument for pre-accession assistance
IPARD	Instrument for pre-accession assistance for agricultural and rural development
ISO	International Organization for Standardization
kg	Kilogramme
MAKSTAT	State Statistical Office of the Republic of North Macedonia
MKD	Macedonian denar (currency)
MoEPP	Ministry of Environment and Physical Planning

MW	Megawatt
NORM	Naturally occurring radioactive material
OECD	Organisation for Economic Co-operation and Development
PEF	Product environmental footprint
PET	Polyethylene terephthalate
PGM	Platinum group metal
PPP	Purchasing power parity
PRO	Producer responsibility organisation
R&D	Research and development
SDG	Sustainable Development Goal
SME	Small and medium-sized enterprise
TMM	Turkish Materials Marketplace
UK	United Kingdom
VA	Voluntary agreement
VAT	Value-added tax
WB	Western Balkans
WEEE	Waste from Electrical and Electronic Equipment
WRAP	Waste & Resources Action Programme

Executive summary

This roadmap aims to assist the government of North Macedonia in establishing a robust policy framework for a successful transition to a circular economy. Grounded in a thorough diagnostic of the country's circular economy landscape, it provides a set of key policy measures for this transition, strategically incorporating ongoing policy initiatives and promoting strong alignment across the sectors, policy measures and stakeholders involved in this transformative process.

There is a compelling case for a circular economy transition in North Macedonia

Propelled by its commitment to sustainable economic growth, addressing environmental challenges, and advancing regional and European Union (EU) integration, North Macedonia is increasingly embracing a circular economy.

North Macedonia must address economic and environmental challenges arising from growing demand for raw materials. While material consumption has declined since 2015, there has been a worrisome reversal in resource productivity trends since 2019. If unaddressed, this could pose a significant threat to the environment and hinder efforts to enhance the competitiveness and resilience of the economy. Given North Macedonia's heavy reliance on fossil fuels for energy, particularly oil and coal, which constitute around 70% of its energy supply, increasing demand for raw materials from industries like automotive and metallurgy could elevate the share of fossil energy materials in domestic consumption while giving rise to material extraction and aggravating import dependencies. Urgent action is needed to intensify efforts in high-energy sectors, emphasising better reuse efficiency to encourage circular material use throughout the lifecycle.

In addition to tackling economic and environmental challenges, North Macedonia's pursuit of EU membership and commitment to the Green Agenda for the Western Balkans serve as key motivators for its efforts in the circular economy realm. In its journey towards EU membership, the country is strategically aligning its environmental policies and practices with established EU standards and regulations. There is a noticeable surge in initiatives aimed to boost energy and resource efficiency, minimise waste, promote recycling, and adopt eco-friendly practices, underscoring a shared dedication to mitigating environmental impact. Nonetheless, these endeavours require further intensification.

A cohesive approach is imperative to guide North Macedonia towards a circular economy. This involves constructing the necessary infrastructure, cultivating awareness of the concept and offering financial incentives to drive the transformation.

Proposed priority areas and key policy recommendations

The OECD analysis and stakeholder consultations identified five priority areas where circular economy reforms would have the greatest impact in North Macedonia: **1) circular business models for small and medium-sized enterprises (SMEs); 2) construction; 3) biomass and food; 4) textile industry; and**

5) mining and metallurgy sectors. This roadmap puts forward 41 policy recommendations and an accompanying monitoring framework, intended to track their implementation across the five priority areas. Incorporating these recommendations into national policies and implementing them can additionally help North Macedonia attain its climate change mitigation goals.

Enabling the shift from traditional linear business models to circular business models for small and medium-sized enterprises

Circular business models reduce material extraction and use, minimise waste production, and use secondary materials and products as inputs for production through reuse and recycling. Consequently, they play a key role in mitigating negative environmental impacts linked to material consumption.

Key policy recommendations to support the adoption and scaling up of circular business models include:

- Raise SMEs' awareness and understanding of the circular economy through tools such as communication campaigns, training, mentoring or acceleration programmes.
- Improve multi-stakeholder co-operation within/across value chains by improving collaboration (e.g. grants for collaborative research and development, stakeholder platforms, investor-entrepreneur matchmaking events).
- Provide financial support for scaling up circular business models by introducing calls for SMEs within existing funding programmes and offer corresponding non-financial support.
- Implement supportive legislation and economic instruments to support circular business models and resource recovery (e.g. extended producer responsibility schemes, green public procurement, ecodesign requirements).

Towards a circular construction sector to improve waste management and reduce the use of virgin raw materials

The Macedonian construction sector can significantly contribute to reducing overall reliance on virgin raw materials and boost the use of recycled materials. There are vast opportunities to transform the construction life cycle through new projects and renovations involving design, manufacturing of components, building construction and secondary material supply. The absence of comprehensive circular economy measures signals untapped potential to cut material consumption and reduce the environmental impacts related to waste and emissions.

Key recommendations to support a circular construction sector include:

- Improve stakeholder engagement and collaboration, and ensure that funding is available for circular construction projects.
- Manage construction and demolition waste in a more environmentally sound manner, including increasing its recovery and reuse through information-driven processes (e.g. systemic data collection) and legal tools (e.g. mandatory selective demolition, end-of-waste criteria).
- Boost the production and uptake of sustainable construction materials in construction and renovation by leveraging green public procurement and introducing quality standards for secondary and recycled construction materials.

A circular food and bio-waste value chain to support waste prevention and management

Integrating circular strategies into North Macedonia's biomass and food value chain can contribute to environmental protection and climate change mitigation by maximising the value of bio-based products and resources. Furthermore, embracing a circular bioeconomy can drive advancements in sectors like the agri-food industry through targeted specialisation, enhanced resource efficiency and innovation.

Key recommendations for advancing a circular food and biomass sector include:

- Improve the management of agricultural waste and bio-waste and close their biological cycle by improving infrastructure and incentives for separate collection, investing in composting facilities, and strengthening the regulatory framework by developing quality assurance systems.
- Move towards a sustainable consumption of food by preventing waste (e.g. through tax incentives for food donations) and create demand for sustainable food products (e.g. through green public procurement).
- Incentivise the development of the circular bioeconomy through better funding and technical support in research and innovation projects.
- Improve stakeholder engagement and collaboration, and awareness raising.

Advancing a circular textile industry through sustainable practices for waste reduction and resource efficiency

Textiles present significant environmental challenges ranging from chemical release to water and soil systems to high rates of landfilling. Positively, there is a growing momentum to address such issues via circular textile design and changes in consumption and production practices, including repair, reuse and recycling. Moreover, the European Union is set to enforce more stringent requirements with the goal of promoting circularity in textiles. These initiatives, though still in their infancy, present a significant opportunity for North Macedonia to prioritise the transformation of its textile industry, particularly in light of its ongoing EU accession process and competitive position as a key exporter of textiles to the European Union.

Key recommendations for making textiles more circular include:

- Develop a national strategy for sustainable and circular textiles that covers the entire textile value chain.
- Reduce and better manage textile waste through improved production processes (e.g. provide financial and technical support) and increased recycling and reuse of textiles.
- Strengthen the circular design of textiles by introducing ecodesign requirements and supporting innovations (e.g. support local projects and innovation for circular textile design).

Cultivating circular practices in mining and metallurgy to support sustainable innovation and environmental stewardship

Mining and metallurgy are critical to the green transition, as the demand for critical raw materials increases with the shift towards greener practices, such as electrification and renewable energy expansion. However, conventional mining practices cause significant environmental harm. A shift to more sustainable practices in mining and metal processing will be critical in North Macedonia's transition to a low-carbon economy, with the circular economy playing a vital role in ensuring a sustainable supply and environmentally responsible management of mineral resources.

Key recommendations for achieving more circularity in mining and metallurgy include:

- Improve stakeholder engagement, education and collaboration, and raise awareness (e.g. develop a circularity potential study, assess data to map out material flows, facilitate industrial symbiosis in green industrial zones).
- Provide financial support and economic incentives for upstream eco-innovation and research and development to enhance metal and mineral value chains for a low-carbon economy.
- Support legislation and policies for circular value chains in mining and metallurgy by mainstreaming circularity principles in strategic documents, procedures for permits and concessions, and considering material recovery obligations.

1 Introduction

This chapter outlines the objectives, structure and context of the circular economy roadmap. Moreover, it explores the concept of the circular economy, providing an overview of the increasing momentum for its implementation in North Macedonia.

Objectives and scope of the roadmap

The principal aim of this roadmap is to assist the government of North Macedonia in establishing a sound policy framework for its transition to a circular economy. This involves strengthening inter-governmental co-ordination and stakeholder engagement, thereby facilitating the necessary transformations. Drawing from a thorough diagnostic of the state-of-play of the circular economy in North Macedonia, and integrating ongoing policy initiatives, the roadmap seeks to foster synergies across the various sectors, measures and stakeholders involved in the circular economy. It provides essential policy recommendations for five priority areas: 1) circular business models for small and medium-sized enterprises (SMEs); 2) construction; 3) biomass and food; 4) textile; and 5) mining and metallurgy.

By incorporating the measures outlined in this roadmap into its regulatory and policy framework, North Macedonia can establish a comprehensive and cohesive policy structure. The effective implementation of these specific measures is pivotal for facilitating the shift towards a circular and climate-neutral economy. Additionally, the adoption of these measures is expected to yield various direct and indirect advantages, including: greater resource efficiency; improved waste management; reduced environmental pressure and the associated benefits for public health; improved material security; and increased industrial competitiveness and job creation. As these benefits materialise over time, they are projected to shape the long-term strategic trajectory and the institutional framework necessary for the transition to a circular economy. This, in turn, is poised to make a positive contribution to achieving national climate and environmental objectives.

The key elements of this roadmap that support the circular economy in North Macedonia are:

- A rationale for the transition to a circular economy in general and within North Macedonia's context.
- A diagnostic presenting a comprehensive analysis of the state-of-play of the circular economy in key economic sectors, recent environmental developments and circular trends, and the existing policy landscape concerning the circular economy, highlighting the key policy gaps in North Macedonia.
- A potential overarching vision, and the roadmap's strategic goals and targets.
- An analysis of and key recommendations for the five selected priority areas (circular business models for SMEs, construction, biomass and food, textile, and mining and metallurgy).
- A monitoring framework with a set of key indicators, based on European Union (EU) circular economy indicators, to support the implementation of the roadmap and measure progress towards achieving its objectives.

Context for the roadmap

The Republic of North Macedonia is taking proactive measures to confront the challenges arising from growing vulnerabilities to climate change, dependence on imported raw materials and increasing amounts of waste. These challenges significantly impact the country's efforts towards regional integration and alignment with the European Union. Prioritising competitiveness, fostering fair and equitable growth, decarbonising the economy, and preserving the environment stand prominently as key priorities of North Macedonia's national interests.

The national commitment to sustainable development, as outlined in North Macedonia's National Strategy for Sustainable Development (2010-2030), relies on the successful adoption of circular economy principles aligned with the United Nations Sustainable Development Goals (SDGs). The journey towards sustainable development and EU integration mandates a comprehensive strategy for waste management, which is a central focus of both the National Plan for Waste Management (2021-2031) and the National Waste

Prevention Plan (2022-2028). These plans are designed to facilitate the necessary shift from a linear waste model to a circular approach that emphasises promoting reuse and recycling.

While North Macedonia has yet to strengthen its framework for environmental protection, extending beyond climate change mitigation to align with the EU *acquis*, the Long-term Strategy on Climate Action (2021-2051) places a strong emphasis on enhancing institutional capacity to cut greenhouse gas (GHG) emissions. This strategy aligns with the EU climate framework and the objectives of the Paris Agreement. Other environmental considerations are increasingly being incorporated into industry-specific policies. A notable example of this is the Smart Specialisation Strategy, which strives to facilitate a green transition across key sectors (including, for example, the agriculture and food sector and manufacturing industries). This involves reshaping supply chains to accommodate more circular products and services while fostering eco-innovation in crucial economic domains.

Key governmental institutions have acknowledged the importance of a circular transition in attaining national and regional development goals. The Ministry of Economy is responsible for steering the progress towards a circular economy. Given the interdisciplinary nature of the circular shift, comprehensive, whole-of-government participation is essential in crafting and executing policies related to the circular economy. Consequently, other institutions such as the Ministry of Environment and Physical Planning; the Ministry of Finance; the Ministry of Agriculture, Forestry and Water Management; and the Ministry of Transport and Communication equally play a crucial role in contributing to this transformative endeavour.

Tangible progress in the realm of the circular economy in North Macedonia has been sparse thus far. The low awareness of circular economy concepts among society, with 77% of citizens not having a clear idea of what the circular economy entails (RCC, 2022[1]), and limited financing options for businesses are some of the main challenges in this regard. The initiatives undertaken in this context have been somewhat disjointed, lacking a cohesive and co-ordinated strategy. This absence of concerted efforts has significantly hindered the shift toward a circular economy in North Macedonia, and is the primary justification for the development of this roadmap.

Overview of the circular economy

The circular economy concept

Mounting concern about environmental issues such as climate change, acidification, eutrophication and intensive land use have captured global attention to the ever-rising rates of material extraction and consumption. This recognition highlights the merit of the circular economy concept, which represents a significant shift away from the traditional linear economic model of “take-make-dispose” and offers a promising approach to address environmental pollution more effectively.

Within a circular economy, goods and services are purposefully designed, produced and consumed to minimise the use of finite material resources. This practice upholds essential principles such as minimising waste throughout the entire product life cycle, recovering materials from waste streams for recycling or reuse, prolonging product life cycles, prioritising durability, and exploring opportunities within the sharing and services economy. Its core tenets include advocating for the repair, reuse and recycling of materials and products, all with the overarching goal of establishing a regenerative closed-loop system.

More specifically, a circular economy transforms the flows of products and materials through three key mechanisms (McCarthy, Dellink and Bibas, 2018[2]):

1. **Closing resource loops** through the substitution of secondary materials and second-hand, repaired or remanufactured products in place of their virgin equivalents.
2. **Slowing resource loops** through the emergence of products which remain in the economy for longer, usually due to more durable product design.

3. **Narrowing resource flows** through more efficient use of natural resources, materials and products, including the development and dissemination of new production technologies, increased utilisation of existing assets, and shifts in consumption behaviour.

Shifting to a circular economy offers various potential benefits. It notably improves resource efficiency and promotes the sustainable handling of materials, effectively mitigating resource depletion, reducing ecosystem degradation and lowering the carbon footprint of economic activities. The benefits of this transition encompass a significant reduction in GHG emissions, new employment opportunities and less dependence on scarce resources. Beyond prioritising environmental sustainability, the circular economy also reinforces economic resilience and stimulates innovation toward more sustainable production and consumption practices.

The circular economy concept has gained broad acceptance, permeating national and international policy making, civil society, and the business sector. Nevertheless, it is essential to note that there is no universally agreed-upon definition or approach to it. Instead, policies and initiatives are tailored to align with the distinct objectives of governments seeking a transition toward a resource-efficient circular economy.

Enhancing resource efficiency and facilitating the shift towards a circular economy are essential in promoting green growth, recognised widely in comprehensive environmental and economic policies. Numerous international organisations actively endorse the circular economy. For example, the OECD has established a Circular Economy Policy Framework, providing guidance to its member countries as they transition towards circular practices. The United Nations promotes sustainable consumption and production through the SDGs, with a specific focus on SDG 12. Additionally, the Plastic Waste Partnership, led by the United Nations Environment Programme, addresses global plastic pollution through circular solutions. The World Economic Forum's Circular Economy Initiative advocates for circular business practices while the G7 Alliance on Resource Efficiency promotes circular economic policies and practices in some of the world's largest economies. Beyond policy-making bodies, influential international and non-governmental organisations collaborate with stakeholders from the private sector, academia and civil society to propel the adoption of circular economy practices.

The European Union's policy framework and legislation promoting a circular economy

The European Union prioritises the journey toward a circular and net zero economy as a key policy objective. To realise its ambitious vision of becoming the first climate-neutral continent by 2050, embedded in its European Green Deal (European Commission, 2019[3]), the European Union actively promotes the transition to circularity.

Building upon the initial Circular Economy Package, which introduced the EU Circular Economy Action Plan in 2015, the European Union reiterated its commitment in 2020 with a renewed plan. The plan serves as a fundamental component of the EU Green Agenda, which aims to achieve climate neutrality by decoupling economic growth from resource consumption, enhancing EU competitiveness, and facilitating a fair and inclusive transition. It establishes ambitious targets, including commitments to recycle 65% of municipal waste and 75% of packaging waste by 2035, employing measures such as reducing single-use plastics and strengthening ecodesign principles for extended product life cycles.

The European Union's legal framework for the circular economy is intricately linked to the "Fit-for-55" package, a comprehensive set of legislations designed to align EU policies with the climate goals outlined in the EU Climate Law.

Numerous established regulations already support the circular economy, and ongoing revisions, as proposed in the Circular Economy Action Plan, continue to enhance this legal framework. Together, these legal instruments establish a robust foundation for the transition to a circular economy in the European Union, making substantial contributions to resource efficiency and environmental sustainability.

- The Waste Framework Directive defines the core principles of waste management, including waste prevention and recycling targets. The latest proposal for a targeted revision of the directive was published in July 2023 (European Commission, 2023[4]). It aims to introduce a mandatory and harmonised extended producer responsibility scheme for textiles, in line with the EU Strategy for Sustainable and Circular Textiles (European Commission, 2022[5]).
- The Packaging and Packaging Waste Directive sets specific targets for packaging recycling and recovery. It is undergoing revisions to strengthen packaging requirements, with a focus on enhancing packaging reusability and recyclability, promoting the use of recycled materials, and ensuring effective enforcement (European Parliament, 2023[6]). A complementary policy framework for bio-based, biodegradable and compostable plastics was also developed (European Commission, 2022[7]).
- The Ecolabel Regulation, adopted in 2010, helps manufacturers and businesses optimise production and save costs while enhancing their green brand and image. Special discounts on EU Ecolabel fees exist for SMEs to reduce application costs. Through its proposal for a directive on empowering consumers for the green transition, as part of the Circular Economy Package, the European Union is seeking to tighten the rules on greenwashing and ecolabels (European Commission, 2023[8]).
- In 2022, proposals for a new Ecodesign for Sustainable Products Regulation (European Commission, 2022[9]), a revised Construction Products Regulation (European Commission, 2022[10]) and the Empowering Consumers for the Green Transition Regulation (European Commission, 2022[11]) were adopted.
- The EU Taxonomy Regulation, which entered into force in 2020, establishes an EU-wide classification system for sustainable activities by setting out four overarching conditions that an economic activity must meet to qualify as environmentally sustainable. The transition to a circular economy is a key objective of the regulation.

In addition to regulatory and policy mechanisms, the European Union promotes and facilitates stakeholder involvement in the transition to a circular economy. Two platforms that contribute to this engagement are the EU Circular Economy Stakeholder Platform, established in 2017, and the Global Alliance on Circular Economy and Resource Efficiency, initiated in 2021. They serve as forums for collaboration, knowledge sharing and policy development, fostering advancements in the circular economy at both regional and global levels.

Momentum for a circular economy in the Western Balkans and North Macedonia

Over the years, there has been a constant rise in per capita waste generation in the Western Balkans, coupled with a notably low recycling rate for municipal waste and a comparatively high resource intensity, indicating low efficiency in resource use (OECD, 2021[12]). This places a substantial burden on the environment, resulting in degradation; biodiversity loss; and water, air and soil pollution, thereby contributing to climate change. Furthermore, the COVID-19 pandemic underscored the economic risks associated with dependence on globalised linear supply chains and cheap virgin raw materials, leading to production disruptions and financial losses, revealing the unsustainability of the current linear economic model. In response to these challenges, the circular economy has gained prominence as a solution to addressing critical environmental issues while simultaneously fostering sustainable and resilient economic development.

The Western Balkan region is of strategic importance to Europe's overarching objective of achieving carbon neutrality by 2050. On 10 November 2020, regional leaders affirmed their commitment to aligning with European climate targets through the signing of the Sofia Declaration on the Green Agenda for Western Balkans. As a crucial element of the Green Agenda for Western Balkans, the European

Commission's Regional Economic and Investment Plan endorses the transition to a circular economy. The Green Agenda for the Western Balkans underscores the necessity of connecting regional economic growth and new business opportunities to more sustainable production and consumption practices. This involves promoting waste prevention, reuse and recycling as well as minimising waste generation, enhancing resource productivity and addressing pollution, particularly plastic pollution.

Driven by a combination of environmental considerations, economic factors, and efforts towards regional and EU integration, the adoption of circular economy principles and practices is gaining momentum in the Western Balkans. Serbia and Montenegro adopted circular economy roadmaps in 2020 and 2022, respectively, accompanied by related programmes/strategies and action plans. Kosovo* adopted its circular economy roadmap in March 2023, while Bosnia and Herzegovina is currently in the process of developing a similar document. With the support of the OECD, work on circular economy roadmaps in Albania and North Macedonia commenced at the end of 2022, with the goal of completing them by early 2024. This document reflects the outcomes of the efforts undertaken in North Macedonia.

With the active development of its circular economy framework, North Macedonia can tackle critical aspects of its circular economy. A primary concern is the inadequate management of waste, which is a common issue shared with neighbouring economies. Additionally, the limited awareness of circular concepts and opportunities within both the broader society and the business community poses a risk of overlooking crucial prospects for essential and environmentally friendly developmental investments.

References

European Commission (2023), *Proposal for a Targeted Revision of the Waste Framework Directive*, European Commission, Brussels, https://environment.ec.europa.eu/publications/proposal-targeted-revision-waste-framework-directive_en. [4]

European Commission (2023), "The EU Ecolabel: The right choice for marketing your sustainable products!", https://environment.ec.europa.eu/topics/circular-economy/eu-ecolabel-home/business_en (accessed on 29 January 2024). [8]

European Commission (2022), "Circular economy: Commission proposes new consumer rights and a ban on greenwashing", press release, 30 March, https://ec.europa.eu/commission/presscorner/detail/en/ip_22_2098. [11]

European Commission (2022), *Communication – EU Policy Framework on Biobased, Biodegradable and Compostable Plastics*, European Commission, Brussels, https://environment.ec.europa.eu/publications/communication-eu-policy-framework-biobased-biodegradable-and-compostable-plastics_en. [7]

European Commission (2022), *Communication – EU Strategy for Sustainable and Circular Textiles*, European Commission, Brussels, https://environment.ec.europa.eu/publications/textiles-strategy_en. [5]

* This designation is without prejudice to positions on status and is in line with United Nations Security Council Resolution 1244/1999 and the Advisory Opinion of the International Court of Justice on Kosovo's declaration of independence.

European Commission (2022), *Proposal for a Regulation Laying Down Harmonised Conditions for the Marketing of Construction Products, Amending Regulation (EU) 2019/1020 and Repealing Regulation (EU) 305/2011*, European Commission, Brussels, https://ec.europa.eu/docsroom/documents/49315. [10]

European Commission (2022), *Proposal for Ecodesign for Sustainable Products Regulation*, European Commission, Brussels, https://environment.ec.europa.eu/publications/proposal-ecodesign-sustainable-products-regulation_en. [9]

European Commission (2019), *Communication on the European Green Deal*, European Commission, Brussels, https://commission.europa.eu/document/daef3e5c-a456-4fbb-a067-8f1cbe8d9c78_en. [3]

European Parliament (2023), *Revision of the Packaging and Packaging Waste Directive*, European Union, https://www.europarl.europa.eu/RegData/etudes/BRIE/2023/745707/EPRS_BRI(2023)745707_EN.pdf. [6]

McCarthy, A., R. Dellink and R. Bibas (2018), "The Macroeconomics of the Circular Economy Transition: A Critical Review of Modelling Approaches", *OECD Environment Working Papers*, No. 130, OECD Publishing, Paris, https://doi.org/10.1787/af983f9a-en. [2]

OECD (2021), *Competitiveness in South East Europe 2021: A Policy Outlook*, Competitiveness and Private Sector Development, OECD Publishing, Paris, https://doi.org/10.1787/dcbc2ea9-en. [12]

RCC (2022), *Balkan Barometer Public Opinion 2022*, Regional Cooperation Council, Sarajevo, https://www.rcc.int/pubs/139/balkan-barometer-public-opinion-2022. [1]

2 State-of-play of the circular economy in North Macedonia

This chapter assesses the circular economy policy framework and initiatives in North Macedonia, emphasising critical economic aspects and environmental impact related to energy production, emissions, material use and waste management. Challenges persist in areas such as energy intensity, fossil dependency, circular material use and waste recycling. This chapter pinpoints key policy areas essential for North Macedonia's shift towards a circular and carbon-neutral economy. By identifying gaps in both policy formulation and implementation, and incorporating further analyses, the chapter provides insights for prioritising areas in future circular economy policy documents.

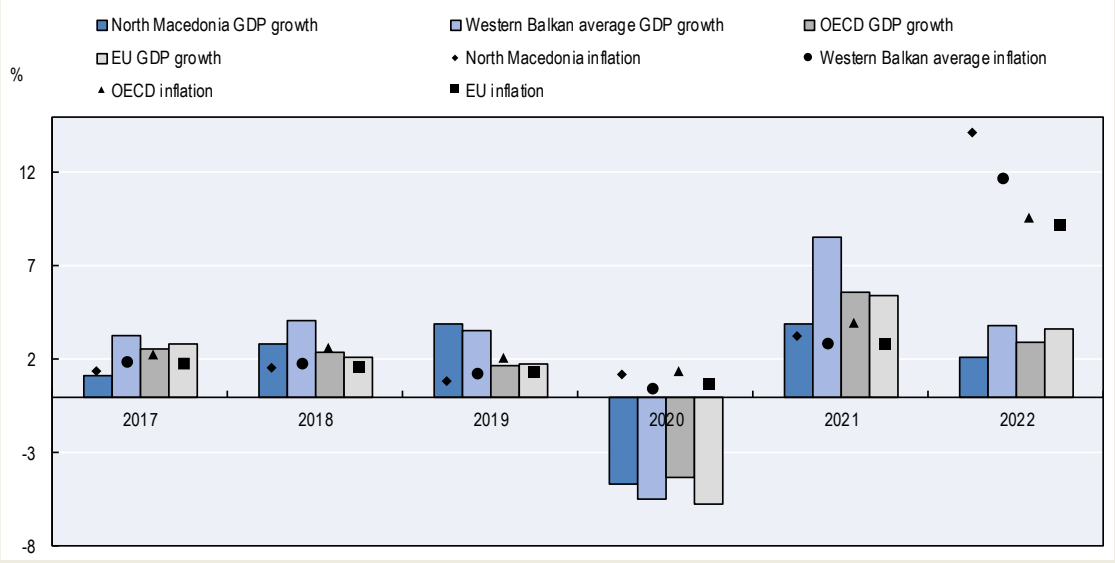
North Macedonia's key economic features and their relevance to the circular economy

North Macedonia has made significant economic progress over the past three decades, having navigated through a post-conflict economic reconstruction. It has moved from a low-income economy to an upper middle-income European Union (EU) candidate country, with gross domestic product (GDP) per capita PPP (constant 2017 international dollars) rising from 9 867 in 1992 to 17 129 in 2022 (World Bank, 2024[1]). While unemployment remains high (14.5% of the population aged 15-64 compared to 7% in the European Union), it has been on a decreasing trend over the past 15 years (European Commission, 2023[2]). North Macedonia's economy has grown at moderate levels for almost a decade, averaging 2.2% between 2012 and 2022 (World Bank, 2023[3]). Since 2020, North Macedonia's economic growth has been impacted by external shocks, starting with the COVID pandemic. The subsequent energy crisis and inflation, induced by the war in Ukraine, dampened its economic recovery (Box 2.1).

Box 2.1. Impact of recent crises on North Macedonia's economic growth

- In 2020, the COVID-19 pandemic had a strong impact on North Macedonia's gross domestic product (GDP), resulting in a year-on-year decrease of 4.7% (Figure 2.1).
- Fast and determined responses from the government and the central bank softened the negative impacts of the pandemic and helped maintain macroeconomic and the financial sector's stability.
- While lower than that of its neighbours in the Western Balkans, North Macedonia's GDP growth rebounded to 3.9% in 2021, fuelled by strong recovery in the production of automotive components, recovery of private consumption and implementation of government support measures.
- Nevertheless, the economy lost steam throughout 2022, as domestic demand weakened and GDP growth dropped to 2.1%. The inflation rate climbed to close to 20% in October 2022, averaging 14% throughout the year, mainly driven by an increase in food and energy commodity prices, disproportionately affecting poorer households and small and medium-sized enterprises. This economic downturn was further exacerbated by the Russian Federation's ongoing war in Ukraine.

Figure 2.1. GDP growth in North Macedonia, 2017-2022



Notes: GDP: gross domestic product; EU: European Union. No data are available for Bosnia and Herzegovina in 2022.
Sources: European Commission (2022[4]); OECD (2022[5]).

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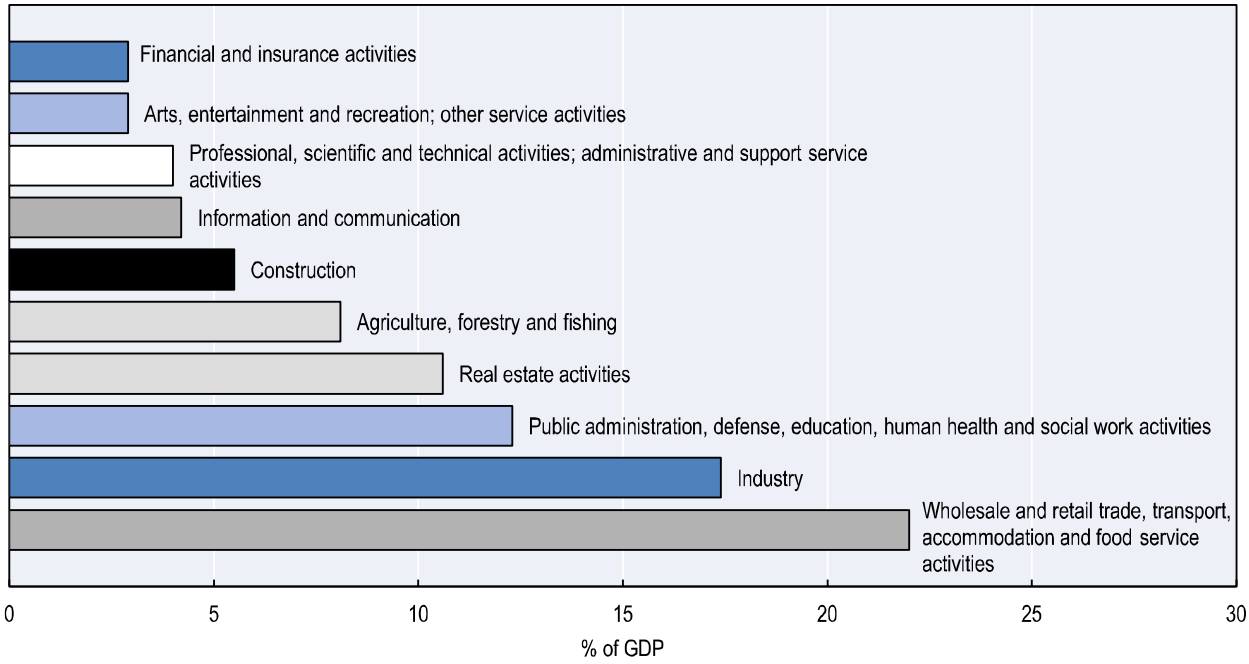
North Macedonia's value added by economic activity shows that the economy is particularly reliant on wholesale and retail trade, followed by industry (Figure 2.2).

Figure 2.2. Value added by economic activity in North Macedonia, 2022



Notes: The total percentage of gross domestic product of all NACE activities does not equal 100%. Data are based on estimations. GDP measurement includes gross value added plus taxes, minus subsidies on products.
Source: Eurostat (2023[6]).

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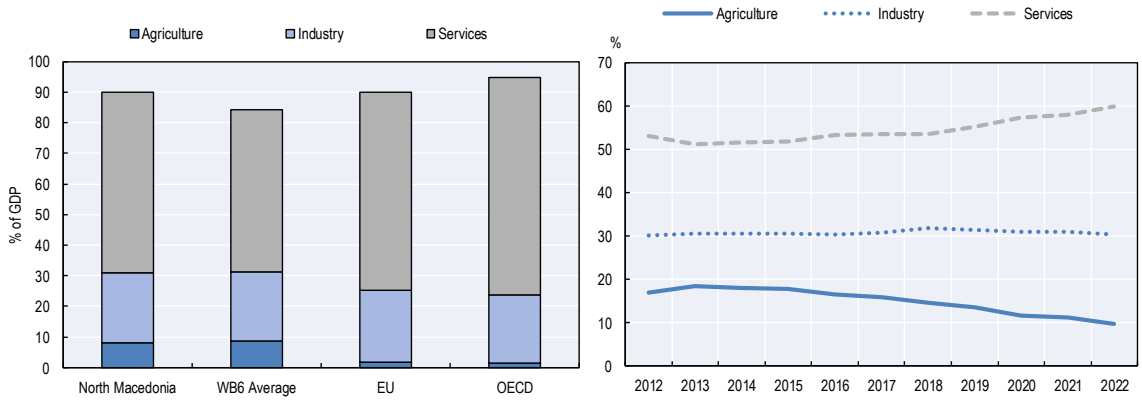
Service sector

North Macedonia's economy is dominated by services, which accounted for 56.9% of GDP and 58% of employment in 2021 (Figure 2.3). Exports of services have increased considerably in the past decade but still account for only 25% of total exports (OECD, 2021[7]). This is the case despite the strong potential for the development of services linked to manufacturing and food processing global value chains (e.g. transport logistics, packaging), the rapidly growing domestic ICT sector and the tourism sector (OECD, 2021[7]).

Wholesale and retail trade (including tourism)[1] account for the largest share of services in North Macedonia (amounting to 22% of total GDP in 2022). A transition towards a circular economy has the potential to enhance new trading opportunities for services, such as waste management, recycling, refurbishment and remanufacturing, reuse, and repair, as well as new business models and product service systems (OECD, 2018[8]). Introducing standards that would reduce services trade barriers for such activities could serve as a basis of circular economy policies (e.g. ecodesign, eco-labelling, green public procurement) and play a key role in facilitating the uptake of circular efforts in international trade (Yamaguchi, 2022[9]). Moreover, while tourism has been severely impacted by recent economic shocks, its recovery offers unique opportunities to redesign the sector in a sustainable and resilient way in line with a circular economy model, intentionally regenerative of natural, human and social capital, operating within the local destinations' sustainable boundaries (Einarsson and Sorin, 2020[10]).

Figure 2.3. Value added by grouped activity, 2022, and share of employment by economic activity in North Macedonia, 2012-2022



Notes: WB: Western Balkan; EU: European Union. Industry includes construction, energy, mining and manufacturing. The value added shares presented in the World Development Indicators for agriculture, industry and services may not add up to 100% due to financial intermediary services indirectly measured and net indirect taxes.
Sources: World Bank (2022[11]); OECD (2024[12]); ILOSTAT (2023[13]); Eurostat (2023[6]).

StatLink https://stat.link/uesfbw

Industry sector

Industry, including construction, has expanded over the past decade. In 2022, it accounted for 22.9% of GDP and 30.4% of employment (see Figure 2.3). The most notable expansion in the industrial sector has been the increase in manufacturing, representing 13% of GDP in 2022 (compared to 10% in 2013) and 22.5% of employment in 2022 (MAKSTAT, 2023[14]), on the back of significant inflows of export-oriented foreign direct investment (FDI) (Ministry of Labour and Social Policy, 2021[15]). North Macedonia has developed a more proactive and direct investor-targeting strategy through the establishment of special economic zones. Manufacturing FDI in special economic zones resulted in a significant increase in total exports, which accounted for 74.9% of GDP in 2022, the highest share in the Western Balkan region (World Bank, 2023[16]). North Macedonia's main exports include automotive parts, textiles and basic metals (ferroalloys) (OECD, 2022[5]). While industry is the most resource-intensive and waste-producing economic sector, it shows tremendous potential for innovation, as the markets for new clean products and services keep growing. The increasing inflows of export-oriented FDI in North Macedonia, coupled with boosted links with local SMEs, could improve technical know-how and capacity to innovate and adopt new technology.

Mining and quarrying

Mining and quarrying accounted for 1.3% of GDP in 2018 in North Macedonia and have a long history in the economy (Macedonian Mining Association, 2021[17]). North Macedonia is rich in different materials – metallic minerals found in its territory include copper, silver, gold, zinc and lead; non-metallic minerals include bentonite, talc, gypsum, quartz and quartz sand; and energy materials include coal (lignite) (Macedonian Mining Association, 2021[17]). There are 201 business entities – mainly microenterprises – involved in mining and quarrying activities (or 0.3% of total active businesses), employing around 10 000 people. The sector accounts for 2.8% of total exports (Macedonian Mining Association, 2021[17]). It has been particularly backed by important FDI in the past decade due to lower restrictions on procedures for issuing permits and concessions. However, mining methods of extraction have resulted in long-lasting

water and soil pollution,[2] affecting biodiversity and the health of the local population. Recent legislative amendments nevertheless provide greater protection of the population's health and of the environment. Improving circularity at the mining operations stage and the recovery of critical raw materials from extractive waste in current mining activities and from historical mining waste sites could ensure the sustainability of critical raw materials and protect the environment from toxic and hazardous elements.

Metallurgy

Metallurgy, or basic metals production (most exported products include ferroalloys, hot-rolled steel, coated flat-rolled steel, steel pipe and tubes, and steel bars) is one of North Macedonia's largest industrial sectors. The sector is comprised of complex technical and technological stems for production as well as modern equipment and technologies for advanced processing of basic metals, making it significantly important and strategic for the economy (Invest North Macedonia, 2023[18]). Basic metals production represented 13.6% of exports in 2021, the vast majority of which was exported to the European Union, with iron and steel imports representing 8.9% of the European Union's total imports from North Macedonia in 2022 (European Commission, 2023[19]). In addition to being easily recycled and reused, transitioning to circular production processes of metal products will be beneficial in light of the EU Carbon Border Adjustment Mechanism.[3]

Construction and building materials

The construction and building materials sector's value added has stagnated between 5% and 7% in the past decade and accounted for 7.7% of the total number of active business entities in 2021 (MAKSTAT, 2022[20]) and 6.5% of total employment in 2022 (MAKSTAT, 2023[14]). However, the consequences of recent crises, namely disrupted supply chains and delayed construction projects, have had adverse effects on the sector and labour force (the number of employees in the sector decreased by 22.1% year-on-year in the third quarter of 2022) (MAKSTAT, 2023[21]). The production of building materials is based on domestic resources of non-metallic minerals (marble, gypsum, brick clay, sand, gravel) and related mining activities (imports of primary raw materials are almost negligeable). The main construction products produced in the economy are cement products, plaster, plasterboard, dry mortar, clay products and bituminous insulating materials. The production of construction products has undergone major changes in recent years with the introduction of new modern production lines and technological advancements (Economic Chamber of North Macedonia, 2021[22]). Nevertheless, the sector produces large amounts of waste that is not recovered and is largely deposited in wild dumpsites (EEA, 2021[23]). Overall, untapped potential remains in the production of sustainable construction materials, in particular through more resource-efficient mining operations and the use of industrial waste and reuse of construction materials (Joint Research Centre, 2021[24]).

Automotive industry

The automotive industry is of growing importance for the Macedonian economy, creating new jobs and attracting investments. Prior to the COVID-19 pandemic, the industry was booming, with automotive components exports amounting to EUR 117.5 million in 2020 (compared to EUR 9.7 million in 2015), in part due to the strong metallurgy sector (Invest North Macedonia, 2022[25]). In 2019, the 15 largest companies[4] in the automotive industry generated total revenues of EUR 2.9 billion, representing one-fourth of North Macedonia's GDP and 43% of total exports (Invest North Macedonia, 2022[25]). The strong recovery of the sector was also a key driver of the post-COVID economic rebound, with companies in the automotive industry responsible for 65% of the total exports in January 2021 (Invest North Macedonia, 2022[25]).

Through the increased production of automotive components, the Macedonian economy has become more integrated into global supply chains, with industrial exports increasingly composed of high value-added products, achieved through the importation of medium-value inputs. These intermediate inputs are then

assembled and finished in North Macedonia, reflecting a strategic shift in the production process. Nevertheless, the global automotive industry is at the beginning of its deepest transformation since its rise, with electrification, digitalisation and decarbonisation requiring massive investments and attention. Optimising the full vehicle life cycle across the value chain, in line with circular business models, can help address these challenges and improve profitability, for instance through modular vehicle design, vehicle end-of-life treatment and material processing (World Economic Forum, 2022[26]).

While automotive companies in North Macedonia are not responsible for all stages of the vehicle life cycle (in particular vehicle conception and design), the circularity of the industry can be improved through better selection, collection and treatment of scrap and waste (in particular for metals and plastics) and by promoting production methods with lower environmental impact and waste generation. There are currently five permits for the waste management of end-of-life vehicles (dismantling and pre-treatment). Municipalities in Greater Skopje and the City of Skopje organise their collection and treatment, including the delivery to the collection point or treatment facility, in accordance with the law. Future long-term plans include defining measures for the reuse or restoration of components, establishment of a system for gathering relevant data, and the creation of an independent producer balancing body.

Textile industry

North Macedonia's textile industry is the second largest industrial sector and one of the most developed and diversified in terms of industrial production, employment and export earnings, accounting for 10% of total exports and 13% of industrial GDP (Invest North Macedonia, 2022[25]). In 2019, the sector represented 7% of total employment (36 000 people), or around one-fourth of employees in manufacturing. More than 800 companies in the textile industry are actively involved in various levels of production, of which about 93% are export-oriented (Invest North Macedonia, 2022[25]). However, the industry is still characterised by landfilling (4.7% of total landfilled municipal solid waste) and low recycling, low reuse and fabric underutilisation, leading to considerable pressure on resources (Jordeva et al., 2018[27]; EEA, 2021[23]). The textile industry stands out as one of the most polluting and waste-generating sectors globally, contributing to 10% of total carbon emissions worldwide, a figure surpassing those of aviation and marine shipping (European Commission, 2020[28]). Furthermore, it accounts for 20% of global freshwater pollution and is associated with high rates of landfilling and burning.

Its associated carbon dioxide (CO_2) emissions are projected to increase by more than 60% globally by 2030. A "new textile economy" based on a circular model will, therefore, be key in reaching climate-neutral targets (Design4Circle, 2021[29]). While North Macedonia's textile companies are not involved in the production and design phase of fabrics, there is circular potential in sustainable textile production processes (manufacturing, treating and dyeing) and waste reduction in fabric usage. Digital tools, such as computer-aided design and computer-aided manufacture, can support such processes.

Agriculture

The contribution of agriculture, forestry and fishing to GDP has been declining continuously since the 1990s and the sector now accounts for 8.1% of GDP, slightly lower than the Western Balkan average (8.5%) but above EU and OECD averages (1.7% and 1.4%, respectively) (see Figure 2.3). Agriculture, however, still accounts for almost 10% of total employment and most jobs are low-skilled and low-wage, mainly due to the prevalence of subsistence farming. Exports of agricultural and food products in 2021 constituted 9.6% of total exports, mainly tobacco, lamb meat, fresh and processed vegetables and fruits, wine, and confectionery products (Invest North Macedonia, 2022[25]). Moreover, organic production has grown in recent years thanks to government support, with the agricultural area under organic farming having more than tripled in between 2015 and 2022, although it still represents less than 2% of total cultivated area (Eurostat, 2023[30]; MAKSTAT, 2023[31]). Agricultural productivity is very low (less than 25% of the EU average) and further development of the sector is undermined by its underdeveloped infrastructure

(including for irrigation), fragmented land tenure (the average farm is 1.62 hectares), lack of skilled labour, and significant amounts of land and water required (Ministry of Agriculture, Forestry and Water Management, 2021[32]; OECD, 2021[7]).

In the pursuit of increased productivity and efficiency in the agricultural sector, circular economy principles can be used to decrease pressure on the living environment and use resources more efficiently, thus preventing further depletion and overexploitation of natural resources. Additionally, a circular transition could foster the resilience and economic profitability of the sector, such as through increased use of agricultural surplus and technological progress (OECD, 2019[33]).

SME sector

The SME sector accounted for the vast majority of enterprises (99.9% vs. 98.9% in the European Union) and employment (73.9% vs. 67% in the European Union) in 2021 (OECD, 2022[5]; European Parliament, 2023[34]). Services represent the main economic activity for more than 68.8% of SMEs in North Macedonia, with the largest share working in the distributive trade sector (31.9%), followed by other services (24.1%) and manufacturing (16.6%), the primary base of the economy's industrial sector, with a focus on chemical products, basic iron, steel and ferroalloys, machinery, and textiles.

Considering that SMEs collectively contribute substantially to the environmental footprint, with small firms responsible for 50% of greenhouse gas (GHG) emissions worldwide (ICT, 2021[35]) and 63% in the European Union (European Commission, 2022[36]), it is crucial for North Macedonia to account for them in its environmental policy making. SMEs, like any other economic entity, encounter the repercussions of environmental degradation, presenting unique challenges to their sustainability and growth. The large share of SMEs in North Macedonia can be a key driver in achieving circular objectives, both due to their flexibility in adopting circular business models ("green performers") and their contribution to developing new products, technologies and approaches that address environmental challenges ("green innovators") (OECD, 2021[37]). However, only 15% of Macedonian businesses believe that their business models allow for a shift towards a circular economy, with added costs and the lack of government subsidies being the most significant impediments in this regard (RCC, 2023[38]).

Environmental trends and recent developments relevant to the circular economy

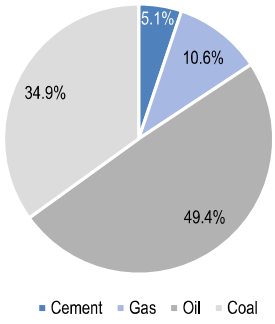
Energy use and emissions trends

North Macedonia is a Non-Annex-I signatory to the United Nations Framework Convention on Climate Change and its Paris Agreement and, as such, has set emissions reduction targets (82% of 1990 emissions levels by 2030). Moreover, in line with the EU ambition to become climate-neutral by 2050, North Macedonia has also committed to achieving carbon neutrality by 2050 by endorsing the Green Agenda for the Western Balkans.

CO_2 emissions account for 80% of North Macedonia's total GHG emissions, and an inventory of other pollutants is under preparation (Ministry of Environment and Physical Planning, 2021[39]). CO_2 emissions reached 3.6 tonnes/capita in 2021, below EU and OECD averages (6.3 tonnes/capita and 7.1 tonnes/capita, respectively) and have been on a decreasing trend over the past decade (from 4.9 tonnes/capita in 2011) (Crippa et al., 2022[40]).

The largest sources of CO_2 emissions in the economy are oil and coal, representing 49% and 35% of total CO_2 emissions, respectively, in 2021 (Figure 2.4). Oil and coal also represent two-thirds of North Macedonia's energy supply (Figure 2.5).

Figure 2.4. CO_2 emissions by source in North Macedonia, 2021



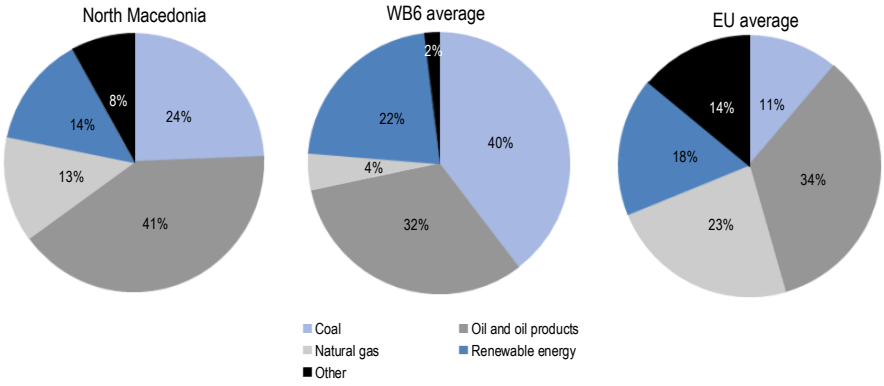
Source: Ritchie, Rosa and Rosado (2022[41]).

Electricity and heat generation is responsible for over half of CO_2 emissions in North Macedonia, which is mainly covered by coal (72%)[5] (IRENA, 2022[42]). Transport, and in particular road transport, emits more than 25% of total CO_2 emissions and is the most demanding oil sector in North Macedonia.

Natural gas' share in North Macedonia's energy supply has increased in the past decade (13% in 2021 compared to 3.2% in 2010) but in light of the energy crisis, the heavy reliance on Russian imports has led the economy to turn to fossil fuels.[6]

Figure 2.5. Energy mix in North Macedonia, the Western Balkans and the European Union, 2021

% of total energy



Notes: WB: Western Balkans; EU: European Union. Nuclear heat accounts for 12.8% of the European Union's energy mix. The major types of renewable energy sources are biomass (wood and wood waste, municipal solid waste, landfill gas and biogas, biofuels), hydropower, geothermal, wind and solar.
Source: Eurostat (2023[43]).

Under its National Energy and Climate Plan, North Macedonia was the first economy in the Western Balkans with structural plans to phase out coal by shutting down all coal-fired thermal power plants by the end of 2027. Nevertheless, objectives have been postponed to 2030 to mitigate the effects of the energy

crisis by reducing reliance on electricity imports (North Macedonia imported 7.7% of its electricity in 2020) (Eurostat, 2022[44]). North Macedonia has continued to feed dated power plants and launched negotiations to buy 3 million tonnes of lignite from Kosovo* at the end of 2022. In this regard, the smaller coal power plant, Oslomej, was reactivated in 2021 after being dormant during 2020 and the Negotino fuel oil-fired power plant was reactivated after not being in use for 12 years (World Bank, 2022[45]).

Energy poverty remains an overarching concern in North Macedonia, with around one-third of households not being able to keep their home adequately warm, one of the largest shares in Europe (World Bank, 2022[45]). When facing higher energy prices, low-income households often switch to cheaper energy sources for heating, such as firewood or waste, thereby exacerbating concentrations of carbon monoxide (CO), presenting a significant threat to air quality and health (OECD, 2021[7]).

Renewable energy only accounts for 14% of North Macedonia's energy supply, the lowest share in the Western Balkans. The total installed capacity of renewable power plants was around 2 117 megawatts (MW) in 2021, with nearly all renewable energy produced from hydro[7] (Energy and Water Services Regulatory Commission of the Republic of North Macedonia, 2022[46]), despite the great potential for wind and solar generation. In particular, wind and solar potential together account for around 71% of the combined utility-scale wind, solar and hydro potential in North Macedonia (IRENA, 2019[47]). One of the National Energy and Climate Plan's key pillars and strategic goals is to increase the share of renewables in final energy consumption to 38% by 2030[8] (Ministry of Economy, 2020[48]). Promisingly, renewable energy sources are developing more rapidly than before. Compared to the period 2017-20, the Energy and Water Services Regulatory Commission licensed almost twice as many solar photovoltaics projects, with a total capacity of 267 MW in 2022/23 alone (Energy and Water Services Regulatory Commission of the Republic of North Macedonia, 2023[49]).

North Macedonia's energy intensity of GDP was almost three times higher than that of the European Union in 2020 (310 and 117 kilogrammes of oil equivalent per EUR 1 000, respectively), making its industries more vulnerable to rising energy prices. High energy intensity is the consequence of low-cost electricity supply based on lignite and hydro and the slow roll-out of investments in energy efficiency (Eurostat, 2020[50]).

Reducing CO_2 emissions in North Macedonia will be dependent on the long-run sustainability of the energy sector. Phasing out coal from its energy mix taking into account underlying economic and social challenges will be a priority, by diversifying the energy mix through other renewable sources and curbing demand growth through energy efficiency measures. This will be particularly important, as energy-intensive economic sectors will be increasingly uncompetitive with the EU Carbon Border Adjustment Mechanism in place. For sustainable energy technologies to replace conventional coal-fired generators, critical metals will be needed (lithium, cobalt and rare earths), which can offer opportunities for mining companies (IEA, 2021[51]). Nevertheless, the mining of such metals presents sustainability and energy security[9] challenges (Pennington, 2022[52]). Renewable material recycling and the use of secondary low-carbon materials will, therefore, be vital to support the clean energy transition. Moreover, introducing circular economy strategies into hydropower generation could ensure its sustainability, as hydropower plants and dams can create greater value, such as contributing to cleaning rivers with equipped trash racks and cleaning machines or improving water management services with water tracking devices. If environmental protection is ensured for hydro generation investments,[10] designing durable and easily disassembled and recycled hydro plants (their lifetime can exceed 100 years) can be significant to long-term low-carbon electricity.

* This designation is without prejudice to positions on status and is in line with United Nations Security Council Resolution 1244/1999 and the Advisory Opinion of the International Court of Justice on Kosovo's declaration of independence.

Materials use

North Macedonia hosts several natural resources, including a rich variety of minerals (zinc, lead, copper, chromium, iron, nickel, silver and gold), fossil energy materials (in particular low-grade lignite and gas), forests (around one-third of North Macedonia's land is forested, providing important resources, such as timber and firewood), arable lands (with crops such as tobacco, vegetables and fruits) and water resources (several rivers and lakes).

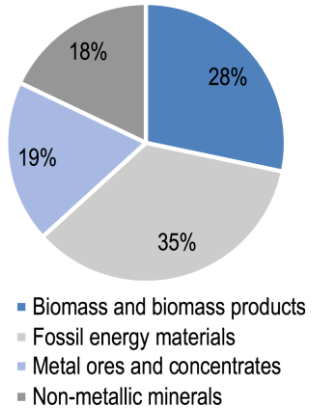
Domestic material consumption[11] (DMC), or the total amount of materials directly used in North Macedonia, stood at 9 tonnes/capita in 2021, lower than the EU and OECD averages, which amounted to 14.1 tonnes/capita (in 2021) and 17.5 tonnes/capita (in 2019), respectively (MAKSTAT, 2021[53]; OECD, 2024[54]). North Macedonia's DMC is dominated by fossil energy materials (35% of the total) and biomass (28.3% of the total) (Figure 2.6).

The share of fossil energy materials in North Macedonia's DMC is much higher than in the European Union (35% vs. 18%, respectively (Eurostat, 2022[55])), due to North Macedonia's high reliance on fossil fuels for its energy supply. Moreover, metal ores and concentrates represent 19% of North Macedonia's DMC, more than three times higher than in the European Union (6% on average) (Eurostat, 2022[55]). Resource efficiency efforts in mining operations, smelting and refining through the processing of residues and secondary metals and materials will be important to reduce environmental impacts and ensure the sustainability of fossil and critical materials.

Biomass' domestic consumption is also higher in North Macedonia than in the European Union (where it represents 23% of its total DMC) (Eurostat, 2022[55]) due to the important contribution agriculture makes to North Macedonia's GDP and the use of firewood for various heating applications. The circular transition of biomass and the development of a circular bioeconomy[12] could be significant in meeting climate targets and protecting the environment, through better policies guiding more resource-efficient and sustainable primary production, and waste management (composting and anaerobic digestion), and supporting the use of residues and waste in agricultural practices. Moreover, bio-waste conversion to energy could support North Macedonia's climate targets by reducing its reliance on fossil energy materials.

Figure 2.6. Structures of domestic material consumption in North Macedonia, 2021

% of total

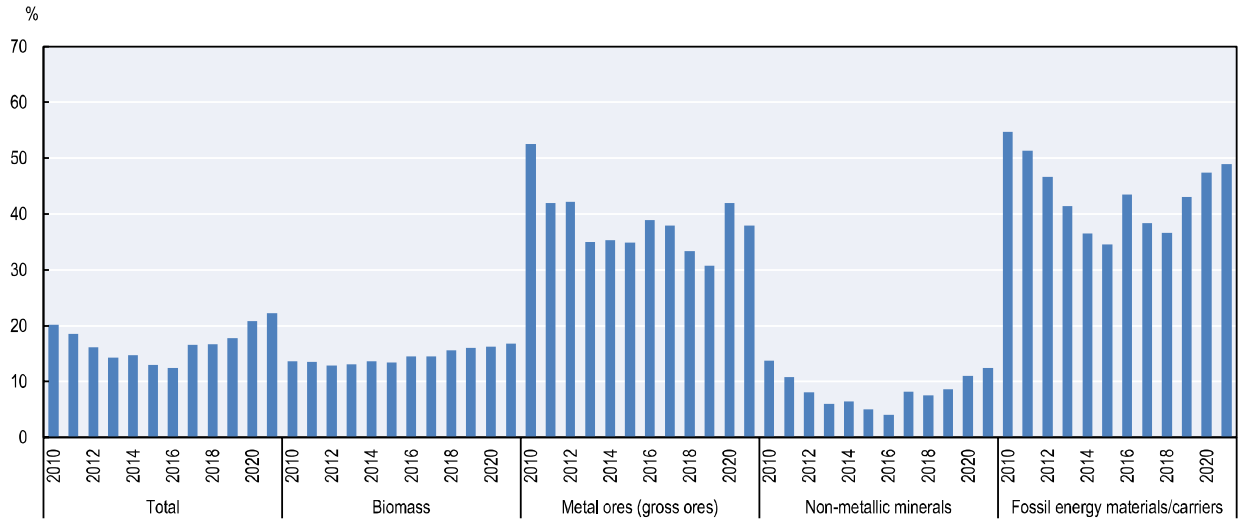


Source: MAKSTAT (2021[53]).

Between 2014 and 2021, while the DMC of fossil energy materials and biomass decreased by 24% and 9%, respectively, their import dependency increased by 29% and 17% (from 2014 to 2020). This trend can point to the depletion of stocks of non-renewable sources in the economy, in particular of coal reserves.

North Macedonia is the most import-dependent on metal ores, whose rate has increased since 2017, reaching 60% in 2020, mainly due the low yield of its mines and the strong demand from the metallurgy and automotive sectors (Figure 2.7).

Figure 2.7. Import dependency in North Macedonia, 2010-2021

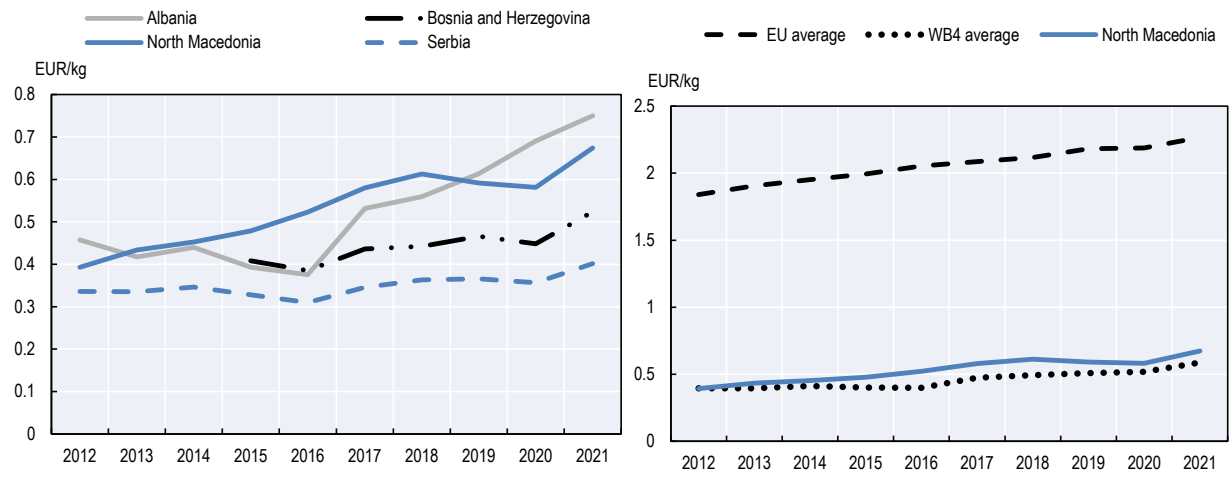


Notes: Import dependency is the ratio of imports over direct material inputs (DMI). DMI is calculated as the sum of domestic extraction of natural resources and imports of materials. Data for the year 2021 are provisional.
Source: Eurostat (2023[56]).

StatLink https://stat.link/wiucl0

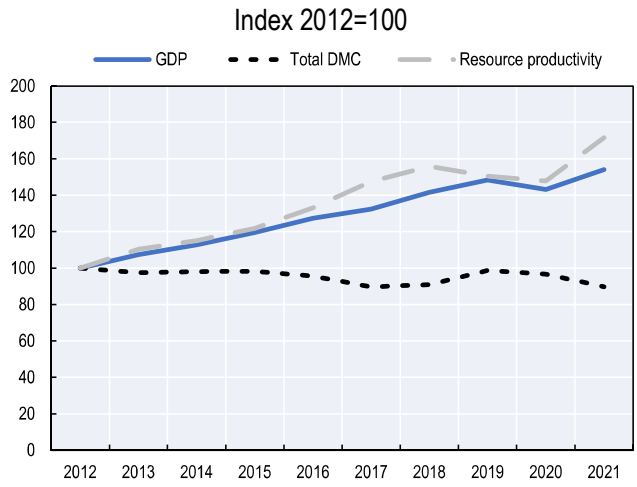
With North Macedonia's DMC being on a slight decreasing trend since 2015 (when it was 9.2 tonnes/capita), resource productivity reached an all-time high in 2021 at 0.67 EUR/kg, marking a sharp increase from 2010, albeit falling short of the EU average (2.26 EUR/kg in 2021) (Eurostat, 2022[57]). While this trend can be interpreted as a first sign of decoupling of economic growth and consumption of natural resources, it has been slightly reversed since 2019 (Figure 2.8). Overall, further efforts are needed to decrease dependence on fossil energy materials, increase resource efficiency and productivity at all stages of the material life cycle (extraction, transport, manufacturing, consumption, recovery and disposal) and throughout its supply chain. A transition to a circular economy, through repair, reuse and recycle, would reduce material extraction levels, ensure the sustainable flow of resources and offer possibilities to reduce dependencies (OECD, 2021[58]).

Figure 2.8. Resource productivity in North Macedonia, 2012-2021



Notes: EU: European Union; WB: Western Balkans. The indicator presents gross domestic product (GDP) divided by domestic material consumption (DMC). DMC measures the total amount of materials directly used by an economy. No data are available for Bosnia and Herzegovina (before 2014), Kosovo, Montenegro, or Albania (2020). Resource productivity data for EU-27 are estimates; 2021 data for North Macedonia are provisional for all indicators.
Sources: Eurostat (2022[55]; 2023[59]).

Figure 2.9. GDP, domestic material consumption and resource productivity in North Macedonia, 2012-2021



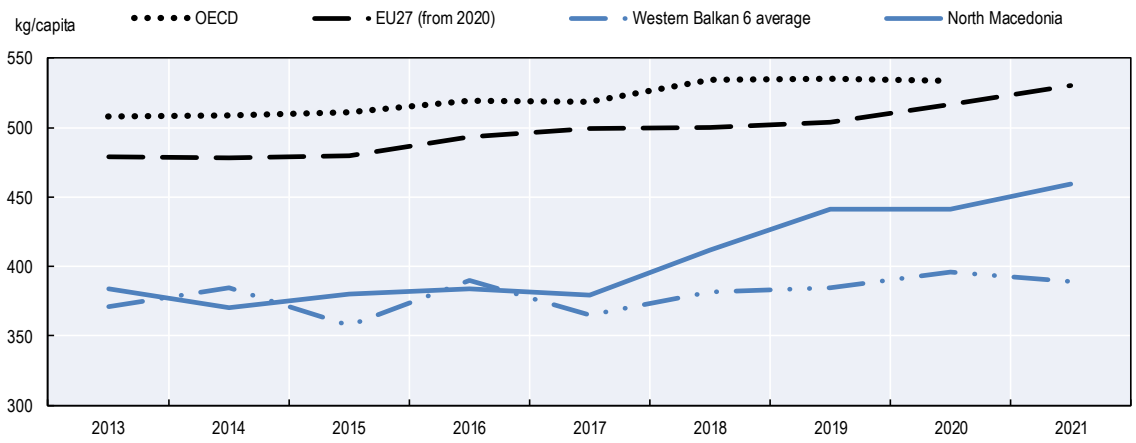
StatLink https://stat.link/tzesca

Waste-related trends

North Macedonia's level of municipal waste generation is higher than that of its neighbouring economies and has been increasing over recent years (Figure 2.10). Municipal waste generation in North Macedonia increased from 786 000 tonnes in 2015 (corresponding to 380 kg/capita) to 916 000 tonnes in 2019 (corresponding to 441 kg/capita). However, there are no exact statistics for waste generation, as data and reports are based on estimations[13] due to the lack of weighing equipment at landfills (with the exception of the Drisla landfill) and the extensive use of illegal dumpsites. Moreover, official data on recycling are based

on reports received from only eight municipalities. A significant part of waste generated remains uncollected by the official system (Ministry of Environment and Physical Planning, 2021[60]).

Figure 2.10. Municipal waste generation, 2013-2021



Sources: Eurostat (2021[61]); data for OECD: OECD (2022[62]); data for North Macedonia: Ministry of Environment and Physical Planning (2021[60]).

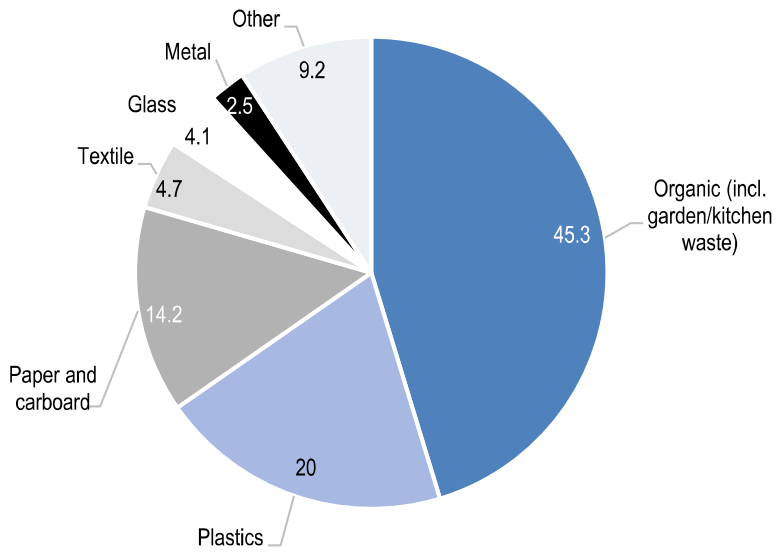
StatLink https://stat.link/zosqnp

In 2020, 45% of estimated municipal waste produced in North Macedonia was organic (food, leaves), followed by 20% of plastics, and 14% of paper and carboard waste (Figure 2.11). When it comes to plastic waste, North Macedonia has one of the highest plastic leakage rates into the Mediterranean through rivers (contributing an estimated 3.2 kg/year/person), mostly due to the high surface runoff, population density in the vicinity of watersheds and a high proportion of mismanaged waste in particular (Boucher and Billard, 2020[63]).

More than 80% of the population in North Macedonia was served by waste collection services in 2022, mainly in urban areas. While the collection coverage has increased, from 72% in 2008 to 83% in 2022, it falls short of the EU average of 98%, and did not attain the government's target of 90% by 2020 (MAKSTAT, 2022[64]; Eurostat, 2023[65]). Waste collection and treatment services are funded from waste management fees[14] from households and private companies; however, the share of citizens paying those fees ranges from 45% to 90% across municipalities due to low penalties and enforcement mechanisms. Pay-as-you-throw schemes are rare due to the lack of measuring equipment in municipalities (EEA, 2021[23]). Low fees and deficient payment thus do not incentivise waste prevention or separate collection.

Figure 2.11. Municipal waste generation by category in North Macedonia (estimations), 2020

In %

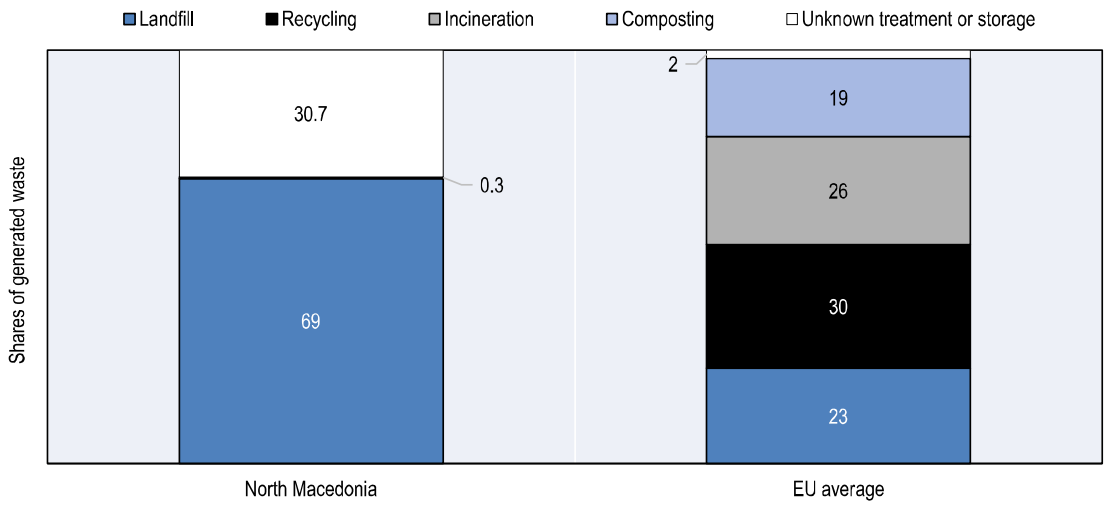


Source: Ministry of Environment and Physical Planning (2021[66]).

Municipal waste management remains a challenge. The main method of managing waste is disposal to landfills (69%); this share is significantly above the share in the European Union (23%) (see Figure 2.12). Recycling rates remain extremely low (0.3%) and around 31% of waste is not treated or unaccounted for. Composting rates dropped from 0.4% in 2015 to 0% in 2020 (Eurostat, 2021[61]).

Figure 2.12. Municipal waste treatment in North Macedonia vs. the EU average, 2020

In %



Notes: The unknown treatment or storage category is calculated as the difference between generated and treated waste. No data are available on incineration and composting in North Macedonia. Recycling data are reported by the European Environment Agency.
Sources: Eurostat (2023[67]); OECD (2022[62]); EEA (2021[23]).

With regard to recycling, municipalities do not organise separate collection of bio-waste or dry recyclables in North Macedonia. The main system for waste collection consists of “bring points” with containers for residual waste collection, where citizens take their waste for disposal. There are some small-scale recycling activities, with informal waste pickers collecting waste from dumpsites and bins and selling it to the recycling industry. Moreover, while a few municipalities are undertaking some pilot circular projects, these remain marginal, such as the conversion of waste and wastewater into compost and biogas in the municipality of Kocani and the establishment of composting stations in the municipality of Resen. Regarding plastic waste, three companies are registered for the management and pre-treatment of PET waste and one for polyolefin, before it is exported to the Republic of Türkiye for recycling (EEA, 2021[23]).

On the other hand, bring systems for packaging waste, regulated under the Extended Producer Responsibility Law, are established by the producer responsibility organisations (PROs) in agreement with municipalities and other entities included in the extended producer responsibility (EPR) scheme (EEA, 2021[23]). In 2021, the PROs reported that 40.9% of packaging waste placed on the market was recycled. However, these amounts are not included in the municipal waste data. PROs, such as Pakomak, have conducted some awareness-raising activities on the importance of separate collection of packaging waste.

Where no waste collection service is provided, waste is often dumped at roadsides or burnt in the open (OECD, 2021[7]). The Drisla landfill, serving the Skopje region, is the only landfill in North Macedonia that meets national legislative standards and is relatively well-managed (EEA, 2021[23]). However, it is estimated that less than 30% of the landfilled waste is currently disposed of at the Drisla landfill. In addition, there are 57 official municipal landfills, which are not compliant with national law, and approximately 1 000 illegal waste dumpsites. Illegal dumpsites have multiplied as a result of the lack of an organised waste collection service, in particular in rural areas (Ministry of Environment and Physical Planning, 2021[60]).

A total of around 1.5 million tonnes of industrial waste was generated in 2020 (latest available data), of which 72% was non-hazardous waste. North Macedonia’s long mining tradition comes with a high amount of mining waste. In 2020, more than one-third (approximately 521 000 tonnes, or 35%) of North Macedonia’s industrial waste was generated by the mining sector, of which 79% was hazardous, containing a large share of toxic contaminated mining waste that remains untreated (MAKSTAT, 2022[68]; Đorđević et al., 2019[69]). The manufacturing sector also accounts for one-third of total industrial waste, composed of 40% of non-hazardous metallic waste (mixed ferrous and non-ferrous) and 20% of combustion waste. According to official statistics, around 56 000 tonnes of construction and demolition waste (mainly mineral) was generated in 2020, representing 3.8% of total generated waste by economic sector (MAKSTAT, 2022[68]). However, structural lack of data due to high rates of informal waste collection in this waste stream makes these statistics less conclusive in an international comparison[15] (Ministry of Environment and Physical Planning, 2020[70]). Industrial, construction and demolition wastes are also largely disposed in waste landfills or unmanaged and their collection, separation and recovery is almost non-existent. Sixteen landfills containing hazardous industrial waste have been identified across North Macedonia. These sites pose a serious threat to the environment, as industrial waste products have particularly dangerous properties, causing pollution in water, soil and crops. Additionally, the presence of naturally occurring radioactive material (NORM) in industrial waste adds to the potential hazards associated with these sites.[16]

Treating waste according to the waste hierarchy, through higher recovery and recycling rates of municipal and industrial waste, will be vital to align with EU waste legislation, including its recycling and landfill reduction targets. Large amounts of organic waste (see Figure 2.11) generated by municipal and agricultural waste could be turned into compost and used either as a resource for organic soil fertilisers or as a source of biomass to generate biofuels, thus reducing the cost of purchasing new raw materials or products. Manufacturing waste, in particular from metallurgical slags and thermal power plants (fly ash and bottom ash), present potential for reuse in the construction and building materials sector, such as for the

production of cement, concrete, aggregates, adobe, brick and insulation material; in the construction of dams and roads; and in geotechnical applications. Moreover, mining waste could potentially be used as a commodity and provide solutions to limited metal supplies, such as to backfill mining voids; as a construction material for restoring old mining sites; and as aggregates in embankment, road, pavement, foundation and building construction (EIT Raw Materials, 2021[71]). Circular solutions are also necessary to reduce plastic pollution, generated by its untenable use and disposal of (single-use) plastic products, as it comes with several risks for the tourism sector, ecosystem and human health.

Existing policy landscape and initiatives relevant to the circular economy in North Macedonia

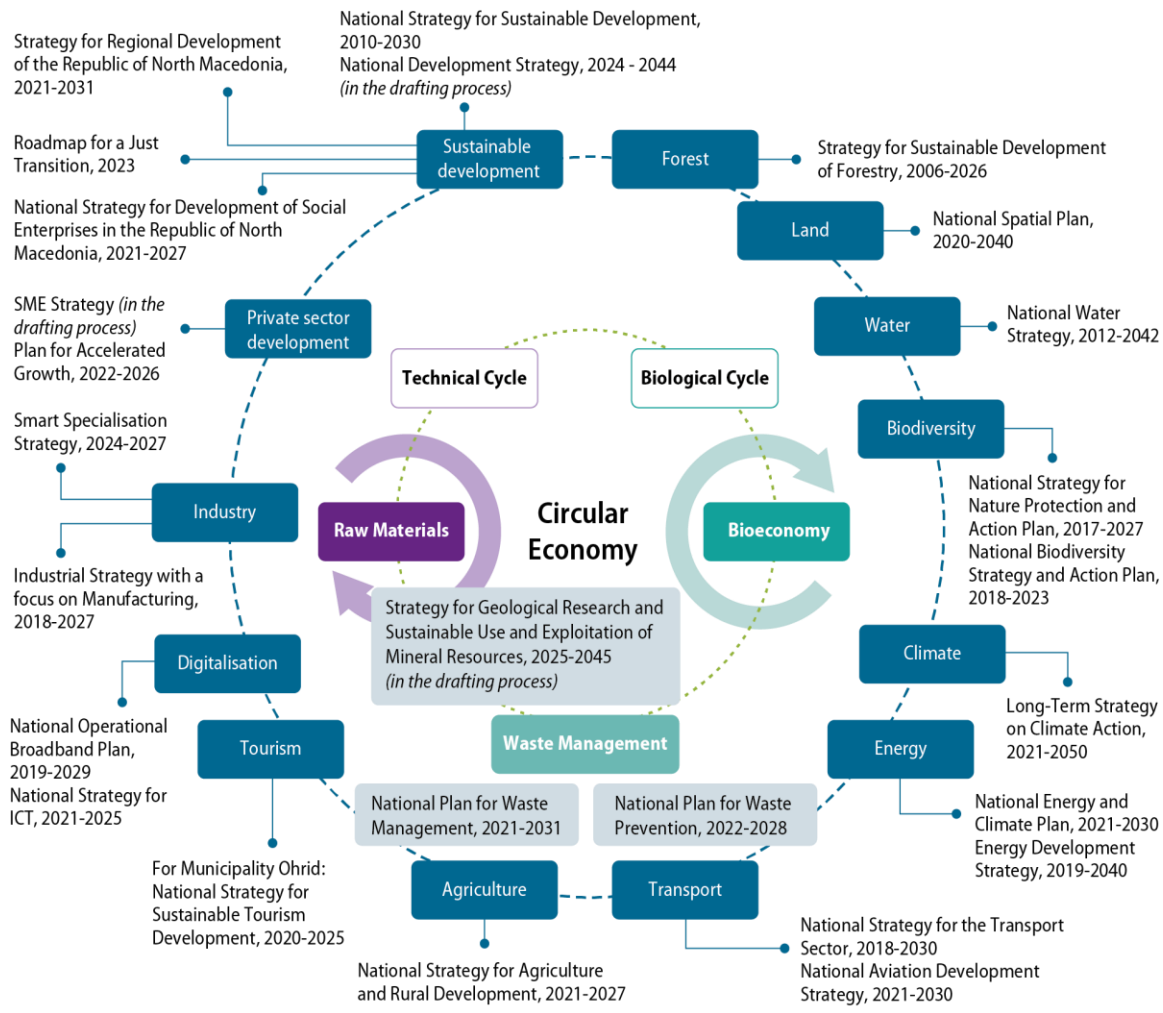
The transition to a circular economy has been gradually gaining momentum in North Macedonia, although no specific policy framework targets the circular economy. Some activities have been undertaken to promote a circular transition in the economy, primarily by international partners, civil society and academia, but they remain rather unco-ordinated and *ad hoc*.

Overview of the circular economy policy landscape in North Macedonia

The Ministry of Economy; the Ministry of Environment and Physical Planning; the Ministry of Finance; the Ministry of Agriculture, Forestry and Water Management; the Ministry of Transport and Communication; and the Ministry of Local Self-Government are the most relevant institutions for designing and implementing circular economy policies. The Agency for Promotion of Entrepreneurship of the Republic of North Macedonia (APPRM) and the Fund for Innovation and Technological Development can also play an important role in promoting circular business models, given their increasing responsibilities as providers of government business support services. Additionally, the State Statistical Office (MAKSTAT) is instrumental in supplying essential data and insights that facilitate informed decision making regarding the transition to a circular economy.

The current legal and policy frameworks, including national regulations, strategic documents and action plans, do not provide a solid basis for the transition to a circular economy. Nevertheless, strategies across a number of thematic areas are considered to be relevant to the transition to a circular economy (Figure 2.13).

Figure 2.13. Overview of North Macedonia's policy landscape relevant to the circular economy



Notes: This policy analysis covered policy documents currently in place and identified across a number of thematic areas considered to be relevant for the transition to a circular economy. This thematic scope includes both technical and biological cycles in the circular economy as well as policy frameworks enabling this transition. The examples of relevant policies in the circular economy context are non-exhaustive.

North Macedonia lacks an umbrella policy framework on environmental protection, although a comprehensive Long-term Strategy on Climate Action was adopted in 2021, which includes a specific focus on promoting the circular economy. Stemming from Figure 2.13, Table 2.1 outlines policy documents relevant to circular economy, classified as "core" or "directly related". Documents identified as ''core'' directly reference the circular economy.

Table 2.1. List of overarching policy documents directly related to the circular economy in North Macedonia

Topic area	Title (English)	Time frame	Qualitative goals relevant to the circular economy	Quantitative targets
			Core policy documents	
Overarching Green Agenda	Green Agenda for the Western Balkans	2020-2030	- Overarching green growth strategy for the Western Balkans, aiming at transitioning from a traditional economic model to a sustainable economy, in line with the European Green Deal - Alignment of the region with the European Union's (EU) 2050 ambition to make Europe a carbon-neutral continent - Unlock the potential of the circular economy - Fight air, water and soil pollution - Promote sustainable methods of food production and supply - Exploit the tourism potential of the region, focusing on protecting biodiversity and restoring ecosystems For the circular economy specifically: - Improve the sustainability of primary production of raw materials - Apply an industrial ecosystem approach to attain environmentally sustainable, balanced economic recovery - Develop circular economy strategies looking at the entire life cycle of products - Make further progress in the construction and maintenance of waste management infrastructure for cities and regions - Design and implement consumer-targeted initiatives to raise citizens' awareness on waste prevention, separate collection and sustainable consumption - Conclude and implement a regional agreement on the prevention of plastic pollution, including specifically addressing the priority issue of marine litter	- Alignment with EU targets
Waste	National Plan for Waste Management	2021-2031	- Strengthen the capacity of relevant institutions and inter-institutional co-operation - Enhance waste management infrastructure (establishment of regional landfills, closure of non-compliant landfills, establishment of infrastructure for recycling and the production of fuel from waste, improvement of waste collection transportation) - Improve financial structures (ensuring implementation of the "polluter-pays principle" and extended producer responsibility, establishment of a	- Increase the share of the population included in the waste collection system (currently about 70-80%) to 100% by 2024 - Increase the share of households connected to separate collection of waste (currently almost non-existent) to 65% by 2030 - Four awareness-raising campaigns - Increase municipal waste recycling to 45% by 2035 and 65% by 2045 Recycling targets for specific waste streams:

			hazardous industrial waste management system) - Align legal framework with EU requirements and revise regional waste management plans - Improve data collection - Introduce a national campaign to raise public awareness of waste management	- minimum 70% of packaging waste recycled by 2035 - 85% of paper and cardboard - 75% of glass - 70% of metals - 85% of plastics - 65% for lead acid batteries, 75% for nickel cadmium batteries and 50% for other batteries
Waste	National Waste Prevention Plan	2022-2028	- Reduce the consumption of materials, water and energy that cause the creation of larger amounts of waste by changing businesses', households' and the public sector's habits and behaviour - Develop a collection and recycling system that determines the value of collected materials for recycling - Sort the remaining waste to extract additional materials that can still be recycled - Increase competitiveness and lower business costs by implementing programmes that stimulate resource efficiency and create a circular economy - Support sustainable development and employment in the "green" economy, including new jobs in reuse, recycling and manufacturing - Reduce the generation of hazardous waste through the development of more efficient industrial and commercial practices along with the use of safer alternatives - Increase awareness of the importance of waste prevention among citizens, businesses and the public sector	Targets aligned with the National Plan for Waste Management Other targets: - Reduction in bio-waste sent to landfill (compared to 1995): 25% by 2026, 50% by 2031 and 65% by 2034
Climate	Long-term Strategy on Climate Action	2021-2050	- Alignment with the EU framework on environment and climate to meet Paris Agreement targets - Strengthen the capacity of relevant institutions and inter-institutional co-operation - Increase the resilience of North Macedonia's society, economy and ecosystems to the impacts of climate change - Enable environment for climate investments - Build solid systems for the regular and periodic collection of data for the production and dissemination of scientific and technical knowledge - Promote a circular economy by reducing waste and promoting the reuse and recycling of materials. This will help reduce greenhouse gas (GHG) emissions, increase resource efficiency and create new economic opportunities	- Reduce national net GHG emissions (including forestry and other land use and excluding memo items, i.e. emissions from aviation and electricity import) by 72% by 2050 compared to 1990 levels - Increase the share of renewable energy to 50% by 2050 Net GHG reduction targets by sector: - Energy sector: -64% (excluding MEMO items) - Agriculture: -34% - Carbon sink in forests and other land uses: +1 733% (the dramatic increase is due to statistical inconsistency of forest area reporting from 1990) - Waste sector: -2%

		Directly related documents		
Sustainable development	National Strategy for Sustainable Development of North Macedonia	2010-2030	- First integrated planning approach, encompassing the economic, social and environmental dimension by 2030 - Enhance sustainable consumption and production - Improve pollution management (focus on waste and wastewater management, air pollution control, noise abatement, and research and development) - Improve the management and avoid the overexploitation of natural resources, recognising the value of ecosystem services	- By 2030, North Macedonia to be in the top 20 sustainable countries in Europe and in the top 3 in the Western Balkan region
Climate and energy	National Energy and Climate Plan	2021-2030	- Steer socially acceptable decarbonisation efforts until 2030 and beyond, aligning with the ambitions of the European Green Deal - Integrate five dimensions of the Energy Union: energy efficiency, renewables, GHG emissions reductions, internal energy market, and research and innovation - Introduce a CO_2 tax to accelerate the phasing out of conventional fuels	Targets by 2030 (compared to 1990): - Decrease net GHG emissions by 82% with the following goals: 66% emissions reduction in the energy sector, 45% emissions increase in industrial processes and product use, 29% emissions reductions in the agriculture sector, 95% removals increase in forestry and other land use, and 21% emissions reduction in the waste sector - Share of renewables in final energy consumption is 38% with the following goals: 66% share in gross electricity production, 45% in heating and cooling gross consumption, and 10% in final energy consumption in transport - Energy efficiency: savings of 20.8% for the consumption of final energy and 34.5% for primary energy compared to the business-as-usual scenario - Lower energy dependence from 60% to 59%
Private sector and industry	Industrial Strategy with a focus on Manufacturing	2018-2027	- Renew industrial policy and refocus it on the sectors which offer the greatest potential to impact on productivity and growth - Promote industrialisation by stimulating the growth and development of the manufacturing sector to boost productivity, create good jobs, raise incomes and strengthen human capital while addressing the challenges of the circular economy - Green manufacturing as the core component of the transition to a circular economy - Boost demand for circular products through green public procurement - Awareness raising and training on the circular economy, green industry/ manufacturing, closed-cycle manufacturing, energy efficiency and clean production	- Increase manufacturing as a percentage of gross domestic product from 12.2% in 2016 to 14% in 2027 - Increase manufacturing output value (from EUR 4.452 million in 2015 to EUR 8.000 million in 2027) - Share of manufacturing output value in green industrial zones in total manufacturing output to increase to 10% in 2027 (from 0% in 2017)

Private sector and industry	Plan for Accelerated Growth		- Increase investment in the public and private sectors - Priority areas: green economy, digitalisation, innovation and technological development, development of physical infrastructure, and human capital - Enhance green projects financing in the post-COVID economic recovery through the establishment of two funds (Hybrid National Green and Digital Fund for SMEs, and Start-ups and Innovative Enterprises and Green Investment Fund) - Improved energy efficiency through green bonds and Energy Efficiency Fund - Accelerate investments in renewable energy sources and finance energy efficiency solutions through green financing instruments	- Accelerate medium-term economic growth rates from 2.5% to 5% average growth - None directly related to the circular economy

Waste management

North Macedonia adopted a new Law on Waste Management in 2021, which is expected to enable the establishment of a functional system for regional waste management, such as regional collection, transport, sorting and recycling of waste; the construction of new regional landfills; and the closing of all non-standard landfills – in accordance with circular economy principles (EEA, 2021[23]). A set of laws targeting specific waste streams and management schemes were adopted in 2021, in parallel to the Law on Waste Management. These include the Law on Management of Batteries and Accumulators and Waste from Batteries and Accumulators, the Law on Management of Electrical and Electronic Equipment and Waste from Electrical and Electronic Equipment (WEEE), the Law on Packaging and Packaging Waste Management, the Law on Additional Waste Flow Management, and the Law on Extended Producer Responsibility. These new laws fully transpose the EU Waste Framework Directive and the Landfill Directive and regulate EPR schemes for packaging, WEEE, batteries, waste oils and tyres, waste textile, and end-of-life vehicles.

Currently, a total of seven EPR schemes have been set up in North Macedonia: three for WEEE, one for batteries and three for packaging waste. The obligation to organise EPR schemes for other waste streams came into effect on 1 January 2024, in accordance with the 2021 laws on waste. These schemes are either organised by producers and importers independently or through an agreement with a PRO, which handles waste management on behalf of producers. PROs report annually to the Ministry of Environment and Physical Planning, and reports are monitored by the Department of Waste (EEA, 2021[23]). Nevertheless, deficiencies in the implementation of EPR schemes have been reported (European Commission, 2021[72]), mainly due to the poor collection services and the lack of awareness. Additionally, the division of responsibilities among various institutions, both at the central and local levels, adds complexity to the system and impedes the seamless implementation of EPR schemes. Progress is currently tangible only in the packaging waste scheme, with a recycling rate of 40% observed in 2021.

While North Macedonia has not transposed the EU Single-Use Plastics Directive, the government banned single-use packaging and plastics in public procurement as of 2020. Moreover, a rulebook was adopted in 2021 on managing plastic packaging bags placed on the market (Ministry of Environment and Physical Planning, 2021[73]).

The Ministry of Agriculture, Forestry and Water Management started the process of preparing a Law on Donating Surplus Food Waste in 2018 (OECD, 2021[7]). In May 2023, the working group, established for the development of this law, finalised the draft proposal. The aim is to establish an institutionalised system

of food donation, promote sustainable food management, reduce food waste and raise awareness on poverty reduction (Ministry of Environment and Physical Planning, 2023[74]).

The National Plan for Waste Management (2021-2031) was adopted in 2021, along with a National Waste Prevention Plan (2022-2028). There have been no reports on the implementation of the previous National Waste Management Strategy (2008-2020), nor on progress towards achieving its targets. The process of establishing an integrated regional system for waste management faced delays due to insufficient administrative and financial resources. It also suffered from a lack of ownership (EEA, 2021[23]).

The recently adopted National Plan for Waste Management is expected to accelerate the circular transition by reducing waste production and increasing levels of reuse, recycling and recovery of products. Its main objectives are:

- Organisational: establish a Waste Management Department, ensure effective co-ordination between ministries and regional bodies, increase government capacities at the national and local levels, and increase the efficiency of the environmental inspection.
- Technical: improve regional collection, transport, selection and recycling of waste with specific targets (see Table 2.1), as well as its treatment and utilisation, produce fuels from waste and close non-compliant landfills, reduce illegal dumping.
- Financial: ensure implementation of the polluter-pays principle and the EPR and co-finance hazardous waste management systems.
- Legal: align legal and policy frameworks with EU requirements and revise regional waste management plans.

More specific measures in the National Plan for Waste Management include national campaigns to raise public awareness of waste management and circular economy concepts, and the introduction of the mandatory green public procurement criteria in procurement bids.

Moreover, the plan foresees the improvement of waste data collection, which has been one of the major concerns, as municipal waste generation is currently not measured but estimated.

The National Waste Prevention Plan (2022-2028) presents a co-ordinated approach to waste prevention (both municipal and industrial) and aims to enforce the waste hierarchy of the European Union, the principles of zero waste, a continuous approach of resource efficiency and EPR schemes. It also includes awareness-raising objectives. Guidelines to reduce waste are under preparation, in particular in the construction sector.

Waste management activities have also slowly started in several regions. While activities for the closure of non-compliant landfills commenced in the East Region, the launching of a regional waste-management system in the Northeast and East regions has been further delayed due to local governments' resistance to host the central waste management facility (European Commission, 2023[2]). Municipalities have undertaken some *ad hoc* initiatives, such the "trash for cash" initiative introduced by the Centar Municipality, which encourages residents to get involved in the process of separate waste disposal.

Raw materials and mining sector

The mining sector is regulated by the Law on Mining (2012), whose aim was to lower restrictions on procedures for issuing permits and concessions. The law was amended in 2019 and 2022 to provide greater protection of the population's health and of the environment, after citizens led protests against the quick increase of government-issued mining concessions. First amendments led to some discussion between environmental activists and the business sector, prompting the government to reassess the regulatory stance on mining. Therefore, in 2022, the government adopted new amendments aiming for a middle ground that addresses both sides of concern regarding the sector.

Moreover, the Strategy for Geological Research and Sustainable Use and Exploitation of Mineral Resources in the Republic of North Macedonia for the period 2025-2045 is under development, in close consultation with the Macedonian Academy for Science and Arts and the Mining Association.

Climate action

North Macedonia recently strengthened its climate action policy framework with the adoption of the Long Term Strategy on Climate Action in 2021. Moreover, the related Law on Climate Action underwent public consultation and is pending adoption. The strategy's main objectives are relevant to the transition to a circular economy transition and include:

- Reducing GHG emissions, including from the energy, industry, transport, agriculture and waste sectors.
- Increasing the share of renewable energy by phasing out coal-fired power plants (with the aim to increase installed capacity of solar photovoltaics and hydropower, followed by wind).
- Enhancing energy efficiency, in particular in buildings, industry and transportation. This includes promoting energy-efficient technologies and encouraging reduced energy consumption.
- Strengthening adaptation to the impacts of climate change, such as increasing resilience to extreme weather events, improving water management and promoting sustainable land-use practices.
- Promoting a circular economy by reducing waste and promoting the reuse and recycling of materials. This will help reduce GHG emissions, increase resource efficiency and create new economic opportunities.

North Macedonia submitted its enhanced Nationally Determined Contributions to the United Nations Framework Convention on Climate Change in 2021 and is one of the two economies in the Western Balkans (along with Albania) that has adopted its National Energy and Climate Plan in 2022 as mandated by the Energy Community. Both documents include climate mitigation and adaptation targets, such as for the phasing out of coal-fired power plants and the introduction of a carbon tax, in alignment with the Long Term Strategy on Climate Action.

Moreover, North Macedonia adopted a Roadmap for a Just Transition in June 2023 which aims at launching activities that will enable the transition away from coal, and further align with the EU policies for accelerated green growth. The roadmap includes measures on alternatives to conventional energy sources while mitigating impacts on coal workers and communities through the transition to new "green" jobs. The Roadmap for Just Transition is composed of four pillars: 1) the path for clean energy (modernisation and development of the energy sector); 2) the path for private investment and start-up support; 3) the path for green and smart infrastructure; and 4) the skills development path.

Private sector and industry

The legal and policy framework targeting private sector and industrial development in North Macedonia has recently been strengthened to accelerate economic growth and improve the business environment, with the transition to a circular economy being increasingly recognised in some strategic documents.

The Law on Public Procurement (2019) includes relevant provisions on green public procurement, including on life cycle costs. These costs cover parts or all of the following: costs borne by the contracting authority or other users (e.g. costs relating to acquisition or purchase); costs of use, such as consumption of energy and other resources; maintenance costs; end-of-life costs, such as collection and recycling costs; costs of eliminating the impact of the products, services or activities on the environment during their life cycle provided that their monetary value can be determined and verified, and which may include the cost of GHG emissions and of other pollutants, as well as other climate change mitigation costs. Application

of life cycle costs as a criterion for tender is optional and the data to be provided by the tenderers and the method for determining life cycle costs should be indicated in the tender documentation. The Law on Energy Efficiency (2020) also introduces procurement requirements specifically in relation to energy efficiency. Additionally, the Public Procurement Bureau and the Energy Agency have developed guidelines on energy efficiency measures to be used in public procurement procedures.

The objective of these measures is to boost demand for resource/energy efficient, durable, recyclable, repairable products, and to promote new business models based on offering functionalities and services instead of selling products. Green public procurement also allows local, regional and national authorities to set examples and standards for businesses and industries to follow. However, the introduction of green public procurement measures in tenders has remained limited since the adoption of these laws.

North Macedonia has introduced environment management systems, green certification (of business practices) and eco-labels (of products) into its legislative framework to support the private sector in its greening efforts: the Law on Environment (2011), the Decree on Eco-design of Products (2011), the Law on Energy Efficiency (2020), and the Law on Management of Electrical and Electronic Equipment and Waste from Electrical and Electronic Equipment (2021). In addition to contributing to an increased demand for green business practices, certification of green practices could be useful for companies when dealing with business licensing and administrative requirements.

The Law on Industrial and Green Zones, adopted in 2013, is being amended to include new provisions for regulating the benefits and opportunities for zone users, unifying applicable provisions for industrial and green zones, and better defining the conditions for performing activity in these areas. The amendment law has a specific focus on carrying out activities in line with circular economy principles in the green and industrial zones.[17]

In addition, “supporting the industry for investments in the development of innovations for a circular and green economy and internationalisation of markets” is one of the key goals of the Decision of the Government on Determining the Strategic Priorities of the Government in 2024 for realising the strategic priority “Promotion of the energy transition, investment in energy efficiency and green development, reducing air pollution and the impact of climate change”.

On the policy side, the Industrial Strategy with a focus on Manufacturing (2018-2027) aims to strengthen industrial policy by stimulating the growth and development of the manufacturing sector to boost productivity and increase the number of higher quality and better paying jobs while addressing the challenges of the circular economy. One of the strategy’s key objectives is to “catalyse green industry and green manufacturing” by stimulating resource and energy efficiency and low-carbon production in the manufacturing sector. The main measures to achieve this are:

- *Undertake green regulatory reform – market interventions to stimulate the development of green manufacturing industry*. Legal requirements are meant to improve energy efficiency and accelerate the use of best available techniques in industry. This will enable industries, including those operating in Technological Industrial Development Zones, to move towards closed-loop production through schemes for recycling, recovery and reuse of materials, including regulatory and control mechanisms to promote the polluter-pays principle and EPR.
- *Introduce green public procurement for high-impact goods and services*. As public procurement accounts for about 12% of GDP in North Macedonia, it can facilitate the supply of green products and services if it works to foster environmentally sound developments.
- *Embed sustainability as a core business strategy for manufacturers* to improve business performance to spur innovation and improve economic results. This measure will support the integration of sustainability within SMEs’ core business strategies through co-financing for technological development that supports energy efficiency improvements; environmental protection; and the preparation and establishment of waste management systems.

- *Support industry-led green manufacturing initiatives* (greening value chains), through the promotion of environmental improvements. Such initiatives measure and inform customers about the environmental impact of products and organisations, and include ISO standards, environmental management systems, the EU eco-label, the Eco-Management and Audit Scheme, environmental footprint (PEF), and organisation environmental footprint. Manufacturers, especially SMEs looking to export to the European Union and elsewhere, will be supported through co-financing of consultancy and certification costs.
- *Develop the industrial and green zones* with a manufacturing focus. Although industrial zones exist in North Macedonia, the ongoing discussion about their greening should centre on their transformation into environmentally friendly, climate-positive, innovative spaces. Policies aimed at achieving this goal should prioritise the promotion of sustainable practices, encouraging the adoption of clean technologies, enforcing stringent environmental regulations and fostering collaborations.

North Macedonia's SME Strategy (2018-2023) had a special focus on environmental policies, and was aligned with the Small Business Act for Europe and translated Principle 9 ("Enable SMEs to turn environmental challenges into opportunities"). It included a set of measures on providing advice and guidance to SMEs, improving resource efficiency, and introducing financial incentives for SME greening. While the strategy did not specifically target the circular economy, the different instruments to support the development of green SMEs provided opportunities to boost circular business models. The development of the new SME Strategy started in 2024 with technical support from the European Union.

Moreover, the newly adopted Plan for Accelerated Growth (2022-2026) is expected to provide a stronger impulse to greening and circular measures in the post-COVID economic recovery with the introduction of several instruments to promote and finance green projects. The proposed financing instruments have yet to be established and include, among other elements, green bonds; a Hybrid National Green and Digital Fund for SMEs, Start-ups and Innovative Enterprises to invest in green and digital SMEs (with a total portfolio of EUR 27 million); an Energy Efficiency Fund (initial capital of EUR 5 million); and a Strategic Green Investment Fund (expected to be worth EUR 36.3 million) to accelerate investments in renewable energy sources and financing energy efficiency solutions.

The Smart Specialisation process started in 2018 and the strategy was adopted in December 2023. The strategy aims to foster development by enhancing research and innovation capacities, facilitating knowledge-driven transformation, promoting competitiveness through collaboration between academia and businesses, diversifying existing industries and services, fostering the growth of emerging industries and enterprises, and encouraging green and digital transitions. The strategy includes four vertical priority areas: 1) smart agriculture and food with higher added value; 2) information and communication technologies; 3) electro-mechanical industry – industry 4.0; and 4) sustainable materials and smart buildings. Energy and tourism were also identified as horizontal priority domains (Ministry of Education and Science, 2023[75]). The transition to a green and circular economy is envisaged in all sectors, and in particular through:

- the reuse of agricultural waste to turn it into high added-value material
- the application of new technological innovations in the electro-mechanical industry
- more efficient use of natural resources in the production of construction materials and development of smart buildings, especially through their extraction and the development of innovative technologies enabling the production of construction materials from industrial waste
- developing the sustainable energy sector by using renewable energy sources, including biomass and biogas.

The Fund for Innovation and Technological Development (FITD), which encourages innovation by providing additional resources for financing innovative activities, will include a Green Business Facility. The

EUR 27 million budget will provide direct subsidies and grants to SMEs, as well as awareness-raising and advisory assistance for green projects. The Green Business Facility will stimulate investments in the areas of industrial innovation and the circular economy, green buildings, clean energy resources, sustainable mobility, and sustainable land use and nature. The facility is expected to be established in the first half of 2024; the grant to the FITD to financially support SMEs is expected in 2025. Moreover, the FITD was designated in 2022 to be accredited to access the Green Climate Fund and submitted its application in 2023 (results are expected in 2025). Both sources of funding will be incorporated into the implementation of the Smart Specialisation Strategy.

The Ministry of Economy has continuously implemented sectoral programmes targeting SMEs, such as the Programme for Supporting the Competitiveness of the Manufacturing Industry and Corporate Social Responsibility and the Programme for the Development of Entrepreneurship and Competitiveness of SMEs, implemented yearly. The programmes provide financial support for technical feasibility studies to selected companies pursuing circular economy projects as well as support for the training, implementation and certification of various horizontal standards, including environment and energy management systems (ISO 14001 and ISO 50001). However, there are almost no data on how many SMEs have adopted energy management systems or eco-labels in North Macedonia or if they have benefitted from such schemes.

Overview of circular economy initiatives and main non-government stakeholders in North Macedonia

A number of stakeholders have been involved in different circular economy-related activities and initiatives in North Macedonia. They focus on different aspects relevant for the circular economy – primarily, though, on waste management and awareness-raising activities. However, their work remains unco-ordinated, and synergies remain to be created between them. Figure 2.14 provides an overview of the main circular economy stakeholders in North Macedonia.

The international development co-operation community has been actively implementing various projects related to the circular economy in North Macedonia which provide financial and technical assistance to the government in diverse areas. Key collaborators and international development co-operation partners for North Macedonia include the European Union, the Austrian Environment Agency, Eidgenössisches Departement für auswärtige Angelegenheiten (EDA), Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), the World Bank, and the European Bank for Reconstruction and Development (see Annex B for an overview of projects). These projects primarily aim to enhance municipal and industrial waste management, incorporating improvements in infrastructure, waste prevention activities and the implementation of recycling programmes. While some initiatives involve grants and subsidies, private sector involvement has been limited, and there are often no clear phase-out processes.

Non-governmental organisations in North Macedonia have been actively engaged in promoting and increasing awareness of environmental and ecology-related concepts and practices (see Annex A). Some organisations have specifically undertaken projects focusing on the transition to a circular economy. Others have conducted studies on the circular economy in North Macedonia (Let's do it Macedonia and the Macedonian Center for Energy Efficiency), have worked on raising awareness about circular economy concepts (Friends of the Earth Macedonia, Zero Waste Skopje, Youth Environmental Network, Go Green Skopje, In Vivo), have supported circular entrepreneurship (Organisation for Social Innovation ARNO, National Center for Development of Innovation and Entrepreneurial Learning), or have implemented projects on circular waste management (O-Krug, Pakomak, REDI Recycling) (see Annex C). However, there is often limited co-ordination among these initiatives and the government rarely provides strategic guidance for steering them toward the circular transition.

Figure 2.14. Overview of the main circular economy non-government stakeholders in North Macedonia

Note: The list is non-exhaustive.

Academia and research institutes have also been at the forefront of conducting analyses and developing solutions to increase the uptake of circular economy practices. Several courses introducing circular economy concepts are available in different faculties at the Ss. Cyril and Methodius University in Skopje and the topic is also explored in other universities across North Macedonia (see Annex C). Think tanks and research institutes offer similar educational courses (Institute for Research in Environment, Civil Engineering and Energy; Finance Think – Economic Research and Policy Institute; Sustainability Institute EKOS).

Private sector organisations, including chambers of commerce, export associations and sector-specific unions, are essential in reaching a wide range of businesses, in particular SMEs. Through awareness-raising activities, conferences and networking events, private sector organisations are increasingly influencing Macedonian companies in developing or transitioning to circular business models (see Annex C).

Several companies have circular business models in North Macedonia, promoting different ways of producing and consuming goods and services. The main circular businesses in North Macedonia focus on

industrial waste management, material recovery and reuse of raw material used in manufacturing (particularly automotive, electronics and textiles) (see Annex C). While their contribution is required to transition to a more resource-efficient and circular economy, government measures have rarely supported them financially or technically. Moreover, as the vast majority of businesses are still not familiar with circular concepts, it remains difficult to map all the actors concerned.

References

Boucher, J. and G. Billard (2020), *The Mediterranean: Mare Plasticum*, International Union for Conservation of Nature, Gland, Switzerland, https://portals.iucn.org/library/sites/library/files/documents/2020-030-En.pdf. [63]

Crippa, M. et al. (2022), "CO2 emissions of all world countries", *JRC/IEA/PBL 2022 Report*, Publications Office of the European Union, Luxembourg, https://edgar.jrc.ec.europa.eu/report_2022. [40]

Design4Circle (2021), *Circular Economy in the Textile and Footwear Industry: Skills and Competences for a Sector Renewal*, https://design4circle.eu/wp-content/uploads/2021/04/CIRCULAR%20ECONOMY_IN_THE_TEXTILE_AND_FOOTWEAR_INDUSTRY_SKILLS_COMPETENCIES_FOR_SECTORAL_RENEWAL.pdf. [29]

Đorđević, T. et al. (2019), "Mineralogy and weathering of realgar-rich tailings at a former As-Sb-Cr mine at Lojane, North Macedonia", *The Canadian Mineralogist*, Vol. 57/3, pp. 403-423, https://doi.org/10.3749/canmin.1800074. [69]

Economic Chamber of North Macedonia (2021), "Association of Civil Construction, Building Materials and Non-metal Industries", https://www.mchamber.mk/Default.aspx?mId=13&id=6&lng=2. [22]

EEA (2021), *Municipal Waste Management: Country Fact Sheet North Macedonia*, European Environment Agency, Copenhagen, https://www.eea.europa.eu/themes/waste/waste-management/municipal-waste-management-country/north-macedonia-municipal-waste-factsheet-2021. [23]

Einarsson, S. and F. Sorin (2020), *Circular Economy in Travel and Tourism: A Conceptual Framework for a Sutainable, Resilent and Future Proof Industry Transition*, CE360 Alliance, https://circulareconomy.europa.eu/platform/sites/default/files/circular-economy-in-travel-and-tourism.pdf. [10]

EIT Raw Materials (2021), *Roadmap of Actions for the Exploitation of RM Sector in ESEE Region: Executive Summary*, European Union, https://reseerve.eu/upload/content/446/d6-4-final_executive-summary_web.pdf. [71]

Energy and Water Services Regulatory Commission of the Republic of North Macedonia (2023), *In January, 6 New MW of Solar Energy from 26 Photovoltaic Plants*, Energy and Water Services Regulatory Commission of the Republic of North Macedonia, https://www.erc.org.mk/odluki/18022023%20%D0%A1%D0%BE%D0%BE%D0%BF%D1%88%D1%82%D0%B5%D0%BD%D0%B8%D0%B5%20%D0%B7%D0%B0%20%D1%98%D0%B0%D0%B2%D0%BD%D0%BE%D1%81%D1%82_%D0%BB%D0%B8%D1%86%D0%B5%D0%BD%D1%86%D0%B8%20%D1%98%D0%B0%D0%BD%D1%83%D0%B0%D1%80%D0%B8.pdf. [49]

Energy and Water Services Regulatory Commission of the Republic of North Macedonia (2022), "Renewable sources", https://www.erc.org.mk/page_en.aspx?id=395 (accessed on 16 November 2023). [46]

European Commission (2023), *2023 Communication on EU Enlargement Policy: North Macedonia 2023 Report*, European Commission, Brussels, https://neighbourhood-enlargement.ec.europa.eu/system/files/2023-11/SWD_2023_693%20North%20Macedonia%20report.pdf. [2]

European Commission (2023), *European Union, Trade in Goods with North Macedonia*, European Commission, https://webgate.ec.europa.eu/isdb_results/factsheets/country/details_north-macedonia_en.pdf. [19]

European Commission (2022), *Annual Report on European SMEs 2021/2022*, European Commission, Brussels, https://ec.europa.eu/docsroom/documents/50654/attachments/1/translations/en/renditions/native#:~:text=However%2C%20due%20to%20their%20large,greenhouse%20gas%20emissions%20by%20enterprises. [36]

European Commission (2022), *EU Candidate Countries' & Potential Candidates' Economic Quarterly (CCEQ): Western Balkans and Türkiye, 3rd Quarter 2022*, Technical Paper 060, European Commission, Brussels, https://doi.org/10.2765/418856. [4]

European Commission (2021), "Annex C1: Twinning fiche", *Support in the Implementation of the Waste Management Legislation and Extended Producer Responsibility (EPR) Scheme*, European Commission, Brussels, https://www.esteri.it/wp-content/uploads/2022/03/Twinning-Fiche-MK-20-IPA-EN-01-21-final-24-Feb.pdf. [72]

European Commission (2020), "The impact of textile production and waste on the environment (infographics)", https://www.europarl.europa.eu/news/en/headlines/society/20201208STO93327/the-impact-of-textile-production-and-waste-on-the-environment-infographics (accessed on 4 December 2023). [28]

European Commission (2018), *Updated Bioeconomy Strategy 2018*, European Commission, Brussels, https://knowledge4policy.ec.europa.eu/publication/updated-bioeconomy-strategy-2018_en#:~:text=The%202018%20update%20of%20the,well%20as%20the%20Paris%20Agreement. [77]

European Parliament (2023), *Small and Medium-sized Enterprises*, Fact Sheets on the European Union 2023, European Parliament, https://www.europarl.europa.eu/erpl-app-public/factsheets/pdf/en/FTU_2.4.2.pdf. [34]

Eurostat (2023), "Energy statistics: An overview", https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_statistics_-_an_overview#Primary_energy_production. [43]

Eurostat (2023), "GDP and main components", https://ec.europa.eu/eurostat/databrowser/view/NAMA_10_GDP__custom_5503090/default/table?lang=en (accessed on 20 February 2024). [59]

Eurostat (2023), "Generation of waste by waste category", https://ec.europa.eu/eurostat/databrowser/view/TEN00108/default/table?lang=en&category=env.env_was.env_wasgt. [67]

Eurostat (2023), "Gross value added and income by A*10 industry breakdowns [nama_10_a10__custom_8247007]", https://ec.europa.eu/eurostat/databrowser/view/nama_10_a10__custom_8247007/default/table (accessed on 7 February 2024). [6]

Eurostat (2023), "Material import dependency", https://ec.europa.eu/eurostat/databrowser/view/ENV_AC_MID/default/table?lang=en&category=env.env_mrp. [56]

Eurostat (2023), "Organic crop area by agricultural production methods and crops", https://ec.europa.eu/eurostat/databrowser/view/org_cropar/default/table?lang=en (accessed on 16 November 2023). [30]

Eurostat (2023), "Treatment of waste by waste category, hazardousness and waste management", https://ec.europa.eu/eurostat/databrowser/view/env_wastrt/default/table?lang=en. [65]

Eurostat (2022), "Energy statistics: An overview (archived)", https://ec.europa.eu/eurostat/statistics-explained/index.php?title=EU_energy_mix_and_import_dependency#Energy_mix_and_import_dependency. [44]

Eurostat (2022), "Material flow accounts", https://ec.europa.eu/eurostat/databrowser/view/ENV_AC_MFA/default/table?lang=en. [57]

Eurostat (2022), "Material flow accounts and resource productivity", https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Material_flow_accounts_and_resource_productivity (accessed on 15 February 2024). [55]

Eurostat (2021), "Municipal waste statistics", https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Municipal_waste_statistics (accessed on 14 February 2024). [61]

Eurostat (2020), "Energy statistics: An overview", https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_statistics_-_an_overview (accessed on 10 October 2022). [50]

ICT (2021), *SME Competitiveness Outlook 2021: Empowering the Green Recovery*, International Trade Centre, Geneva, https://www.intracen.org/publications/smeco2021/ITCSMECO2021. [35]

IEA (2021), *The Role of Critical Minerals in Clean Energy Transitions*, OECD Publishing, Paris, https://doi.org/10.1787/f262b91c-en. [51]

ILOSTAT (2023), "Country profile North Macedonia", https://ilostat.ilo.org/data/country-profiles/?. [13]

Invest North Macedonia (2023), "Electro-metal industry", https://investnorthmacedonia.gov.mk/export-electro-metal-industry. [18]

Invest North Macedonia (2022), "Introduction to key industries", https://investnorthmacedonia.gov.mk/export-key-industries/#:~:text=Textile%20and%20clothing,of%20the%20country%20after%20metallurgy. [25]

IRENA (2022), *Energy Profile – North Macedonia*, International Renewable Energy Agency, Abou Dabi, https://www.irena.org/-/media/Files/IRENA/Agency/Statistics/Statistical_Profiles/Europe/North%20Macedonia_Europe_RE_SP.pdf. [42]

IRENA (2019), *Renewable Energy Market Analysis: Southeast Europe*, International Renewable Energy Agency, Abou Dabi, https://www.irena.org/publications/2019/Dec/RE-Market-Analysis-Southeast-Europe. [47]

Joint Research Centre (2021), *Final Report on Qualitative Analysis of Preliminary Priority Areas in the Smart Specialization Process in the Republic of North Macedonia*, Publications Office of the European Union, Luxembourg, https://eprints.ugd.edu.mk/29254/1/FIN%20Final%20Report%20QA%20_%20RNM_5.4.2021.pdf. [24]

Jordeva, S. et al. (2018), "Sustainability of the textile waste stream in Macedonia", *Advanced Technologies*, Vol. 7/1, pp. 74-78, https://doi.org/10.5937/savteh1801074J. [27]

Macedonian Mining Association (2021), *Review of the Situation in the Mining and Quarrying Sector*, https://www.mchamber.mk/upload/%D0%98%D0%9D%D0%A4%D0%9E%D0%A0%D0%9C%D0%90%D0%A6%D0%98%D0%88%D0%90_%D0%97%D0%90_%D0%A0%D0%A3%D0%94%D0%90%D0%A0%D0%A1%D0%A2%D0%92%D0%9E%D0%A2%D0%9E.pdf. [17]

MAKSTAT (2023), "Agricultural areas and crop production, 2022", https://www.stat.gov.mk/PrikaziSoopstenie_en.aspx?rbrtxt=127. [31]

MAKSTAT (2023), "Employed by economic status and sectors of activities, quarterly", https://makstat.stat.gov.mk/PXWeb/pxweb/en/MakStat/MakStat__PazarNaTrud__TrimesecniARS/440_PazTrud_Mk_VrabEkStat_ml.px/?rxid=a32e58c4-95e9-40a3-8d83-4757eabf96f5 (accessed on 18 February 2024). [21]

MAKSTAT (2023), "Full time and part time employed by economic status and sectors of activity, annual", https://makstat.stat.gov.mk/PXWeb/pxweb/en/MakStat/MakStat__PazarNaTrud__AktivnoNaselenie__Vraboteni/012_PazTrud_Mk_polno4_ml.px/table/tableViewLayout2/ (accessed on 21 February 2024). [14]

MAKSTAT (2022), "Municipal waste", https://www.stat.gov.mk/PrikaziSoopstenie_en.aspx?rbrtxt=80. [64]

MAKSTAT (2022), "Number of active enterprises by regions and municipalities, according to NACE Rev. 2 sectors, from 2021", https://makstat.stat.gov.mk/PXWeb/pxweb/en/MakStat/MakStat__DelovniSubj__AktDelovniSubjekti/425_Delovni_Reg_Ops_NACE_ml.px/table/tableViewLayout2/?rxid=46ee0f64-2992-4b45-a2d9-cb4e5f7ec5ef (accessed on 15 February 2024). [20]

MAKSTAT (2022), "Waste by section of economic activity", https://www.stat.gov.mk/PrikaziSoopstenie_en.aspx?rbrtxt=82. [68]

MAKSTAT (2021), "Economy-wide material flow accounts, 2020 and 2021", https://www.stat.gov.mk/PrikaziSoopstenie_en.aspx?rbrtxt=130. [53]

Ministry of Agriculture, Forestry and Water Management (2021), *Strategy on Agriculture and Rural Development 2021-2027*, https://faolex.fao.org/docs/pdf/mac209144.pdf. [32]

Ministry of Economy (2020), *National Energy and Climate Plan of the Republic of North Macedonia (Draft)*, Government of the Republic of North Macedonia, https://www.energy-community.org/dam/jcr:bbb63b32-6446-4df8-adc6-c90613daf309/Draft_NECP_NM_%202020.pdf. [48]

Ministry of Education and Science (2023), *Draft Smart Specialisation Strategy of the Republic of North Macedonia*, https://mon.gov.mk/download/?f=EN-%20S3-MK%2020.12.2023.docx#:~:text=The%20%E2%80%9CSmart%20Specialisation%20Strategy%20of,a%20strategic%20vision%2C%20priorities%20and. [75]

Ministry of Environment and Physical Planning (2023), "With the Law on Donating Surplus Food, we prevent poverty and food waste", https://www.moepp.gov.mk/en/nastani/%D1%81%D0%BE-%D0%B7%D0%B0%D0%BA%D0%BE%D0%BD%D0%BE%D1%82-%D0%B7%D0%B0-%D0%B4%D0%BE%D0%BD%D0%B8%D1%80%D0%B0%D1%9A%D0%B5-%D0%BD%D0%B0-%D0%B2%D0%B8%D1%88%D0%BE%D0%BA%D0%BE%D1%82-%D0%BD%D0%B0-%D1%85%D1%80. [74]

Ministry of Environment and Physical Planning (2021), *Enhanced Nationally Determined Contribution*, United Nations Framework Convention on Climate Change, https://unfccc.int/sites/default/files/NDC/2022-06/Macedonian%20enhanced%20NDC%20%28002%29.pdf. [39]

Ministry of Environment and Physical Planning (2021), *North Macedonia Waste Management Plan 2021-2031*, Republic of North Macedonia, Skopje, https://www.moepp.gov.mk/%d0%b4%d0%be%d0%ba%d1%83%d0%bc%d0%b5%d0%bd%d1%82%d0%b8/%d0%bf%d0%bb%d0%b0%d0%bd%d0%be%d0%b2%d0%b8/. [66]

Ministry of Environment and Physical Planning (2021), *Rulebook on Managing Plastic Packaging Bags Placed on the Market*, Ministry of Environment and Physical Planning, Skopj, https://www.moepp.gov.mk/wp-content/uploads/2018/12/pravilnikza-kesi.pdf. [73]

Ministry of Environment and Physical Planning (2021), *Waste Management Plan of the Republic of North Macedonia, 2021-2031*, Ministry of Environment and Physical Planning, Skopj. [60]

Ministry of Environment and Physical Planning (2020), *Rapid Assessment Report on the Benefits of Circular Economy on Mitigation of GHGs Emission in the Waste Sector*, Ministry of Environment and Physical Planning, Skopj, https://api.klimatskipromeni.mk/data/rest/file/download/a6aebd5fbc39eb38094ab488c9ffd4c96b408a35d0d33abe126425ab7b4a1ad8.pdf. [70]

Ministry of Labour and Social Policy (2021), *National Employment Strategy 2021-2027*, Ministry of Labour and Social Policy, Skopje, https://www.mtsp.gov.mk/content/pdf/2021/trud/strategija_vrabotuvanje_2021_eng.pdf. [15]

OECD (2024), *Material consumption* (indicator), https://doi.org/10.1787/84971620-en (accessed on 1 March 2024). [54]

OECD (2024), *Value added by activity* (indicator), https://doi.org/10.1787/a8b2bd2b-en (accessed on 1 March 2024). [12]

OECD (2022), *OECD Municipal Waste, Generation and Treatment Database*, https://stats.oecd.org/index.aspx?DataSetCode=MUNW. [62]

OECD (2022), *SME Policy Index: Western Balkans and Turkey 2022: Assessing the Implementation of the Small Business Act for Europe*, SME Policy Index, OECD Publishing, Paris, https://doi.org/10.1787/b47d15f0-en. [5]

OECD (2021), *Competitiveness in South East Europe 2021: A Policy Outlook*, Competitiveness and Private Sector Development, OECD Publishing, Paris, https://doi.org/10.1787/dcbc2ea9-en. [7]

OECD (2021), *Facilitating the Green Transition for ASEANS SMEs: A Toolkit for Policymakers*, OECD, Paris, https://www.oecd.org/southeast-asia/regional-programme/networks/Facilitating-green-%20transition-for-ASEAN-SMEs.pdf. [37]

OECD (2021), *Towards a More Resource-efficient and Circular Economy: The Role of the G20*, OECD, Paris, https://www.oecd.org/environment/waste/OECD-G20-Towards-a-more-Resource-Efficient-and-Circular-Economy.pdf. [58]

OECD (2019), *Circular Approach and the Sustainability of the Agro-food System: Closing Resource Loops to Improve Sustainability (archived)*, OECD, Paris, https://www.oecd.org/agriculture/events/circular-approach-and-the-sustainability-of-the-agro-food-system-3-april-2019.htm. [33]

OECD (2018), *International Trade and the Transition to a Circular Economy*, OECD, Paris, https://www.oecd.org/environment/waste/policy-highlights-international-trade-and-the-transition-to-a-circular-economy.pdf. [8]

Pennington, J. (2022), "3 ways the circular economy is vital for the energy transition", World Economic Forum, https://www.weforum.org/agenda/2022/02/3-ways-circular-economy-renewables-energy-transition. [52]

RCC (2023), *Balkan Barometer Business Opinion 2023*, Regional Cooperation Council, Sarajevo, https://www.rcc.int/balkanbarometer/results/1/business. [38]

Ritchie, H., M. Roser and P. Rosado (2022), "CO2 and greenhouse gas emissions", *Our World in Data*, https://ourworldindata.org/co2/country/north-macedonia. [41]

World Bank (2024), "GDP per capita, PPP (constant 2017 international $) - North Macedonia", https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.KD?locations=MK (accessed on 15 February 2024). [1]

World Bank (2023), "Exports of goods and services, % of GDP", https://data.worldbank.org/indicator/NE.EXP.GNFS.ZS?locations=MK-AL-ME-RS-XK-BA (accessed on 14 February 2024). [16]

World Bank (2023), "GDP growth (annual %) – North Macedonia", https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?end=2022&locations=MK&start=1991&view=chart (accessed on 29 January 2024). [3]

World Bank (2022), "Services, value added (% of GDP) – OECD members", https://data.worldbank.org/indicator/NV.SRV.TOTL.ZS?locations=OE (accessed on 14 February 2024). [11]

World Bank (2022), *Western Balkans Regular Economic Report No.21: Steering Through Crises*, World Bank Group, Washington, DC. [45]

World Economic Forum (2022), *Driving Ambitions: The Business Case for Circular Economy in the Car Industry*, World Economic Forum, Geneva, https://www3.weforum.org/docs/WEF_Driving_Ambitions-2022.pdf. [26]

World Travel and Tourism Council (2020), "Economic impact reports", https://wttc.org/research/economic-impact (accessed on 25 November 2023). [76]

Yamaguchi, S. (2022), "Securing reverse supply chains for a resource efficient and circular economy", *OECD Trade and Environment Working Papers*, No. 2022/02, OECD Publishing, Paris, https://doi.org/10.1787/6ab6bb39-en. [9]

Notes

[1] In 2019, the tourism sector accounted for around 7.5% of total GDP, falling short of the European average of 9.9% (World Travel and Tourism Council, 2020[76]).

[2] Concessions for mines in North Macedonia granted before the 2019 Amendment Law on Mining mainly used sulfuric acid, cyanide, thallium and arsenic to extract minerals from the ore.

[3] The Carbon Border Adjustment Mechanism is expected to become operational in 2026 and gradually apply to a select number of goods with a high risk of carbon leakage (iron and steel, cement, fertiliser, aluminium, and electricity generation). As EU importers will buy carbon certificates corresponding to the carbon price that would have been paid had the goods been produced under the European Union's carbon pricing rules, non-EU producers such as North Macedonia will be encouraged to green their processes and lower production-related emissions.

[4] The company Johnson Matthey was responsible for more than half of total revenues generated by the automotive industry (EUR 1.9 billion) in 2019.

[5] Coal generation mainly consists of two main coal thermal power plants (with a total of 824 MW installed capacity, around 50% of total electricity production).

[6] Nevertheless, the finalisation of the interconnection Greece-Bulgaria in October 2022 will allow North Macedonia to diversify its supply by tapping into the Trans-Adriatic Pipeline for natural gas supplied via the Shah Deniz project from Azerbaijan.

[7] Hydro generation is covered by 9 large hydropower plants (571 MW of installed capacity) and more than 100 small ones.

[8] The National Energy and Climate Plan includes a projected EUR 3.1 billion investment plan to establish approximately 1 600 MW of solar power plants, 600 MW of wind farms and 333 MW of hydropower plants by 2030.

[9] The European Union currently supplies only 1% of the raw materials needed for key technologies such as wind energy, lithium batteries, silicon photovoltaic assemblies and fuel cells.

[10] The legal procedure requiring environmental impact assessments needed to obtain licences for the construction of hydropower plants has been largely circumvented in North Macedonia, including in protected areas (OECD, 2021[7]).

[11] The DMC measures the total amount of materials extracted and used from the environment, taking into account the physical trade balance.

[12] The bioeconomy covers all sectors and systems that rely on biological resources: animals, plants, microorganisms and derived biomass, including organic waste, their functions and principles. The bioeconomy includes and interlinks land and marine ecosystems and the services they provide; all primary production sectors that use and produce biological resources (agriculture, forestry, fisheries and aquaculture); and all economic and industrial sectors that use biological resources and processes to produce food, feed, bio-based products, energy and services (European Commission, 2018[77]).

[13] The estimations refer to collected waste and are made by municipalities based on the approximate number of residents. Estimates also include waste generated by households not covered by waste collection services.

[14] Most of the municipalities use flat rates for households (fees are based on the size of houses, apartments and gardens). Fees are higher for private companies.

[15] Official statistics report that only 56 000 tonnes of CDW were generated in 2020, but estimations using the average per capita generation as an indicator from other countries point to around 8.5 million (including excavation waste).

[16] Certain industrial processes, such as mining, mineral processing and oil extraction, can concentrate naturally occurring radioactive elements, leading to the generation of industrial waste with elevated levels of NORM (naturally occurring radioactive materials). The collection and management of such waste must adhere to specific guidelines established by the European Atomic Energy Community and the International Atomic Energy Agency, of which North Macedonia is a member.

[17] According to the draft law, a green industrial zone is defined as a zone in which activities are performed in a way that promotes innovative and best available techniques as well as the application of highest environmental protection standards.

3 Selected priority areas of the Circular Economy Roadmap for North Macedonia

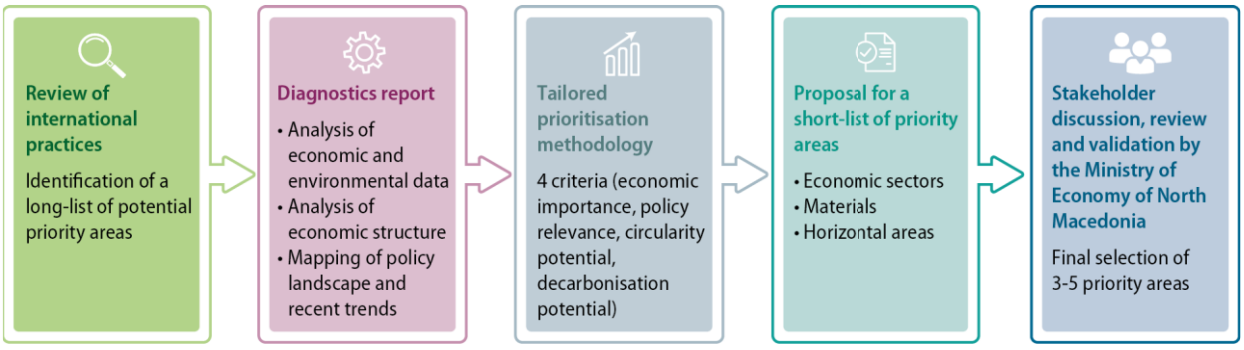
This chapter presents the selection process that culminated in the identification of five priority areas for North Macedonia's Circular Economy Roadmap: circular business models for small and medium-sized firms, construction, biomass and food, textiles, and mining and metallurgy. It elaborates on the consultation and decision-making processes underlying the selection, offering insights into the OECD methodology employed to decide on the pertinent priority areas.

Approach taken to select the priority areas of North Macedonia's Roadmap

A crucial initial step for formulating a national circular economy strategy or roadmap is identifying and selecting priority areas. This prioritisation is essential to operationalise and maintain focus, given the broad nature of the circular economy concept, which spans actions across the entire economy and life cycle. While existing literature (Järvinen and Sinervo, 2020[1]; Ellen MacArthur Foundation, 2015[2]; Salvatori, Holstein and Böhme, 2019[3]) and a review of existing circular economy strategies and roadmaps conducted in the context of previous OECD work on this topic highlight a lack of consensus on defining and approaching focus areas, it is evident that countries generally concentrate on a few key sectors or areas, such as vital value chains, materials or horizontal areas, where reforms would have the most significant impact.

A review of international practices shows that countries have opted for customised quantitative and qualitative methodologies to inform their choice of specific priority areas. For North Macedonia, the OECD proposed the approach described in Figure 3.1, which was also based on the availability of data and information.

Figure 3.1. Proposed approach for the selection of priority areas of the Circular Economy Roadmap for North Macedonia



The tailored prioritisation methodology falls back on four criteria and their related indicators to inform the choice of (potential) priority areas:

- Economic importance, the assessment of which is largely data-driven. Relevant indicators include value added, employment and trade in sectors and industries as well as the position of the sector in the global value chain.
- Policy relevance is assessed qualitatively by analysing whether a specific area has been included in the government's relevant strategic documents and action plans and to what extent, and whether a policy gap has been identified in the specific area. Since North Macedonia is a European Union (EU) candidate country on the path of aligning its regulatory framework with the EU *acquis*, the criterion also considers the policy relevance for the European Union, including whether there are specific EU targets and obligations in the considered area.
- Circularity potential can be assessed using a number of quantitative indicators, such as material productivity, material intensity, resource use, waste generation and recycling rates. Some of these indicators can be compared to an EU average or a specific target, which can provide insights into the potential of specific areas to increase their circularity.
- Decarbonisation potential measured as the level of greenhouse gas emissions in specific sectors/industries, which can provide insights into which sectors offer the greatest greenhouse gas

emissions reduction potential. While decarbonisation is not a primary goal of the circular economy, it is an important benefit.

The diagnostics of the circular economy for North Macedonia, detailed in Chapter 2, served as the primary source of data and information for the prioritisation exercise. As a result of this exercise, the OECD prepared a list of 11 potential priority areas along with their preliminary policy recommendations. These were presented and discussed at a stakeholder meeting in North Macedonia. The working group was asked to choose three to five priority areas from the proposed list.

Table 3.1 shows the 11 potential priority areas according to their level of priority (first and second priority, transversal incorporation) based on the 4 criteria discussed above (economic importance, policy relevance, circularity potential and decarbonisation potential). Due to the challenges in consistently applying the four criteria to identify horizontal or cross-cutting areas (e.g. circular business models), additional relevant indicators were employed, such as the potential to achieve environmental outcomes, incentivise innovation, generate revenue or provide incentives for consumers and businesses.

Table 3.1. List of the potential priority areas for the Circular Economy Roadmap for North Macedonia

Proposed as the first priority	Proposed as the second priority	Proposed to be included transversally, across the chosen priority areas
Construction	Textiles	Automotive
	Mining	Wood industry
Municipal waste management	Plastics	Biomass and food (agri-food system)
Circular business models for small and medium-sized enterprises	Economic instruments	Awareness raising and education

Note: Areas shaded in grey correspond to horizontal areas that cut across sectors and materials.

Preliminary policy recommendations to illustrate all 11 priority areas were proposed based on the diagnostics presented in Chapter 2, additional desk research and discussions with stakeholders, drawing on OECD expertise and previous work on the development of circular economy roadmaps.

The proposed policy recommendations are categorised into short-, medium- and long-term actions. The emphasis in the short term (up to two years) is often on low-hanging fruits or measures that help to achieve a legal target/obligation, whereas the medium- (two to eight years) to long-term actions (from eight years up to 2040) require certain foundations and prerequisites to be fulfilled. The approach also aims to encompass the entire value chain, from design and material sourcing to use and waste management.

Final selection of the priority areas

Five priority areas selected for North Macedonia's circular economy transition

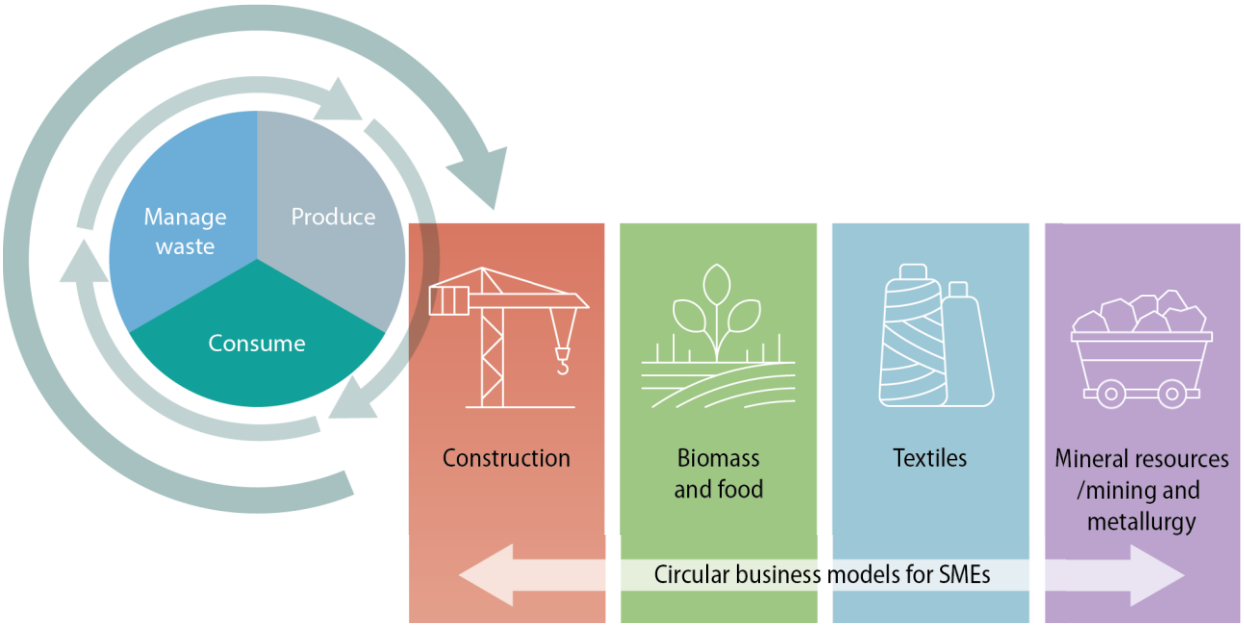
Out of the 11 identified potential priorities for the transition to a circular economy, North Macedonia has chosen 5 (Figure 3.2), for which the OECD provided more in-depth analysis and recommendations (details for each priority area are outlined in the respective chapters):

1. circular business models for SMEs (Chapter 4)
2. construction (Chapter 5)

3. biomass and food (Chapter 6)
4. textiles (Chapter 7)
5. mining and metallurgy (Chapter 8).

Each priority area captures the different points in the value chain (production, consumption, waste management and recycling) (Figure 3.2). Circular business models for SMEs is a cross-cutting area that pays specific attention to providing an enabling framework for businesses. The other four priorities focus on key sectors and materials in the Macedonian economy and provide measures that can be implemented throughout the life cycle and by different actors in the selected sectors.

Figure 3.2. Priority areas covered by the Circular Economy Roadmap for North Macedonia



Note: SME: small and medium-sized enterprise.

Decision-making process

Stakeholder engagement played a key role in the development of this roadmap. Regular consultations were conducted with the circular economy working group, which is comprised of key circular economy stakeholders from the government, private sector, civil society and academia. Perspectives, experiences, challenges, needs and concerns regarding the circular transition were carefully considered in the development of the diagnostics and played a crucial role in selecting the priority areas (see Annex A).

Such consultations harbour the risk of some bias in the selection of the final priority areas. While the 11 priority areas proposed were informed by indicators defined by the OECD, the final choice was the result of a decision-making process of the circular economy working group, endorsed by the Ministry of Economy, the co-ordinating institution responsible for the circular economy in North Macedonia. While informed by OECD guidance, priority areas were thus selected in line with the government's economic and political agenda and the perspectives of a wide range of relevant stakeholders. This does not suggest that some of the identified areas are deemed irrelevant for North Macedonia, but rather that they will not be the primary focus of this document. Instead, the diagnostics conducted by the OECD, included herein, provide a sound basis for developing and including other circular economy-related areas in relevant sector-focused strategies.

References

Ellen MacArthur Foundation (2015), *Delivering the Circular Economy: A Toolkit for Policymakers*, Ellen MacArthur Foundation, https://www.ellenmacarthurfoundation.org/a-toolkit-for-policymakers (accessed on 10 December 2020). [2]

Järvinen, L. and R. Sinervo (2020), *How to Create a National Circular Economy Road Map: A Guide to Making the Change Happen*, SITRA Studies No. 170, SITRA, Helsinki, https://www.sitra.fi/en/publications/how-to-create-a-national-circular-economy-road-map (accessed on 14 January 2021). [1]

Salvatori, G., F. Holstein and K. Böhme (2019), *Circular Economy Strategies and Roadmaps in Europe: Identifying Synergies and the Potential for Cooperation and Alliance Building*, European Economic and Social Committee, Brussels, https://doi.org/10.2864/554946. [3]

4 Circular business models for small and medium-sized enterprises in North Macedonia

This chapter introduces a set of policy recommendations to facilitate the shift of the Macedonian economy towards circular business models, with an emphasis on small and medium-sized enterprises. The chapter assesses the current situation and policy framework in place, identifies possible areas for improvement, and makes a number of specific policy recommendations, which are supported by international best practices.

What are circular business models?

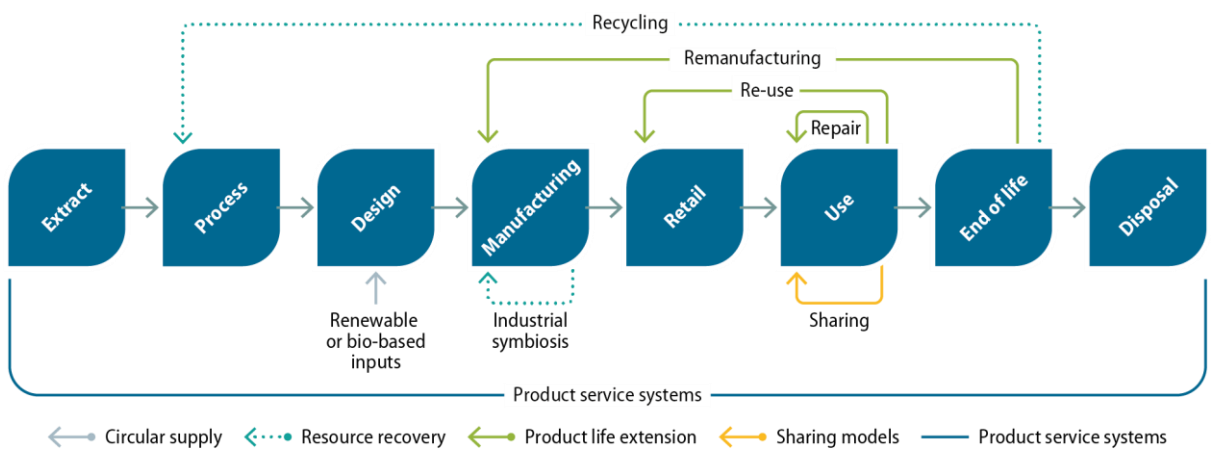
Circular business models represent fundamentally different ways of producing and consuming goods and services than the traditional linear business models. They aim to reduce the extraction and use of materials, minimise waste generation, and use existing materials and products as inputs to production through reuse and recycling. By doing so they help reduce the negative environmental impacts of materials consumption.

Circular business models can be classified into five main types (Figure 4.1) ((OECD, 2019[1]):

1. **Circular supply models** involve replacing traditional production inputs with bio-based, renewable or recovered materials. This reduces demand for virgin materials in the long run. These models target the design phase of production and sourcing of materials.
2. **Resource recovery models** involve the production of secondary raw materials from waste streams. They thereby divert waste from final disposal and reduce the extraction and processing of virgin materials. There are three main components for the model to work: 1) waste collection; 2) sorting; and 3) production of secondary materials from waste.
3. **Product life extension models** involve extending the lifetime of products. This can be achieved by designing products in a way that increases durability, by reuse and repair activities, or remanufacturing.
4. **Sharing models** facilitate the sharing of underutilised products through, for example, online platforms through co-ownership or co-access. This can reduce demand for new products and materials.
5. **Product service systems models** involve selling services rather than products. Since the service provider remains the owner of the product that provides the "service", this increases incentives for circular product design that increases durability and reparability as well as more efficient product use.

The distinction between the different types of circular business models is less clear-cut in reality, as in some cases businesses adopt a combination of business models. Different types of companies, from small to large, can implement circular business models. Certain circular business models also tend to be implemented by social enterprises with public goals, for example those involved in the collection and resale of used items.

Figure 4.1. Typology of circular business models



Source: Adapted from Lacy and Rutqvist (2015[2]).

Motivation for the selection of circular business models with a focus on small and medium-sized enterprises as a key priority area of the Roadmap

Circular business models for small and medium-sized enterprises (SMEs) have been selected because of their high economic importance, high policy relevance, high circularity potential as well as possibly important decarbonisation potential for North Macedonia. SMEs are the backbone of North Macedonia's economy. They account for 99.9% of enterprises, contribute to roughly 67% of value added to gross domestic product (GDP) and 73.9% of employment; 69% of them work in services (OECD, 2022[3]). North Macedonia also implements a number of policies that target and support SMEs, for example, the SME Strategy (2018-2023) had a special focus on environmental policies. It included a set of measures on providing advice and guidance to SMEs, improving resource efficiency, and introducing financial incentives for SME greening. While the strategy did not specifically target the circular economy, the different instruments support the development of green SMEs. The development of the revised strategy for the upcoming period started in 2024. The Ministry of Economy has also continuously implemented sectoral programmes targeting SMEs, such as the Programme for Supporting the Competitiveness of the Manufacturing Industry and Corporate Social Responsibility and the Programme for the Development of Entrepreneurship and Competitiveness of SMEs, implemented annually.

Since SMEs, in aggregate, have a significant environmental footprint (small firms account for 50% of the world's greenhouse gas emissions (ICT, 2021[4])), it is essential that North Macedonia considers them in its environmental policy making. Like any other economic entity, SMEs face the consequences of environmental degradation, which can generate specific challenges for their survival and growth. They can also be a source of innovation and solutions to develop the technologies needed to address environmental challenges. New green markets, such as the circular economy, can also create new business opportunities for SMEs. Even without moving into new markets, SMEs can potentially improve performance by realising efficiency gains and cost reductions by greening their products, services and processes. In this regard, tailored policies, incentives and instruments are necessary to enable them to participate in the green transition, as they face a number of barriers (financial, informational, etc.) in their greening efforts, and more so than large firms (OECD, 2021[5]).

Different types of circular business models (Figure 4.1) can contribute significantly to the transition to a circular economy. By closing resource loops and slowing and narrowing resource flows, they can reduce the environmental impacts of production and consumption. For example, in the case of resource recovery business models, producing materials via recycling rather than from virgin materials can significantly reduce greenhouse gas emissions. Remanufacturing products that have reached their end of life can reduce the extraction of natural resources and generation of waste by up to 80% relative to manufacturing new products (OECD, 2019[1]). However, the extent of the environmental benefits depends on the uptake of such models in the economy. In general, the market penetration of these models is currently limited. Recycling, remanufacturing and repair; the sharing of spare capacity (i.e. sharing models); and the provision of services rather than products typically only account for up to 15% of production in any given sector (OECD, 2019[1]). In recent years, some circular business models have been on the rise, largely due to the emergence of new technologies and platforms (e.g. sharing platforms such as Airbnb and car renting/sharing services). Some other business models, for example recycling and repair, are relatively mature. Circular business models have recently penetrated the market in North Macedonia, although it remains difficult to map all the actors concerned, as the vast majority of businesses are still not familiar with circular concepts. The main circular businesses in North Macedonia are based on resource recovery models, mainly focusing on recycling waste to use as input material in production (particularly textile, paper, agriculture and construction waste) (see Annex C).

Countries need to implement an enabling framework in the economic sectors that would support the adoption of such models to increase the market penetration of these business models and make them more competitive with the more traditional, linear business models.

Overview and approach for selecting the proposed policy recommendations

The approach for selecting the proposed policy recommendations for this area is a bit different from the approach for the four sectoral priorities. The overall aim of the recommendations for this area is to provide an enabling framework for SMEs to scale up the adoption of the five types of circular business models. The business models themselves cover the different stages of the life cycle, where, for example, the circular supplies model aims at increasing the use of secondary, bio-based or alternative materials in production, while resource recovery models focus on the end-of-life and recycling. The recommendations thus aim to provide policy measures that can be applied across the five business model types and economic sectors to support SMEs' activities in this area (Table 4.1).

Table 4.1. Overview of the proposed policy recommendations in the priority area circular business models for small and medium-sized enterprises for North Macedonia

Short term	Medium term	Long term
Provide awareness-raising campaigns and training programmes on the circular economy for small and medium-sized enterprises (SMEs), including showcasing of good practices and access to finance	Implement supporting legislation and economic instruments for resource recovery and circular supply of materials models	Implement supporting legislation and economic instruments for product life extension, sharing and product service models
Introduce calls for circular business models projects within existing funding programmes, including technical support for the public administration for the development and implementation of such programmes	Consider establishing a dedicated funding programme for SMEs to scale up circular business models	Organise investor-entrepreneur matchmaking events
Provide financial and technical assistance to SMEs (business support, access-to-finance support)	Support capacity building and entrepreneurship skills, vocational training as well as acceleration and mentoring programmes	
Support collaboration between SMEs and academia, as well as regional and international collaboration on research and development and innovation	Establish a circular economy stakeholder/ business platform to strengthen collaboration within and across value chains	

However, besides these more general measures, it will be important, in parallel, to put in place sectoral policy frameworks that provide sufficient economic and other incentives for the uptake of these circular business models. Such incentives could be mainstreamed as part of green industrial zones, in line with the Law on Industrial and Green Zones, currently being amended to include new provisions for regulating the benefits and opportunities for zone users. Incentives for the uptake of circular business models could also be integrated as part of funding planned by the Strategic Green Investment Fund, which will aim to facilitate private sector financing for the green transition and accelerate economic growth by attracting foreign and domestic investment in green industries, including as part of technological industrial development zones. These are included in the four selected sectoral priorities (construction, biomass and food, textile, and mining/metallurgy).

The proposed policy recommendations primarily target the supply side of circular business models, namely SMEs, as it is very relevant to boost their economic growth without it coming at an environmental cost. Recent economic crises have put additional pressure on Macedonian SMEs and their greening efforts, primarily due to issues with liquidity maintenance and access to finance. Well co-ordinated and targeted financial and technical support is thus required to overcome challenges in adopting sustainable practices and circular business models. To date, incentives and instruments to encourage SMEs to engage in greener practices have remained rather scarce in North Macedonia. While SMEs' greening efforts have been encouraged by easier access to finance in recent years, notably through government programmes, newly established funds and increased lending from the Development Bank of North Macedonia, non-financial tools to

support environmental practices have rarely targeted SMEs, despite being envisaged in the legislation (OECD, 2022[3]).

In parallel to targeting SMEs, the consumer side also needs to be addressed to increase demand for green products and services. Targeted communication and education initiatives are, therefore, necessary to further support the scaling up of circular business models. More extensive use of economic instruments in the sectoral priorities can also help to scale up these business models, as economic instruments change the relative price of different products and services, and hence can make circular business models more price-competitive compared to the more linear business models.

Key proposed policy recommendations

The key proposed recommendations are structured according to the type of policy instrument:

1. awareness-raising initiatives, education and other information tools
2. multi-stakeholder co-operation within and across value chains
3. financial support measures
4. supporting legislation and economic instruments.

1. Raising SMEs' awareness and education on the circular economy

In North Macedonia, only 15% of enterprises believe that their business models allow for a shift towards a circular model, with 38% rejecting the model, the highest share in the Western Balkans (RCC, 2022[6]). In 2022, the *OECD SME Policy Index* found that a few activities had been conducted to raise awareness on the benefits of green policies, but rarely as part of a co-ordinated government approach (OECD, 2022[3]). Occasional awareness-raising campaigns have been undertaken with the support of international partners and non-governmental organisations as well as capacity-building workshops with local governments and the private sector. For example, the National Corporate Social Responsibility Award, organised annually by the Ministry of Economy, raises awareness on green policies for SMEs, as it includes the environment as one of its categories. North Macedonia's first Aarhus Centre, set up in 2019, acts as a platform to engage citizens, governments and the private sector in a dialogue on environmental challenges and facilitates access to environmental information (OECD, 2022[3]). Some international development co-operation partners also offer these activities in their project portfolios. Moreover, academia and research institutes have been developing courses and conducting analyses to increase the uptake of circular economy practices among researchers and students. Nevertheless, there is limited co-ordination among these initiatives, and they are rarely part of strategic government approaches towards a circular transition. To further support the scaling up of circular business models, North Macedonia will need to continuously implement targeted communication and education initiatives. This could also be done through private sector organisations, including chambers of commerce.

In the short term, North Macedonia should focus on raising awareness on the circular economy and circular business models for SMEs through additional communication campaigns and training programmes, including showcasing of good practices and access-to-finance possibilities. Such activities could be conducted by the Agency for Promotion of Entrepreneurship of the Republic of North Macedonia (APPRM), which is responsible for the public provision of business support services, ranging from training, education initiatives, vouchers and co-financing to consulting services and tailored mentoring; or the Fund for Innovation and Technological Development (FITD), which introduced its own support mechanism for SMEs, providing both financial support and technical assistance. Given the novelty of the topic, both institutions might need to receive capacity-building support. The Development Bank of North Macedonia, which already provides credit relief in the form of subsidised SME credit lines, including support from international co-operation development partners, could also step-up awareness campaigns

on available access-to-finance opportunities (OECD, 2022[3]). Since 2023, the Ministry of Economy supports the Eco-En Cert verification for environmental, social and organisational practices with a subsidy through the social responsibility support programme, thereby indirectly contributing to the establishment of sustainable green co-operatives with the support of the verified companies. Support for the preparation of sustainability reports according to the new European Sustainability Reporting Standards could also help companies raise private finance, though this may be less relevant for SMEs at the moment.

Awareness-raising and educational activities could focus on circular business models in general or target specific sectors. For example, dedicated stakeholder events and campaigns could be organised on waste prevention in selected sectors or advising on setting up product life extension business models, such as repair cafés. Government authorities could also collaborate with the food industry and the non-governmental sector on promoting food waste reduction strategies directed at consumers, in line with the Law on Donating Surplus Food Waste currently undergoing final consultations. A best practices inventory or (online) resource database accessible to consumers and professionals could also be developed, as well as support training and education for food industry professionals and employees (see Chapter 6 for more on awareness raising in this sector).

In collaboration with the Hungarian Prime Minister's Office, the OECD organised a training event in Hungary as part of a project to support the development of the National Circular Economy Strategy. The event aimed to raise awareness and provide training on circular business models, particularly for SMEs. It introduced the Circular Economy Technology Platform, outlined circular economy principles for key priority areas (construction, biomass and food, and plastics), and highlighted successful examples of circular business models in Hungary. The session concluded with a presentation on public funding opportunities for transitioning to a circular economy in Hungary. North Macedonia could consider organising a similar event, focusing on specific economic sectors and value chains, such as construction, agriculture, textiles, or even plastics.

In the medium term, North Macedonia could also support capacity building and entrepreneurship skills, vocational training as well as acceleration and mentoring programmes on the circular economy. Education and capacity-building instruments include tailored training courses for companies, formal and informal associations of citizens, co-operatives, social entrepreneurs and civil organisations. They also include advice/consulting support for start-ups, companies and entrepreneurs that can be provided by a variety of institutions in the country or within international projects funded by development co-operation partners. The creation of an eco-system of creators and innovations in communities, regions and at the national level could also be supported. Local authorities and/or waste management organisations can also facilitate the education activities by sending representatives to schools or inviting children to facility tours. Producers that have extended producer responsibility (EPR) obligations sometimes contribute to financing such educational activities. In some countries, compulsory minimum producer responsibility organisation expenditures spent on awareness have also been introduced. In Austria these amount to 0.3% of income and in Poland, 5% (Drab, Engel and Kristofory, 2020[7]).

International projects relevant to the circular economy and waste could have a component dedicated to the provision of training to local SMEs as well as financial institutions to raise awareness and knowledge among entrepreneurs about circular business models and educate investors about the risks and opportunities of such projects, hence increasing the likelihood of financing for such projects. The Circular Economy Regional Initiative funded by the European Bank for Reconstruction and Development and the Global Environmental Facility seeks to drive a circular economy expansion in the Western Balkans and the Republic of Türkiye focusing efforts on decreasing the barriers to investments in circular business models, technologies and processes. As one of its main components, the project contributes to active knowledge sharing between relevant stakeholders and offers the technical assistance necessary for developing bankable projects (GEF, 2021[8]). This is one example for common practice in programmes funded by international development co-operation partners, though most are aimed at increasing energy efficiency and renewable energies. Awareness-raising initiatives and education activities are especially relevant for SMEs and start-ups which, besides their already lesser exposure to domestic research and

development (R&D) and innovation activities, might also not be fully aware of the opportunities offered by circular business models and might lack skills in accessing and using existing data, information and knowledge.

2. Improving multi-stakeholder co-operation within and across value chains

Strengthening collaboration among the relevant stakeholders and partnerships between public and private organisations are key for transitioning to a circular economy, which requires a change across the entire economy. Promoting inter-sectoral, cross-agency and interdepartmental collaboration in North Macedonia would help scale up innovative circular business models, as the circular economy concept cuts across economic sectors and value chains as well as the competencies of public authorities. Currently, the lack of an overarching body responsible for co-ordinating SME greening policies and corresponding funds is hampering the proper implementation and monitoring of activities undertaken by different institutions (OECD, 2022[3]). To improve multi-stakeholder co-operation within and across value chains, North Macedonia could focus on three key actions.

First, in the short term, North Macedonia should strengthen collaboration between SMEs and academia, as well as regional and international collaboration on R&D and innovation. Collaboration between SMEs and academia could be improved, for example, through introducing grants for collaborative R&D, innovation vouchers, or supporting the establishment of collaborative research centres and accelerator programmes. While the FITD piloted an innovation voucher scheme in 2020 to facilitate research projects between higher research institutes and SMEs, uptake remained limited and did not specifically focus on green or circular projects (OECD, 2022[3]). Examples of international practices in this area include the United Kingdom's funding available through the TSB Collaborative R&D Scheme to encourage collaboration between business and researchers. The Czech Republic implements a government programme for applied research and experimental development administered by the Technology Agency of the Czech Republic. In particular, its ZETA programme supports co-operation between academia and industry (Technology Agency of the Czech Republic, n.d.[9]). To further encourage inter-firm linkages and co-ordination, the formulation and implementation of clusters could be supported. In addition, the Circle Economy (2020[10]) published a guide on setting up collaborations for a circular economy.

North Macedonia could also promote more regional and international collaboration, for example by sharing examples of regional and international projects and helping SMEs to establish partnerships with other businesses or academia. This could be done through their national contact points for the EU programmes (e.g. Horizon Europe, European Open Science Cloud or LIFE programme – for which an association agreement was signed in July 2023).

Second, to strengthen collaboration, information exchange and exchange of good practices, North Macedonia will also need to establish a circular economy stakeholder/business platform in the medium term. Research of the conditions that such a platform will need to fulfil and its potential for networking and dispersing circular business practices will need to be established prior to its creation. Besides enabling collaborations and networking opportunities between the public and private sectors, such platforms (whether virtual or physical) may also facilitate synergies and knowledge sharing across the different parts of the value chain. A circular economy stakeholders' platform, established as part of the OECD Supporting Green Transition through Circular Economy Roadmaps project, can provide a solid foundation for such efforts (see Annex A for more information). Most European countries have established national circular economy stakeholder platforms or hubs, which serve as fora for information exchange; peer learning; multi-stakeholder co-operation; and a depository of information, data and other relevant material (see Box 4.1 for a few examples). Some have set up working groups on specific topics. North Macedonia could, for example, set up specific working groups for the selected sectors in this roadmap, where SMEs could discuss and exchange practices.

A circular economy business platform could also be used to promote industrial symbiosis within the green industrial zones in North Macedonia. Ongoing amendments to the Law on Industrial and Green Zones could incorporate provisions that would enable the zone environment to promote resource recovery and recycling, thereby creating an environment conducive to strengthening business partnerships and collaboration. In addition to ensuring efficient waste management practices, the amendments could introduce incentives to promote industrial symbiosis, where one firm's waste output or by-product serves as another's input. These strategic measures not only contribute to sustainable practices but also enhance the potential for businesses to collaborate and thrive in a mutually beneficial ecosystem. This aligns with North Macedonia's commitment to foster a more sustainable and collaborative economic landscape, providing a solid foundation for strengthened business partnerships and co-operative endeavours. The Turkey Materials Marketplace outlined in Box 4.1 serves as an excellent example for encouraging collaboration in green zones in North Macedonia by providing a secure online platform for companies to share data on materials and identify material reuse opportunities.

Box 4.1. Examples of circular economy platforms/hubs

- **Slovak Circular Economy Platform (Circular Slovakia)** – established in the form of a public-private partnership by the Slovak Ministry of Environment, the Embassy of the Kingdom of the Netherlands, the Institute for Circular Economy, PwC Slovakia, the Slovak Business Agency and the Slovak Environment Agency in 2019. Its main goals are to: promote the circular economy to businesses as an approach that provides economic benefits and opportunities, exchange information and experience, help build business partnerships and new projects, inform businesses about the latest legislation in the area, and support their participation in the policy-making process. The platform also helps increase discussion between the public and private sectors as well as among businesses themselves.
- **Circular Glasgow** – hosted since 2015 by the Glasgow Chamber of Commerce, Zero Waste Scotland and the Glasgow City Council (United Kingdom). Circular Glasgow aims to build best practices and capacity on the circular economy across Glasgow businesses, helping them identify opportunities to support and implement circular ideas. This is done by: workshops and events – a series of knowledge-sharing business-to-business networking events; Circle Assessment – a tool which helps businesses understand opportunities to become more circular; and the Circle Lab – an online hackathon event to find a circular solution to local challenges.
- **The Italian Circular Economy Stakeholder Platform** – established in 2018 by the National Agency for New Technologies, Energy and Sustainable Economic Development as a mirror initiative of the European Circular Economy Stakeholder Platform. It acts through six working groups: 1) Research and Eco-innovation; 2) Policy and Governance; 3) Measuring the Circular Economy; 4) Sustainable and Circular Design, Production, Distribution and Consumption; 5) Cities and Territory; and 6) Good Practices. The platform aims to foster synergies between relevant stakeholders, overcome the fragmentation of initiatives at the national level, map good practices, and promote the Italian way for a circular economy at the national and international levels.
- **Turkey Circular Economy Platform** – established in 2020 by the Business Council for Sustainable Development of Türkiye. The platform aims to provide practical solutions, incentives, news and opportunities in the field of the circular economy. It includes a knowledge hub and measurement tools and offers training, financial opportunities and consultancy services for companies looking to accelerate their transition to a circular economy. Another integral part of the platform is the Turkey Materials Marketplace (TMM) established in 2016, an e-commerce platform for industrial symbiosis. In particular, TMM offers economic benefits for buyers and

sellers by reducing storage costs and contributing to improved waste management and environmental performance.

- Other examples of platforms connecting experts and organisations, engaging stakeholders within different working groups, and promoting projects that integrate the principles of a circular economy include the **Holland Circular Hotspot** and the newly established **Czech Circular Hotspot**.

Sources: OECD (2021[11]); ICESP (n.d.[12]); Business Council for Sustainable Development of Türkiye (2020[13]); Holland Circular Hotspot (n.d.[14]); INCIEN (n.d.[15])

Third, in the long term, and once circular business models are more well-known and widespread in North Macedonia, it could also organise investor-entrepreneur matchmaking events. The aim of these events would be to gather investors and innovators in North Macedonia, present the pipeline of potential projects that support circular business models, pitch investors' ideas, and try to match investors with project developers. This is more common for technological innovations in the energy sector, but the same concept has been expanded to circular innovations as well (for example, in Germany and the Netherlands). Public authorities can be involved in setting up such business support networks, as is the case in the Netherlands, for example, where the Ministry of Infrastructure and Water has jointly created with other partners the Netherlands Circular Accelerator business platform that helps match entrepreneurs across regions and value chains. Such events could also be organised regionally (in the Western Balkans), with the aim to establish new connections and joint investments across the region.

3. Providing financial support for scaling up circular business models

The transition to a circular economy needs resources to drive the uptake of new business models, support the development of innovative technologies and motivate behavioural change within society. Governments can support the transition by using specific legislative and economic instruments (see the next sub-section). Another way for governments to help reorient market forces towards a circular economy is through financial support for projects and initiatives in the form of grants and loans. These instruments help decrease the cost of capital for circular investments and overcome financial and information barriers. Public funding can thereby stimulate the development of new circular business models, innovative technologies and strategic partnerships. Besides public funding, companies will need to raise private finance to support and scale up their circular activities. To do so, sustainable reporting standards, including the EU Taxonomy Regulation for sustainable financing may have an important role to play.

The diagnostics of the circular economy in North Macedonia showed that multiple funding programmes support green investments in North Macedonia. For example, North Macedonia has launched the new Green Finance Facility, allocating EUR 30 million to provide performance-based incentives for SMEs, a programme considered among the top 10 Sustainable Development Goal blended finance instruments in the world (Joint SDG Fund, 2022[16]). In addition, the newly adopted Plan for Accelerated Growth (2022-2026) is expected to provide a stronger impulse to greening and circular measures in the post-COVID economic recovery with the introduction of several instruments to promote and finance green projects. The proposed financing instruments have yet to be established and include, among other elements, green bonds, a Hybrid National Green and Digital Fund for SMEs, Start-ups and Innovative Enterprises to invest in green and digital SMEs (with a total portfolio of EUR 27 million). The FITD, which encourages innovation by providing additional resources for financing innovative activities, will include a Green Business Facility. The facility will stimulate investments in the areas of industrial innovation and the circular economy, green buildings, clean energy resources, sustainable mobility, and sustainable land use and nature. The facility is expected to be established at the beginning of 2024 and the grant to the FITD to financially support SMEs is expected in 2025. Moreover, the FITD was designated in 2022 to be accredited to access

the Green Climate Fund; in 2023, it submitted its application (results are expected in 2025). Both sources of funding will be incorporated into the implementation of the Smart Specialisation Strategy.

International development co-operation partners are also conducting several projects relevant for the circular economy in North Macedonia, providing financial and technical support to the government in different areas. Nevertheless, for those initiatives that include grants and subsidies, buy-in from the private sector has remained limited and phase-out processes often lack.

While financial incentives for green investments for SMEs in North Macedonia have steadily increased in recent years, they predominantly focus on energy efficiency and renewables. Existing funding programmes and incentives lack specific measures directed towards promoting circularity in SME practices. Additionally, North Macedonia has not established sufficient national mechanisms to provide adequate financial incentives for SME greening (OECD, 2022[3]). Presently, no co-ordinating body monitors and provides data on SMEs benefitting from financial initiatives for green practices.

Therefore, North Macedonia will need to further capitalise on current positive developments by actively providing targeted financial support for scaling up circular business models and increasing stakeholder awareness about the availability of performance-based incentives. In the context of this roadmap, this can be done in three ways.

First, in the short term, North Macedonia could introduce calls for circular business models projects within existing funding programmes that provide grants and soft loans. Such projects could be integrated, for example, as part of the green finance envisaged by the Programme for Supporting the Competitiveness of the Manufacturing Industry and Corporate Social Responsibility and the Programme for the Development of Entrepreneurship and Competitiveness of SMEs, implemented annually. The programmes provide financial support for technical feasibility studies to selected companies pursuing green projects as well as for the training, implementation and certification of various horizontal standards, including environment and energy management systems (ISO 14001 and ISO 50001). The programmes will need to clearly define what is considered to be green finance.[1] In addition to SMEs, academia should be able to participate in those projects together with businesses. A specific amount of total financing could be dedicated to circular projects. These calls should specify the priorities and the allocation of funds dedicated to circular economy projects. The focus of supported projects could be: the introduction of new business models and pilot projects; and knowledge dissemination in the areas of the circular economy. The call could also specify preference for projects with a focus on construction, biomass and food, textiles, and mining/metallurgy as key priorities for the transition to a circular economy in North Macedonia. To successfully develop and implement calls for circular business models projects, technical support may be needed for the public administration to familiarise itself with the different types of circular projects.

Box 4.2 provides an example of how this was done recently in Hungary. Hungary used the process of developing a national circular economy strategy to identify the circular economy priorities that would be included in the existing funding programme (funded by the EU Structural and Cohesion Funds) in its next programming period (2021-27). It then organised an awareness-raising and training event for SMEs in the country to instigate applications for this programme, and the circular economy priority in particular.

Box 4.2. Introducing calls for projects focused on circular business models within existing funding programmes

Hungary's Operational Programme for 2021-2027

Environmental and Energy Efficiency Operational Programme (EEEOP) Plus in Hungary

The EEEOP Plus is the continuation of the previous EEEOP under the new framework for the period 2021-27 (as illustrated in Figure 4.2). The programme is implemented by the Deputy State Secretariat for the Implementation of Transport, Environmental and Energy Efficiency Development Programmes of the Ministry of Public Administration and Spatial Development, and funded by the EU Structural and Cohesion Funds. Its priorities include:

- water management and disaster risk reduction
- circular economy systems and sustainability
- protection of the environment and nature
- a renewable energy economy
- a just transition.

The programme's overall budget is HUF 1 612.56 billion (EUR 4.3 billion), with HUF 411.97 billion (EUR 1.1 billion) allocated to the priority covering circular economy systems and sustainability, among others, such as:

- Under the **waste management objective**, the programme funds projects that focus on: improving the existing separate waste collection system; supporting waste recycling and the production of high-quality secondary raw materials; developing new waste management centres and upgrading existing ones; optimising municipal waste collection and transport; supporting residual waste facilities; rehabilitating abandoned landfills; and active, experience-based, community-building awareness-raising activities.
- The **circular economy-related objective** is a new topic of the EEEOP Plus. Its aim is to pave the way for a circular transition through small-scale investments targeting mainly small and medium-sized enterprises. The funding focuses on: service provision; promoting decoupling of raw material consumption and gross domestic product growth; building value chains/circles; and developing new business sectors and business models. It targets a diverse range of projects, translating circular economy principles into practice (from both upstream and downstream perspectives), and awareness-raising activities and small demonstration/pilot projects.

Figure 4.2. EEEOP Plus and its precursor EEEOP

EEEOP 2014-2020

Priority	Action	Alloc. EUR M	Main respon-sible
1	Water management	891	MoI
	Disaster management/Climate	154	
2	Drinking water	183	MTI
	Waste water	1 031	
3	Waste management	300	MTI
	Remediation	100	MTI
4	Nature protection	100	MoA
5	Renewable energy	314	MTI
	Energy efficiency	600	
	District heating	106	
	Awareness raising	6	
TOTAL		3 785	

EEEOP Plus 2021-2027

Priority	Action	Alloc. EUR M	Main respon-sible
1	Water management	702	MoI
	Disaster risk reduction	121	
2	Sustainable water utility systems	652	MTI
	Green and blue infrastructure	190	
	Circular waste management	208	
	Circular economy	52	
3	Remediation/Environmental protection	45	MoA
	Nature protection	112	
4	Promoting energy efficiency measures	883	MTI
	Promoting renewable energy	535	
	Smart energy systems, -networks and -storage	518	
5	Just Transition Fund	295	MTI
TOTAL		4 313	

Note: MoI: Ministry of Interior; MTI: Ministry of Technology and Innovation; MoA: Ministry of Agriculture.
Source: Prime Minister's Office, Hungary.

Table 4.2 summarises the indicators and targets for these two objectives.

Table 4.2. Indicators and targets of waste and circular economy-related actions within the EEEOP Plus

Specific objective	Action	Indicator		Unit	Baseline		Milestone 2024	Target 2029
		Code	Name		Value	Year		
2.3. Transition to a circular economy	Circular waste management	RCO34	Additional capacity for waste recycling	tonnes/year	n.r.	n.r.	50 000	250 000
		RCR47	Waste recycled	tonnes/year	0	2021	n.r.	300 000
	Circular economy	RC001	Enterprises supported	number	n.r.	n.r.	16	160
		RCR04	Small and medium-sized enterprises introducing marketing or organisational innovation	number	0	2021	n.r.	143

Note: n.r.: not reported.
Sources: Government of Hungary (2022[17]); OECD (2023[18]).

Second, the financial support in the form of grants and loans should be combined with technical and other assistance to SMEs. This non-financial support could consist of more general business support (e.g. writing a good business plan and accessing finance) as well as of technical support through consultancy services in the area of circular business models and could be implemented by the APPRM, in charge of business development services. It is common practice in some programmes funded by international development co-operation partners to provide more general business as well as technical support in addition to a grant and/or soft loan. For example, the FITD will include a Green Business Facility, which will provide direct subsidies and grants to SMEs, along with awareness-raising and advisory

assistance for green projects. Its total budget is EUR 27 million. The Green Finance Facility also provides technical co-operation support from the government, in addition to incentives/grants. Also, the European Bank for Reconstruction and Development administers energy efficiency programmes that provide a small non-reimbursable grant, a soft loan and consulting services to successful applicants, and training to financial institutions that administer those loans locally. Scotland has set up the Circular Economy Business Support Service to provide one-on-one consultancy for SMEs across all sectors (Zero Waste Scotland, 2020[19]) while Luxembourg has set up a decision-making tool (Fit 4 Circularity) through which it helps companies identify and assess their growth potential, and adopt circular economy approaches and innovative business models (Luxinnovation, 2020[20]).

Third, in the medium term, North Macedonia could consider establishing a dedicated funding programme for SMEs to scale up circular business models. No such programme exists at the moment in North Macedonia. One example of such a programme is within the RE: Source innovation programme in Sweden. The Swedish government has appointed two agencies to invest in a strategic innovation programme that focuses on developing a circular economy and resource efficiency innovations (RE: SOURCE, n.d.[21]). The programme brings together companies, universities and authorities to collaborate in strategically important areas, and provides specific funding for projects under this programme and five platforms to develop solutions for its priority areas. In North Macedonia, the focus could be, for example, on launching circular construction and renovation pilots, or on launching circular business models aimed at food waste prevention. Another example is from Scotland, which has set up a Circular Economy Investment Fund offering grant support to SMEs and non-governmental organisations for innovative circular economy projects resulting from the Circular Economy Business Support Service and nearing commercialisation (Zero Waste Scotland, n.d.[22]). To implement such a programme in North Macedonia would probably require that the programme be funded and administered by international development co-operation partners. However, ensuring the sustainability of the programmes will be crucial, and collaboration with government institutions, such as the APPRM or the FITD, is essential. Also, Macedonian SMEs will need to have attained a certain level of knowledge and experience to ensure that the programme generates a pipeline of circular economy projects with good business plans that are economically and financially sustainable.

4. Implementing supportive legislation and economic instruments

Besides awareness raising, education, multi-stakeholder collaboration and funding programmes providing grants, loans and technical assistance, legislation and economic instruments also support the uptake of circular business models and are often a necessary prerequisite for other measures to be effective.

In the medium term, North Macedonia could strengthen legislation and economic instruments to support resource recovery and a circular supply of materials business models. This could be done by effectively implementing the new Law on Waste Management and EPR as well as green public procurement (GPP). The new Law on Waste Management is expected to enable the establishment of a functional system for regional waste management, such as regional collection, transport, sorting and recycling of waste; the construction of new regional landfills; and the closure of all non-standard landfills – in accordance with circular economy principles (EEA, 2021[23]). Once this law is effectively implemented, it should provide a good enabling framework for recovering and recycling waste, and therefore for resource recovery business models that require waste collection, sorting and production of secondary materials from waste.

The Law on Extended Producer Responsibility in North Macedonia establishes obligations, targets and economic incentives for businesses that should lead to increased recycling and material recovery. EPR take-back schemes require firms to bear the costs of waste management for their products post-consumer stage, including responsibility for collecting and treating the products. Currently, a total of seven EPR schemes have been set up in North Macedonia: three for waste electrical and electronic equipment, one

for batteries, and three for packaging waste. The obligation to organise EPR schemes for other waste streams came into effect on 1 January 2024, in accordance with the 2021 Law on Waste. Nevertheless, it has been reported that deficiencies, largely in the infrastructure for separate collection and recycling of waste streams and the lack of awareness among producers, hamper the implementation of EPR schemes (European Commission, 2021[24]).

Effective EPR schemes help collect, sort and recycle waste that can be used as secondary materials; they, therefore, facilitate the uptake of resource recovery business models. To facilitate the adoption of general good practices and OECD guidance on EPR (OECD, 2016[25]), authorities and other actors covered by the new EPR Law in North Macedonia could make use of the EPR Toolbox (PREVENT Waste Alliance, n.d.[26]) to consult other international practices and participate in the knowledge exchange to enhance the functioning of the domestic EPR system. The EPR Toolbox contains three modules that span more general aspects of an EPR, including the monitoring of financial flows. It also focuses on concrete actions, such as the integration of the informal sector or the creation of a market for recycled plastics (PREVENT Waste Alliance, n.d.[26]). For example, as waste collection and sorting are labour-intensive, EPR schemes offer a great opportunity to integrate the informal waste sector into more formalised types of employment. Producer responsibility organisations can offer attractive and formalised employment, thus encouraging waste collectors who have been working informally to apply for jobs (PREVENT Waste Alliance, n.d.[26]).

GPP can provide industry with incentives to innovate and develop environmentally friendly works, products and services with potentially lower waste disposal. It is also said to increase the supply of products and services that are more circular. GPP refers to public purchasing of products and services that are less environmentally damaging when taking into account their whole life cycle. As public procurement accounted for about 8.6% of the GDP in North Macedonia in 2022 (European Commission, 2023[27]), it can facilitate the supply of green products and services if it works to foster environmentally sound developments. The Law on Public Procurement (2019) includes relevant provisions on GPP, including on life cycle costs. Application of life cycle costs as a criterion for tender is optional and the data to be provided by the tenderers and the method for determining life cycle costs should be indicated in the tender documentation. The Strategy for Improving the Public Procurement System (2022-2026) incorporates measures moving towards sustainability, though it does not exclusively focus on GPP. Looking ahead, efforts will be directed towards addressing remaining gaps in the legal framework, ensuring full compliance with EU Directives and facilitating the effective implementation of the 2019 Law on Public Procurement. Strategic issues, including “green”, social and innovative procurement, are given increased emphasis. The corresponding Action Plan 2022 successfully achieved its measure to create a GPP manual including a catalogue of good practices for potential suppliers, completed by the Public Procurement Bureau in June 2022. Moreover, the National Plan for Waste Management (2021-2031) includes the introduction of the mandatory GPP criteria in procurement bids. The government banned single-use packaging and plastics in public procurement as of 2020. However, the introduction of GPP measures in tenders has remained limited since the adoption of these laws.

To expand the use of GPP, North Macedonia will need to implement a number of measures. This could include:

- A national GPP strategy and an action plan that include green criteria and targets for selected product groups, supported by sector- or product-specific methodological guidelines and capacity-building programmes for public authorities as well as other stakeholders. It is crucial for North Macedonia to prioritise and ensure effective implementation, supported by a robust monitoring framework. To assess concrete advancements in GPP, the Strategy for Improving the Public Procurement System suggests establishing indicators for data collection and result measurement.

- Stronger promotion of GPP among public authorities at all levels of government, by introducing a mandatory element into GPP, for example mandatory green award criteria which would ensure that companies are competing on green criteria and not only on price.
- Support for the use of secondary raw materials by introducing minimum recycled content requirements within GPP (see Box 4.3).

Box 4.3. Example of introducing minimum recycled content requirements within green public procurement in Japan

The Japanese Act on Promoting Green Procurement and its related Basic Policy on Green Procurement specifies environmental criteria to be considered when purchasing goods and services by the government or its administrative agencies. The environmental criteria include, among other things, recycled content criteria for pulp and plastics used in the products designated for procurement. For example, the higher the recycled content share in an evaluated good, the higher the evaluation score for that good. For some of the goods, the policy requires minimum recycled content requirements. This is the case, for example, for coated inkjet colour printer paper, where at least 70% recycled pulp content is required, or for stationery products where items containing plastics contain at least 40% recycled plastics in weight of the total plastics and items containing paper contain at least 50% recycled pulp. Green public procurement is mandatory for government agencies across a wide array of product categories.

Source: OECD (2024[29]); Ministry of the Environment of Japan (2000[30]).

In the long run, North Macedonia could focus on strengthening legislation and economic instruments that support product life extension, sharing and product service models. This can be done primarily by implementing ecodesign requirements for increased durability and reparability of products; green certification/standardisation and environmental labelling; and fiscal incentives that support reuse, repair and waste reduction. North Macedonia implemented a Decree on Eco-design of Products (2011), which is further complemented by the integration of ecodesign considerations for the construction sector, as highlighted in the first National Waste Prevention Plan (2022-2028) (see Chapter 5). As part of the Sustainable Products Initiative, the European Commission proposed a Regulation on Ecodesign for Sustainable Products to make products placed on the EU market more sustainable, extending ecodesign requirements to new design principles and aligning materials properties with the circular economy (European Commission, 2022[28]). This also implies that if the regulation is adopted, ecodesign criteria related to longevity, reparability and recyclability might become mandatory in EU member states.

Regarding green certification and environmental labelling, environment management systems, green certification (of business practices) and eco-labels (of products) that support the private sector in their greening efforts have been introduced in North Macedonia's legislative framework, for example in the Law on Environment (2011) and the Law on Management of Electrical and Electronic Equipment and Waste from Electrical and Electronic Equipment (2021). In addition to contributing to an increased demand for green business practices, certification of green practices could be useful for companies when dealing with business licensing and administrative requirements as well as in GPP.

However, programmes promoting the certification of SMEs remain limited. There are almost no data on how many SMEs have adopted energy management system or eco-labels in North Macedonia or if they have benefitted from such schemes. North Macedonia will need to increase awareness of the benefits of these certificates and eco-labels among businesses and consumers, including recognition of the logos. On the other hand, it will need to streamline the processes for obtaining such certification/eco-labels, as this may be too costly for SMEs. For example, the German Blue Angel Ecolabel has a one-off cost of EUR 400

(plus value-added tax [VAT]) and an annual fee charged according to the company's annual sales, ranging from EUR 320 to EUR 10 500 per year (Blue Angel Ecolabel, 2023[31]). The certification/labelling should apply to the extent possible to environmentally friendly products and services that are commonly used by consumers rather than, for instance, products relevant for business-to-business transactions. GPP is another tool that can support eco-labelling and green certification.

North Macedonia may also want to consider introducing a quality standard for reused or recycled products. Quality standards for products also provide consumers with valuable information on the products that they buy. Introducing quality standards for recycled materials and/or reused products (furniture, toys, bicycles and even industrial equipment, but in particular electronics) could boost the market for second-hand, refurbished and remanufactured consumer goods. An example of such a quality standard is the Scottish Revolve Reuse Quality Standard (Box 4.4). Social enterprises, charity shops and other businesses that sell used products could be tested to be certified by using those standards. Authorised organisations, by displaying the certification logo, could inform customers that their products have been through appropriate safety and quality checks. The Scottish Revolve Reuse Quality Standard has been developed on behalf of Zero Waste Scotland, a not-for-profit environmental organisation supported by the Scottish government. The standard was first used by non-governmental organisations, then later rolled out across a wide range of organisations. Roll-out of such standards requires a lot of outreach to businesses. A recent study for the European Commission found that increasing consumers' confidence about the quality and safety of reused products, and improving information about durability and reparability at the point of sale through labels, information or educational campaigns, was key to shifting consumer preferences towards more circular products (European Commission et al., 2018[32]).

Box 4.4. Revolve Reuse Quality Standard in Scotland

Since 2011, Zero Waste Scotland, a not-for-profit environmental organisation supported by the Scottish government, has been conducting a programme for increasing customer confidence in reused products. The Revolve Reuse Quality Standard, an externally validated tool, was designed and piloted in 2011 for Scottish reuse businesses to increase the purchasing of reused goods. According to the UK Statistics Authority, confidence in the quality and safety of reused products is a barrier to reuse, as only 27% of the national population purchases in second-hand shops, even if 77% declares a willingness to doing so. The introduction of this quality standard is both increasing consumers' confidence and helping the accredited businesses to increase their turnover by selling second-hand products. Businesses that sell reused products and want to be certified are tested by using those standards related to the quality of the goods, shopping experience and trust. In 2018, there were 122 accredited stores across Scotland. In a sample of ten stores, revenue has increased by just under GBP 45 000 since 2011. As well as increasing the purchase of second-hand over new products and supporting second-hand stores to reach a wider audience and sell more, another important objective of this initiative is opening a discussion around legislation, perception and barriers for the reuse of goods.

Source: OECD (2022[33]); Zero Waste Scotland (2020[34]); Moir (2018[35]).

Lastly, while currently fiscal incentives that support reuse, repair and waste reduction are, in general, less well-established in the European Union, they could provide economic incentives to businesses (and consumers) to change their practices. The most common examples in EU member states include reduced (or exempt) VAT on repair services and food donations (see Chapter 6). While introducing such fiscal incentives in North Macedonia may not be an immediate priority, the country is actively considering such measures, specifically for food waste prevention. In the long run, as the country converges towards its European peers and the wealth and standard of living of its population increases, such measures are likely to become increasingly suitable. However, these instruments should be implemented as part of a broader

policy mix, where additional policy measures, such as ecodesign requirements and promoting waste prevention through targeted communication and information tools, would help achieve the desired outcome.

References

Blue Angel Ecolabel (2023), "The German costs for applying for the label", https://www.blauer-engel.de/en/certification/costs-applying-label. [31]

Business Council for Sustainable Development of Türkiye (2020), *Turkey Circular Economy Platform*, https://donguselekonomiplatformu.com/en (accessed on 7 December 2023). [13]

Circle Economy (2020), *Will You Be My Partner? Nine Steps to Identify and Establish Successful Collaborations for a Circular Economy*, Circle Economy, https://www.circle-economy.com/resources/will-you-be-my-partner-collaborations-in-the-circular-economy. [10]

Drab, J., M. Engel and T. Kristofory (2020), *Sorting Out Waste Sorting*, Institute for Environmental Policy, Ministry of Environment of the Slovak Republic, https://www.minzp.sk/files/iep/sorting_out_waste_sorting.pdf. [7]

EEA (2021), *Municipal Waste Management: Country Fact Sheet North Macedonia*, European Environment Agency, Copenhagen, https://www.eea.europa.eu/themes/waste/waste-management/municipal-waste-management-country/north-macedonia-municipal-waste-factsheet-2021. [23]

European Commission (2023), *2023 Communication on EU Enlargement Policy: North Macedonia 2023 Report*, European Commission, Brussels, https://neighbourhood-enlargement.ec.europa.eu/system/files/2023-11/SWD_2023_693%20North%20Macedonia%20report.pdf. [27]

European Commission (2022), *Communication on Making Sustainable Products the Norm*, European Commission, Brussels, https://ec.europa.eu/environment/publications/communication-making-sustainable-products-norm_en (accessed on 21 April 2022). [28]

European Commission (2021), "Annex C1: Twinning fiche", *Support in the Implementation of the Waste Management Legislation and Extended Producer Responsibility (EPR) Scheme*, European Commission, Brussels, https://www.esteri.it/wp-content/uploads/2022/03/Twinning-Fiche-MK-20-IPA-EN-01-21-final-24-Feb.pdf. [24]

European Commission et al. (2018), *Behavioural Study on Consumers' Engagement in the Circular Economy*, European Commission, https://doi.org/10.2818/956512. [32]

GEF (2021), "Circular Economy Regional Initiative (CERI)", https://www.thegef.org/projects-operations/projects/10328. [8]

Government of Hungary (2022), "Környezeti és energiahatékonysági operatív program plusz (KEHOP PLUSZ)", https://archive.palyazat.gov.hu/kornyezeti_es_energiahatekonysagi_operativ_program_plusz (accessed on 24 January 2024). [17]

Holland Circular Hotspot (n.d.), *Holland Circular Hotspot website*, https://hollandcircularhotspot.nl. [14]

ICESP (n.d.), *Italian Circular Economy Stakeholder Platform*, https://www.icesp.it. [12]

ICT (2021), *SME Competitiveness Outlook 2021: Empowering the Green Recovery*, International Trade Centre, Geneva, https://www.intracen.org/publications/smeco2021/ITCSMECO2021. [4]

INCIEN (n.d.), *Platforma pro podporu cirkulární ekonomiky [Circular Economy Platform]*, https://incien.org/hotspot. [15]

Joint SDG Fund (2022), "Joint SDG Fund doubles its portfolio to $114 million in catalytic impact investments", https://www.jointsdgfund.org/article/joint-sdg-fund-doubles-its-portfolio-114-million-catalytic-impact-investments. [16]

Lacy, P. and J. Rutqvist (2015), *Waste to Wealth: The Circular Economy Advantage*, Springer. [2]

Luxinnovation (2020), "Performance programmes Fit 4 Circularity", https://www.luxinnovation.lu/innovate-in-luxembourg/fit-4-performance-programmes. [20]

Ministry of the Environment of Japan (2000), *Act on Promotion of Procurement of Eco-Friendly Goods and Services by the State and Other Entities (Act on Promoting Green Procurement)*, Government of Japan, https://www.env.go.jp/en/laws/policy/green/index.html (accessed on 4 November 2021). [30]

Moir, S. (2018), "Revolve – Scotland's national re-use quality standard". [35]

OECD (2024), *Material consumption* (indicator), https://doi.org/10.1787/84971620-en (accessed on 27 February 2024). [29]

OECD (2023), *Towards a National Circular Economy Strategy for Hungary*, OECD Publishing, Paris, https://doi.org/10.1787/1178c379-en. [18]

OECD (2022), *Closing the Loop in the Slovak Republic: Annexes*, OECD, Paris, https://www.oecd.org/env/waste/Closing-the-Loop-in-the-Slovak-Republic-Annexes.pdf. [33]

OECD (2022), *SME Policy Index: Western Balkans and Turkey 2022: Assessing the Implementation of the Small Business Act for Europe*, SME Policy Index, OECD Publishing, Paris, https://doi.org/10.1787/b47d15f0-en. [3]

OECD (2021), "No net zero without SMEs: Exploring the key issues for greening SMEs and green entrepreneurship", *OECD SME and Entrepreneurship Papers*, No. 30, OECD Publishing, Paris, https://doi.org/10.1787/bab63915-en. [5]

OECD (2021), *The Circular Economy in Glasgow, United Kingdom*, OECD Urban Studies, OECD Publishing, Paris, https://doi.org/10.1787/7717a310-en. [11]

OECD (2020), *Developing Sustainable Finance Definitions and Taxonomies*, Green Finance and Investment, OECD Publishing, Paris, https://doi.org/10.1787/134a2dbe-en. [37]

OECD (2019), *Business Models for the Circular Economy: Opportunities and Challenges for Policy*, OECD Publishing, Paris, https://doi.org/10.1787/g2g9dd62-en. [1]

OECD (2016), *Extended Producer Responsibility: Updated Guidance for Efficient Waste Management*, OECD Publishing, Paris, https://doi.org/10.1787/9789264256385-en. [25]

PREVENT Waste Alliance (2023), *EPR Toolbox*, GIZ, Bonn, Germany, https://prevent-waste.net/epr-toolbox. [36]

PREVENT Waste Alliance (n.d.), *EPR Toolbox*, https://prevent-waste.net/epr-toolbox. [26]

RCC (2022), *Balkan Barometer Business Opinion 2022*, Regional Cooperation Council, Sarajevo, https://www.rcc.int/pubs/140/balkan-barometer-business-opinion-2022. [6]

RE: SOURCE (n.d.), *RE: SOURCE Research and Innovation for Sustainable Material Use*, https://resource-sip.se. [21]

Technology Agency of the Czech Republic (n.d.), "Programmes and challenges", web page, https://www.tacr.cz/programy-a-souteze/programy (accessed on 2 March 2022). [9]

Zero Waste Scotland (2020), "Circular Economy Business Support Service", https://www.zerowastescotland.org.uk/circular-economy/business-support-service (accessed on 3 June 2021). [19]

Zero Waste Scotland (2020), "Scotland: Increasing customer confidence in reused products", https://www.zerowastescotland.org.uk/circular-economy/establishing-reuse-repair. [34]

Zero Waste Scotland (n.d.), "Circular Economy Investment Fund", https://www.zerowastescotland.org.uk/resources/circular-economy-business-support (accessed on 3 June 2021). [22]

Note

[1] Various definitions of green/sustainable finance exist. For an overview of the most commonly used ones, see OECD (2020[37]).

5 Towards a circular construction sector in North Macedonia

This chapter elaborates policy recommendations for promoting the sustainability and circularity of North Macedonia's construction sector across all building life stages. It gives an oversight of the current state-of-play and policy framework in the country along with areas for improvement and puts forward a set of concrete policy recommendations, enriched with insights from international best practices.

The circular economy in the construction sector

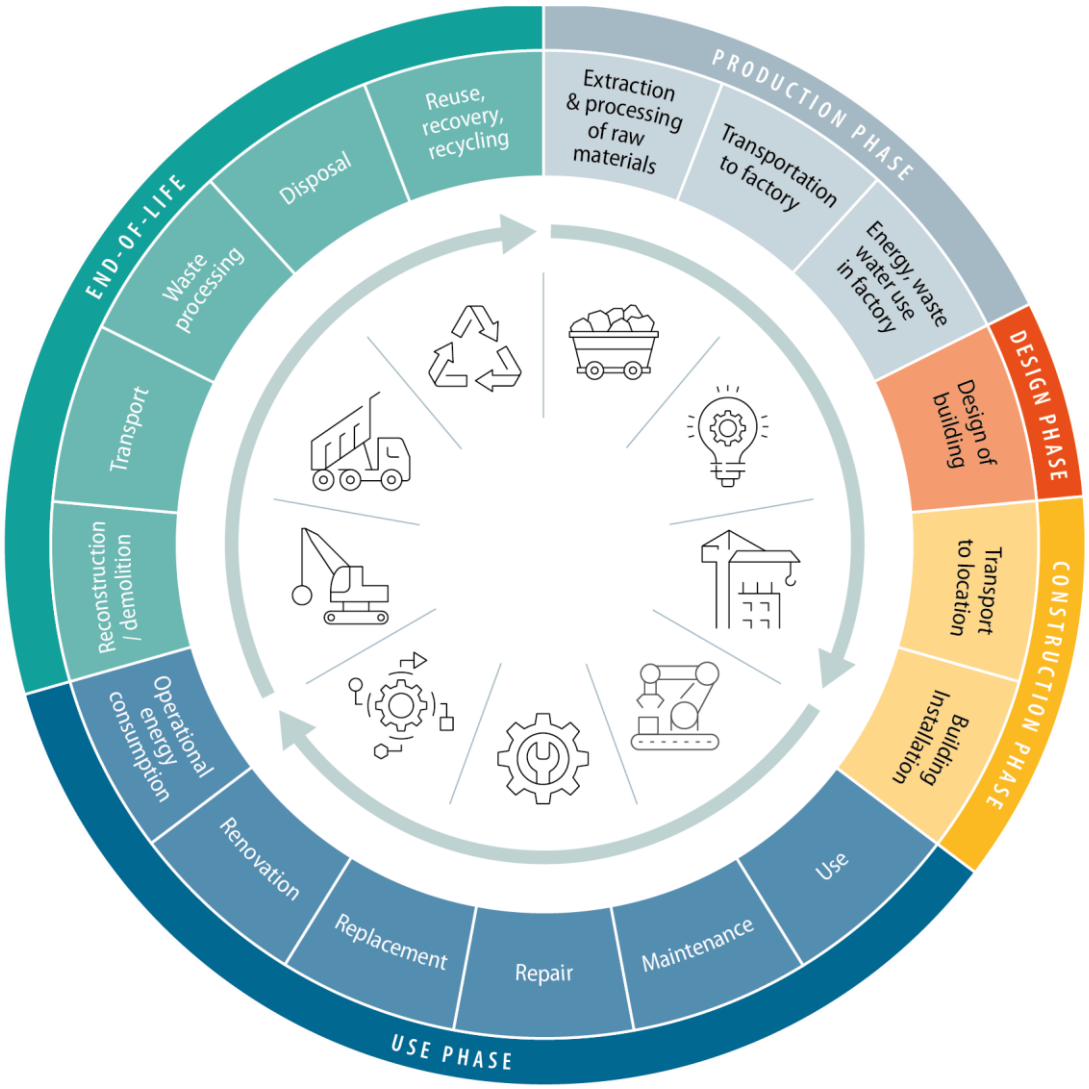
The construction sector is among the biggest consumers of energy and raw materials worldwide, accounting for about half of all raw materials extracted and nearly one-third of all waste generated globally (Breene, 2016[1]). In 2017, it was also responsible for 39% of CO_2 emissions and 36% of energy consumption (IEA and UNEP, 2018[2]; Schober, 2021[3]).

With the rise in population and urbanisation, the construction sector will continue to have a substantial impact on the demand for raw materials, further exacerbating its environmental impact. Accordingly, it is crucial for the sector to implement transformational changes and explore novel approaches to obtain, utilise and handle resources and waste in its operations.

The circular economy offers several opportunities for transforming the construction sector into a more sustainable industry with lower environmental impacts throughout the life cycle. The different opportunities, in particular for buildings, are outlined below and illustrated in Figure 5.1 (adapted from ARUP (2016[4]) and Circle Economy et al. (2018[5])).

- **Production of construction materials.** The use of virgin materials for producing construction materials is minimised and substituted with secondary raw materials, comprising reused or recycled materials, bio/renewable materials, and components. Primary preference is given to locally sourced materials. Production covers material extraction and domestic material consumption of construction materials.
- **Design of buildings.** The design of buildings adheres to a long-term perspective, focusing on modularity, adaptability and energy-efficient principles that reduce externalities. The design integrates operation and performance into the processes, while open-source architectural design techniques facilitate the sharing of ideas among designers, architects and engineers, encouraging collaboration in the development of their work.
- **Manufacturing of construction components and construction of buildings.** The construction process allows for greater flexibility, facilitating easy remodelling of buildings during renovation and easier disassembly at the end of their lifespan. Off-site manufacturing and prefabrication assist in reducing construction and demolition waste (CDW) on building sites. Innovative methods, such as 3D printing, enable the creation of construction materials, components or entire buildings with strong accuracy and flexible design, which results in efficient time management, reduced costs and minimised waste production.
- **Use of buildings.** A building's lifespan is extended by employing internal circular resource cycles, including waste capture, filtration and net-energy production. Occupants of circular buildings lease components and services, as opposed to owning them. Regular maintenance ensures the optimal use of resources within buildings and prevents the premature destruction of building components by means of repair or minor renovations. The flexible utilisation and sharing of buildings optimises occupancy rates.
- **End-of-life of buildings and new lifetime of components and materials.** The demolition of buildings is minimised and mostly limited to old and inefficient building stock. New design approaches allow easy access to building services and include demountable and reconfigurable systems. Building information modelling, along with digital product passports, among other models or frameworks, aids in the expansion, contraction, redesign, construction or deconstruction of buildings. Cloud-based building information modelling provides a chance to remotely collaborate with a greater number of stakeholders. Extending the lifespan of construction materials, products, components and entire buildings can be achieved via practices like reuse, repurposing, refurbishment, recovery and recycling. These methods help optimise the value of materials currently in use and ultimately reduce the need for new, virgin materials.

Figure 5.1. Construction life cycle phases and the circular economy



Source: Adapted from Circle Economy et al. (2018[5]).

Motivations for the selection of the construction sector as a key priority area of the Roadmap

The construction sector has been selected because of its relatively high economic importance, high policy relevance, and high circularity and decarbonisation potential for North Macedonia. The sector generated gross value added of around 5.5% of gross domestic product (GDP) and 6.5% of total employment in North Macedonia in 2022. In addition, the production of construction materials is an important economic activity in North Macedonia and has a strong link with the domestic metallurgy sector. The metal manufacturing industry is a key supplier for the construction sector, providing essential products like steel structures for infrastructure projects such as bridges, as well as smaller scale building works requiring items like steel framework networks, aluminium windows and doors, protective doors, and wire products. Its impact extends to crucial components for households, as well as companies such as hotels and

restaurants, contributing to the furnishing of these structures and their energy supply networks through cabling, solar energy panels, racks and more (Invest North Macedonia, 2023[6]). The sector also has relatively high policy relevance, as it is a key sector and waste stream in domestic policies such as the Smart Specialisation Strategy and the National Waste Prevention Plan of North Macedonia. Moreover, the government places a strong emphasis on modernising its road infrastructure and continues to invest in buildings that prioritise energy efficiency and reducing consumption. There is also a heightened focus on enhancing control measures at construction sites (Government of the Republic of North Macedonia, 2022[7]). Including the construction sector in the circular economy roadmap as a key priority can create strong synergies with these strategies. In the European Union (EU), the sector must fulfil a number of obligations and targets and is likely to be regulated even more in the future under the European Union's Sustainable Products Initiative. This is highly relevant for North Macedonia as an EU accession candidate country on the path to aligning its regulatory and policy framework with that of the European Union. Moreover, little work on the circular economy in this sector is carried out nationally, hence this roadmap can help fill this important policy gap.

Regarding the circularity potential, the sector consumes a large quantity of primary materials and contributes significantly to waste, with construction waste amounting to 3.8% of total waste generated in 2022[1] (MAKSTAT, 2022[8]). The circular economy offers many opportunities to curb the consumption of primary construction materials and generated waste, for example by increasing the use of secondary raw materials, recovery and recycling of CDW, and the production of sustainable construction materials. Applying circular economy measures and practices in the sector could also reduce greenhouse gas (GHG) emissions. Such decarbonisation potential is high, as the sector is emissions-intensive, with buildings generating 2.6% and the manufacturing/construction sector 11.1% of the country's GHG emissions in 2020 (Climate Watch, 2022[9]).

Overview and approach for selecting the proposed policy recommendations

The approach for selecting the proposed policy recommendations for the construction priority area is similar to that used for the other sectoral priority areas (biomass and food, textiles, and mining/metallurgy). Recommendations advocate for a life cycle approach with a focus on design, production, (re)use and end-of-life stages. This is because the entire construction life cycle, from the extraction of materials to their waste management, can create significant environmental pressures affecting ecosystem health and economic growth. The proposed measures also aim to bridge the gap between the current situation in North Macedonia and present as well expected obligations and targets stemming from national and EU legislation. The Waste Framework Directive includes a target for recycling 70% of CDW by 2020. As stated in North Macedonia's National Waste Management Plan 2021-2031, given the need for significant improvements in implementation, infrastructure and data systems (collection and evaluation of data of CDW flows), achieving this target may take until 2031 ((Ministry of Environment and Physical Planning, 2021[10]). The key steps to achieve this as outlined in the National Waste Management Plan include sorting construction waste into component fractions and recycling inert waste, such as bricks, tiles and concrete, into recycled aggregate.

In addition, the National Waste Prevention Plan 2022-2028 specifies several measures for the circularity of the construction sector, such as incorporating green criteria into the planning system and into the construction of facilities it owns; considering setting goals for reuse and recycling of inert waste; developing policies for ecodesign in the construction sector; new policies for the treatment and management of construction noise; encouraging the reuse of products; setting up systems for promoting repair and reuse activities for construction materials and products; and reducing waste generation in processes related to construction and demolition. The measures proposed in this roadmap also aim to create synergies and complementarity with measures proposed in both policy documents as well as in North Macedonia's Smart Specialisation Strategy. By doing so, they aim to tap into the high circularity potential this offers as

explained above, including reuse and recovery of CDW and constructing buildings in a sustainable way. Based on the current situation in North Macedonia, it is proposed that the roadmap focuses on improving three key areas:

1. cross-cutting policies that improve stakeholder engagement and collaboration and ensure funding for circular construction projects
2. managing CDW in a more environmentally sound manner, including increased recovery and reuse of CDW (this would also help provide the supply of recycled construction materials)
3. production and uptake of sustainable construction materials in construction and renovation (proposed measures in this area would primarily help increase the demand for recycled construction materials).

There are other areas the government could support to help achieve a circular construction sector, including the circular design of buildings and the use of advanced digital tools and technologies for a more efficient use of materials, as outlined in the section "The circular economy in the construction sector". Additional measures could be selected and supported at a later stage, once the key challenges and opportunities for a circular construction sector are identified in North Macedonia.

Table 5.1 provides an overview of the proposed policy recommendations to support these three key areas.

Table 5.1. Overview of the proposed policy recommendations in the priority area construction for North Macedonia

Short term	Medium term	Long term
Establish a working group on circular construction	Launch circular construction and renovation pilots	Introduce end-of-waste criteria for certain construction materials
Support scaling up innovation and ensure funding for innovative circular construction and renovation projects (initially through donor funding, link with Smart Specialisation Strategy)	Introduce (mandatory) selective demolition in combination with a gradually increasing landfill tax for CDW	Introduce quality standards for secondary and recycled construction materials
Improve measurement and monitoring of construction and demolition waste (CDW) flows	Strengthen green public procurement of construction works by public entities	
	Promote digitalisation of the construction industry	

Key proposed policy recommendations

1. Improving stakeholder engagement and collaboration, and ensuring that funding is available for circular construction projects

The application of circular economy approaches in the construction sector in North Macedonia is currently in its infancy. Efforts are underway to refine and concretise the integration of a circular economy within existing and new strategies (such as the Industrial Strategy of the Republic of Macedonia 2018-2027, the National Strategy for Sustainable Development 2008-2030, the Growth Acceleration Plan 2022-2026 or the Smart Specialisation Strategy of North Macedonia), but it is necessary to gain a better understanding of the sector, the key barriers to a circular economy transition and the best ways to advance circular economy practices within the sector.

To gain a better understanding of the sector and its opportunities for a circular economy, and contribute to more coherent circular economy-related policy actions, North Macedonia should first establish a working group on circular construction. This working group would strive to establish collaboration and a multi-stakeholder partnership, pinpoint barriers to circular construction, and deliberate strategic measures. It could recognise focal points to propel circular construction forward and serve as a

platform to elevate stakeholder awareness and education regarding circular construction. Improving co-ordination and collaboration among all pertinent stakeholders, including inter-ministerial collaboration, is imperative to promote the adoption of circular economy principles throughout the construction life cycle. Enhancing capacity-building activities, knowledge transfer and educational efforts is crucial to achieve this goal.

Such a working group could function as a sub-group of the existing circular economy stakeholder working group created to support the preparation of this roadmap. It could also be involved in the establishment of a centre in 2024 to facilitate collaboration among academia, businesses, policy makers, municipalities and the non-government sector in the realm of sustainable materials and smart buildings, which is foreseen under North Macedonia's Smart Specialisation Strategy. This strategy further envisions additional measures to engage relevant stakeholders and provide funding for advancing the most effective circular economy practices in construction. The overarching objective is to enhance public-private partnerships in this sector, including by organising workshops; developing and utilising an interactive database to address challenges; promoting co-operation among businesses; facilitating academia-business fairs to boost collaboration; and supporting municipalities focusing on energy efficiency, secondary raw materials and recycling. These actions can directly contribute to the transition towards a circular economy in North Macedonia. It is, therefore, strongly recommended to create synergies and complementarities between the Smart Specialisation Strategy and the Circular Economy Roadmap in the construction sector. The Circle Economy's recent publication includes a guide on setting up collaborations for a circular economy (Circle Economy, 2020[11]).

To strengthen stakeholder engagement in circular construction, **North Macedonia will also need to support the scaling up of innovation and ensure funding for innovative circular construction and renovation projects.** Existing and foreseen funding programmes such as the Greening Business Facility (see Chapter 4) and the soon to be established Energy Efficiency Fund[2] could be used for this purpose. Additionally, the Smart Specialisation Strategy aims to drive scientific excellence in the sector by providing funding based on grants and other financial incentives such as subsidies, or tax incentives for establishing research and innovation laboratories in the business sector collaborating with academia, along with co-financing opportunities for commercialised products. To support a circular construction sector, government support should focus on, for instance, providing grants to help domestic material producers modernise technologies and production processes in order to manufacture construction materials using recyclates,[3] and enabling market mechanisms and tools to facilitate SMEs' operations. This is in line with the measures foreseen in the Smart Specialisation Strategy; hence, strong co-ordination in this area is recommended. Alternatively, national or regional research and/or renovation programmes can also support circular renovation by providing direct subsidies and training. An example from Belgium is the regional initiative Vlaanderen Circulair (Circular Flanders), a partnership between government, businesses, academia and other experts. The initiative also targets business model innovation within the construction sector funded by grants. It includes a guide on circular school construction, a tool for the building information modelling environment and a project on financing circular materials differently (Vlaanderen Circular, n.d.[12]).

In the medium term, North Macedonia could launch circular construction and renovation pilots through the funding mechanisms established for this purpose. These pilots could test and apply circular construction innovations. Contrary to long-term infrastructure development, pilot projects can be a quick source of learning for a large-scale deployment of circular economy practices in the future. When building stock is about to reach the end of its life or will require deep renovation, North Macedonia might seize the opportunity to apply and test circular economy strategies through deconstruction and new construction pilot projects. A number of countries and municipalities have already piloted circular design principles. On the city level, a recent OECD report (OECD, 2020[13]) collects evidence of successful pilot projects to test new technologies, raise awareness and encourage public procurement. At the regional

level, one key initiative is from the Brussels-Capital Region, which established a circular renovation programme (Box 5.1).

Box 5.1. Circular renovation programme in the Brussels-Capital Region

A key example of a wider programme to pilot circular construction projects is from the Brussels-Capital Region. The regional authorities planned to: launch a study to define a strategy for reusing building materials; set up a "renovation lab" programme to support circular economy renovation projects and raise awareness; and gradually implement mandatory selective demolition (through environmental permits).

The Roadmap for the Construction Industry in Brussels – Towards a Circular Economy sets various milestones for completing a range of studies assessing the economics of reuse channels, sociological obstacles to reuse, the viability of circular business models in construction and the market potential for reusing materials not currently in the market, until 2025.

The Renovation Lab initiative ("RenoLab"), launched in September 2021, aims to show actors across the construction sector, as well as the users of the buildings, the feasibility of sustainable renovation by establishing a network/platform managed by the regional agency, Brussels Environment, to share innovative practices. RenoLab has two components. RenoLab.ID supports ideas and projects as well as tools and mechanisms that lower barriers to renovation. RenoLab.B supports circular and sustainable renovation initiatives at different stages. By launching calls for pilot projects, the initiative also aims to test and develop the tools and techniques used in the context of sustainable renovation.

The Horizon 2030-2050 Strategy for Reducing the Environmental Impact of Existing Buildings includes provisions for formulating and enacting regulations mandating selective dismantling. This is yet to be implemented, and interim targets related to these measures are anticipated in 2024.

Sources: European Commission (2021[14]); Government of the Brussels-Capital Region (2019[15]); Bruxelles Environnement (2019[16]); Renolution (2023[17]).

2. Managing construction and demolition waste in a more environmentally sound manner, including increasing its recovery and reuse

In North Macedonia CDW (mainly mineral) represents 3.8% of total industrial waste (MAKSTAT, 2022[8]). However, structural lack of data due to high rates of informal waste collection in this waste stream makes these statistics less conclusive in an international comparison[4] (Ministry of Environment and Physical Planning, 2020[18]). Municipalities are in charge of CDW, and so far no private investments have been secured to finance waste removal or processing operations (Ministry of Environment and Physical Planning, 2021[19]). CDW is currently largely disposed in waste landfills or unmanaged, and its collection, separation and recovery almost non-existent. The few recycling activities in place are largely conducted by the informal sector.

To accelerate the prevention of CDW, encourage a more appropriate use and treatment of CDW, and embed circular economy principles in the management of CDW, North Macedonia will need to implement a construction waste reform. This reform should focus on a minimum of three key elements with regard to end-of-life management of CDW:

- improving the measurement and monitoring of CDW flows in the short term through digital tools to understand what the issues are, and promoting digitalisation in the medium term to improve resource efficiency and sustainability of the sector;

- introducing (mandatory) selective demolition in combination with a gradually increasing landfill tax for CDW in the medium term to stimulate greater reuse and recycling of CDW;
- introducing end-of-waste (EoW) criteria for certain construction materials.

To achieve these goals, a clear waste legislative framework and waste infrastructure for the collection, transport and processing of CDW needs to be in place. This is planned under the National Plan for Waste Management (2021-2031), including dedicated infrastructure to provide treatment and disposal options for manufacturers and the introduction of a legal obligation for on-site waste management plans for large construction projects. Moreover, guidelines to reduce waste are under preparation, including for the construction sector under the National Waste Prevention Plan (2022-2028).

To better tailor and design existing and new policy measures and scale up the adoption of circular business models in the sector, North Macedonia will need to put in place systematic data collection and promote digitalisation of the sector. Improving data availability on CDW flows enables sustainable waste flow management from producers to final waste processors, while digital tools facilitate reporting and the exchange, processing and management of data. North Macedonia does not yet have a system for monitoring the uses of construction materials and CDW generation. A recent review of the current CDW management in European countries identifies the lack of a database for monitoring CDW quantities and a clear assignment of responsibilities to control and monitor waste management as the first obstacle to a sustainable waste flow management (Giorgi, Lavagna and Campioli, 2018[20]). An inventory should record the amounts of CDW produced throughout the economy, along with their quality specifications. To achieve this, construction companies must improve their data reporting on waste codes, lifetimes, prices and usability of different waste streams. Additionally, laboratory tests for specifying the quality of secondary raw materials recovered from CDW are necessary. This information could, in turn, inform the quality standards and labelling for secondary construction materials discussed in the section on “3. Production and uptake of sustainable construction materials in construction and renovation”. Additionally, it could facilitate matching suppliers with users of recycled construction materials, thus driving the creation and adoption of a marketplace for secondary raw materials. Ultimately, increased data availability would also aid evidence-based policy making. To build such an inventory, North Macedonia could draw on the experience from the Czech Republic and France (Box 5.2). To accurately monitor CDW flows, including CDW recovery rates, CDW flows need to be tracked to their final destination.

North Macedonia can also promote the use of different digital tools in the medium term. Digital tools, such as materials passports and building information modelling, provide detailed documentation of materials, components and products within buildings’ structures, and generate multidisciplinary data to create digital representations of buildings’ characteristics. This enables the utilisation of buildings as material banks and facilitates a transparent flow of information between stakeholders throughout the project phases (OECD, 2022[21]). These tools provide North Macedonia with an opportunity to use its building stock as a source of raw materials and to track CDW flows from construction and renovation activities. Other digital technologies include robots, drones, 3D printing and 3D scanning. Examples of digital approaches to a circular economy in the construction sector include the Danish Strategy for Digital Construction (launched to increase the productivity and efficiency of the construction sector) (European Commission Construction Sector Observatory, 2019[22]), the Digital Transformation of the Bulgarian Industry (which also addresses the construction sector) (Ministry of Transport, Information Technology and Communications of the Republic of Bulgaria, 2020[23]) and the Dutch digital approach to circular economy in construction. A recent report by the European Construction Sector Observatory (2021[24]) collects evidence and lessons learnt on integrating digital technologies (including data acquisition, automation, and digital information and analysis) into the construction sector. The European Commission also proposed to introduce “digital product passports” in its proposal for a revision of the Construction Products Regulation (European Commission, 2022[25]).

Box 5.2. International good practices on monitoring waste flows (including construction and demolition waste)

Czech Republic

Czechia's electronic registry for waste is an exemplary model of a successful national waste information database. Recently rated as the best European system for waste data management and evaluation by the European Topic Centre for Circular Economy, it employs two distinct systems. One handles the mandatory data reported by entities subject to relevant legal acts (Information System for Reporting Obligations) while the other manages the subsequent verification, processing and evaluation of the reported data (Information System for Waste Management). This streamlined process is further enhanced by extending verification authority to municipal and regional authorities. The Environmental Information Agency functions as the central data hub. By engaging a diverse array of stakeholders, including the Czech Statistical Office, the information system becomes a catalyst for the development and implementation of evidence-based waste management policies.

France's *National Buildings Database*

France's *National Buildings Database* (*Base de données nationale des bâtiments*) is an open-data project cross-sourcing geospatial information from about 20 different datasets in the public domain, representing a unified identity map of more than 21.4 million buildings on French (metropolitan) territory. The data relate to the morphology of buildings, the type of use, embedded materials and technical equipment, energy consumption and performance, as well as administrative and economic data. This unified database allows users to navigate information on the national built environment, bypassing the limitations of individual datasets. Relevant applications include the fields of energy transition (such as the Bat-ID project on monitoring buildings' energy renovation), the circular economy, social housing and infrastructure networks, among others. Since April 2022, publicly available data can be downloaded directly from the government's website.

Sources: Tuscano et al. (2022[26]); data.gouv.fr (2022[27]).

To stimulate greater reuse and recycling of CDW, North Macedonia needs to introduce (mandatory) selective demolition for CDW in the medium term. Currently, North Macedonia has failed to ensure that CDW is managed in a manner conducive to more efficient recycling and reuse. Stakeholders have voiced apprehensions about CDW being illegally disposed into dumpsites and the absence of measures to encourage separation of CDW for recovery and reuse. Selective demolition enables the removal and safe handling of hazardous substances; facilitates reuse and high-quality recycling; and contributes to the establishment of sorting systems for a number of materials, such as wood, mineral fractions, metal, glass, plastics and plaster (EU Waste Framework Directive 2008/98/EC). The process consists of four phases: 1) identification of hazardous materials and decontamination; 2) deconstruction; 3) dismantling and demolition; and 4) sorting. When employed effectively, selective demolition can retrieve high-quality materials for reuse or recycling so that only a minor proportion of rejects and hazardous waste needs disposing of. A pre-demolition survey will aid the identification of hazardous materials that require removal before the demolition, therefore simplifying the appraisal of their recycling capability. Waste sorting may occur on-site at the demolition or at dedicated sorting facilities for mixed construction waste. A systematic enforcement of mandatory selective demolition rules is necessary to ensure its uptake and compliance. In the European Union, the revised Waste Framework Directive has recommended the implementation of selective demolition. A number of countries, including Belgium, Denmark, Finland and Sweden, have already established legal requirements for materials and their specific separation of CDW at the demolition site (Wahlström et al., 2020[28]). The Austrian technical standards for the design and execution of selective demolitions demonstrate the successful implementation of such requirements within national legislation.

An example of an online traceability system providing quality assurance for the selective demolition process is the database developed in Flanders (Belgium) (Hradil et al., 2019[29]). The European Commission has also established guidelines for waste audits before demolition and renovation works (European Commission, 2018[30]).

To further incentivise recycling (rather than landfilling for backfilling purposes), North Macedonia could implement landfill taxes, including for CDW, combined with better enforcement of waste legislation to prevent an uptick in illegal dumping. Many countries levy landfill taxes to reflect the environmental costs associated with landfill use, including for inert CDW waste. These taxes are typically charged on the weight or volume of waste delivered to landfill sites, or on the authorised landfill capacity. Inert CDW tends to have a lower landfill tax rate than some other waste streams, such as municipal or hazardous waste. To ensure that CDW is diverted away from landfill, some countries have increased their landfill tax rates for CDW. A recent example is the Slovak Republic, which in 2022 amended its waste legislation to increase the landfill tax rates for CDW and industrial waste gradually, from EUR 8 per tonne in 2021 to EUR 25 per tonne in 2022, EUR 30 per tonne in 2023 and EUR 35 per tonne in 2024 of construction waste (and from EUR 7 per tonne of excavated soil in 2021 to EUR 8 in 2022, EUR 10 in 2023 and EUR 15 in 2024).

However, to prevent a rise in illegal CDW dumping, North Macedonia will also need to step up its enforcement efforts. This could be done through a combination of awareness-raising, a mandatory pre-demolition audit, and better enforcement and supervision mechanisms (including a higher probability of being sanctioned). In terms of preventive measures, for example, the Slovak Republic plans to strengthen co-operation between municipalities and police, clean up incriminated locations, punish offenders, monitor illegal waste incineration, and extend the responsibility of property owners for illegally disposed waste (Ministry of Environment of the Slovak Republic, 2019[31]). Austria organised large awareness and information campaigns, increased control and enforcement activities, and improved the electronic recording of waste streams and waste management (European Commission, 2012[32]). To fight illegal dumping from the building sector, France introduced an extended producer responsibility scheme for building construction products and materials that started on 1 January 2022. To improve the monitoring of waste streams and prevent illegal disposals, Belgium introduced a mandatory pre-demolition inventory of the types/quantities of materials present in buildings (to identify hazardous and other waste fractions) (Giorgi, Lavagna and Campioli, 2018[20]). A number of other countries are tackling fly-tipping[5] and large-scale illegal landfilling with better enforcement, including more effective control and prosecution of abusive practices. For instance, Czechia aims to improve conditions for law enforcement authorities to prevent and combat waste-related crime through a short-term national strategy. This aims to improve co-operation among the environmental law enforcement agencies, strengthen their competencies, improve the regulatory environment and build public awareness of waste-related matters (Ministry of the Interior of the Czech Republic, 2019[33]). In terms of specific punitive regulations, offenders are often pursued and have to pay the landfill tax (Fischer, Lehner and McKinnon, 2012[34]; European Commission, 2021[35]).

North Macedonia could also introduce EoW criteria for certain construction materials to further instigate their reuse and recycling in the long term. EoW criteria determine when waste ceases being waste and becomes a secondary raw material or by-product (as defined by the EU Waste Framework Directive 2008/98/EC). The revised Waste Framework Directive recommends the implementation of EoW criteria to promote a level playing field for secondary raw materials (Box 5.3). At the EU level, such criteria have been adopted for certain waste streams (including iron, steel, aluminium and copper scrap, and glass cullet). Meanwhile, individual EU member states have the discretion to confer a by-product status on other waste streams. This can be accomplished either by adopting binding national criteria or by taking decisions on a case-by-case basis.

Additionally, it is crucial to tailor EoW criteria to meet local requirements and regulations. Legislation granting EoW status for a range of construction and building materials is currently in place in Austria, Belgium, Bulgaria, Croatia, the Netherlands, the Slovak Republic and the United Kingdom. These countries

aim to target specific types of CDW, such as bricks, tiles, building waste, building and demolition wood, inert waste, concrete rubble, and various slags, among others (European Commission, 2020[36]). The aggregates obtained can then be considered for use in construction projects such as road construction, bound surfaces, and concrete and asphalt mixes. Recent analysis by the European Commission (2020[36]) has shown a case study on mineral CDW, which is used as a building material under the EoW status. An earlier report from the European Commission's Joint Research Centre outlined a methodology for determining EoW criteria, along with criteria for pilot case studies that include aggregates and metal scrap (Delgado et al., 2009[37]).

Box 5.3. Guidance for developing end-of-waste criteria

Conditions outlined in the EU Waste Framework Directive

According to Article 6 (1) and (2) of the Waste Framework Directive, "waste ceases to be waste when it has undergone a recovery operation (including recycling) and complies with the following criteria:

- the substance or object is commonly used for specific purposes
- a market or demand for the substance or object exists
- the use is lawful (substance or object fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products)
- the use will not lead to overall adverse environmental or human health impacts."

Meeting the first two conditions increases the likelihood of the material being put to a useful purpose instead of being thrown away. The third condition requires that the material be suitable for legal use, and the fourth ensures that using the material does not warrant waste legislation. To determine this, an assessment is made by comparing the environmental impact of using the material under waste legislation versus non-waste product legislation.

Alternatively, a material may cease to be waste if Article 5 of the Waste Framework Directive applies: "Member States shall take appropriate measures to ensure that a substance or object resulting from a production process the primary aim of which is not the production of that substance or object is considered not to be waste, but to be a by-product" if certain conditions are met.

Countries, in accordance with their local regulations, have established distinct terminology for end-of-waste criteria, addressing various types and compositions of construction and demolition waste. For example, the classification of recycled aggregates may be classified by weight (specifically particle density exceeding or falling below 2 000 kg/m³), size (ranging from fine to coarse to all-in) or composition (determined by the weight percentage of individual components like concrete, glass, ceramic and plaster).

The European Commission has laid down end-of-waste criteria for iron, steel and aluminium scrap (see Council Regulation (EU) No. 333/2011), glass cullet (see Commission Regulation (EU) No. 1179/2012) and copper scrap (see Commission Regulation (EU) No. 715/2013).

Sources: Delgado et al. (2009[37]); European Commission (2023[38]).

3. Production and uptake of sustainable construction materials in construction and renovation

The third key area for improvement in the construction sector that the Circular Economy Roadmap for North Macedonia could address is incentivising greater production and adoption of sustainable

construction materials. The production of building materials in North Macedonia is based on domestic resources of non-metallic minerals (marble, gypsum, brick clay, sand, gravel) and related mining activities (imports of primary raw materials are almost negligeable). The main construction products produced in the economy are cement products, plaster, plasterboard, dry mortar, clay products and bituminous insulating materials. The production of construction products has undergone major changes in recent years with the introduction of modern production lines and technological advancements (Economic Chamber of North Macedonia, 2021[39]). Overall, untapped potential remains in the production of sustainable construction materials, in particular through more resource-efficient mining operations (see Chapter 8) as well as through the use of industrial waste and the reuse of construction materials. The Smart Specialisation Strategy also advocates for more efficient use of natural resources in the production of construction materials, especially through their extraction and the development of innovative technologies enabling the production of construction materials from industrial waste (Ministry of Environment and Physical Planning, 2023[40]).

To complement the initiatives under the Smart Specialisation Strategy, the roadmap could focus primarily on incentivising the demand for and investment in more circular construction products and building services in the medium to long term. This could be supported by two key measures:

1. strengthening the use of green public procurement (GPP) for construction works by public authorities
2. introducing quality standards for recycled construction materials.

North Macedonia needs to strengthen the use of GPP criteria in the construction sector to stimulate demand and, as a result, the market for sustainable buildings construction and renovation in the medium term. As public procurement accounted for about 8.6% of GDP in North Macedonia in 2022 (European Commission, 2023[41]) and the Law on Public Procurement (2019) includes relevant provisions on life cycle costs, it can facilitate the supply of green products and services in the construction sector. The application of GPP in construction and refurbishment projects is an established practice throughout Europe and beyond, aimed at stimulating the market for sustainable public construction works and the use of recycled materials. This tool has been made a priority in policies promoting a circular economy by leaders in the field, including Belgium, the Netherlands and the United Kingdom, as well as the European Union in its 2020 Circular Economy Action Plan. To facilitate the adoption of GPP within the construction sector, the European Commission developed EU GPP criteria for office building design, construction and management in 2016 (underwent revisions until 2023) (Dodd, Garbarino and Gama Caldas, 2016[42]), as well as for road design, construction and maintenance (Wolf et al., 2016[43]). On 30 March 2022, the European Commission published a proposal for the revision of the Construction Products Regulation, which empowers the European Commission to establish mandatory GPP criteria for construction products (European Commission, 2022[44]).

However, there is no “one-size-fits-all” approach to implementing GPP in this sector and countries have so far adopted a variety of approaches as well as infrastructure delivery models (Box 5.4). North Macedonia could choose to take a mandatory and/or a voluntary approach to GPP. The mandatory approach may take the form of compulsory technical specifications, selection criteria, award criteria, contract performance clauses or targets, as appropriate (in line with the proposal for a revised EU Construction Products Regulation). Both mandatory and voluntary approaches will require building the internal capacity of all public authorities to apply and monitor the implementation of environmental criteria in public construction and renovation works.

Box 5.4. Infrastructure delivery models

The existing literature highlights that several models of construction procurement exist, yet no "one-size-fits-all" model can be recommended. A critical aspect of the procurement model is the degree of separation and integration of design and construction works, as split responsibilities and a lack of co-operation can lead to end results that do not meet the desired standards (Table 5.2).

Table 5.2. Different types of infrastructure delivery models

Model	Responsibilities and risks
Design-bid-build	• Contracting authority has completed the majority of the design work (sometimes with the assistance of specialised consultants). • Government engages contractor to build, based on supplied design. • Risks associated with design faults, changing requirements and adverse site conditions are typically borne by the contracting authority.
Design-build	• Contracting authority only provides a project brief in the tender documentation, sometimes with only performance-based requirements. • Contractor engages design consultants. • Contractors bid on their developed design and lump sum construction price. • Risks associated with errors or omissions in final design and latent conditions typically borne by contractors and design consultants. • Costs of directed variation typically borne by the contracting authority.
Construction management or general contractor	• Contractor undertakes a significant part of the project management role, including: obtaining development approvals; undertaking on-site investigations; finalisation of design; and developing a construction, commissioning and maintenance programme. • Assumes the risk for construction performance as the equivalent of a general contractor holding all subcontracts during the construction phase. • Contractors provided with incentives to manage project costs by sharing cost savings.
Alliance contracting	• Contracting authority and other alliance partners jointly develop the design and share risks. • Other alliance partners may include designers, consultants, management service providers, suppliers and construction contractors. • Often considered to be of greatest value where the contracting authority has had limited experience with the risks for the project.
Public-private partnership and concessions	• Contract between the public and private sectors, which can reflect a number of different partnership models. • Private sector delivers infrastructure and services over the long term. • Some level of private financing for the project. • Project may be funded by government, user payments or a combination of the two.

Source: OECD (2015[45]).

Examples of practices

Design-bid-build. The example of the Weiz District Authority offices renovation in Austria shows that an ambitious energy target (obtaining the A+ Austrian energy certificate) was set, and a planning and design team of architects and consultants was initially procured. This team was also responsible for preparing detailed technical specifications for the procurement of construction work (including materials) and building services, as well as the compliance assessment of bids. Construction achieved an 80% reduction in heating energy requirements.

Design-build. In the Koemarkt renewal in Purmerend, Netherlands, a two-stage (design and build) cost-led procurement model with a maximum budget was used, with award criteria solely based on quality. The contracting authority employed a consultant for the two-stage procurement process as it had little previous experience. The tender procedure involved several steps and, notably, the participation of the local population in choosing the winning bidder.

Construction management. Some authorities are also seeking to integrate design and construction with building operation and maintenance, which further incentivises the optimisation of construction works, as the contracted company may benefit from greater operational efficiency. In the Jyväskylän Optimi project in Finland, a company was employed for the design, construction and operation of a school and day-care centre with the aim of promoting innovation and life cycle thinking in procurement. Limits were set for heating and energy, electricity and water consumption, and the service provider was liable to cover any costs exceeding those limits. If energy demand was below the set limits, the benefits were shared equally among the service provider and the contracting authority.

Source: OECD (2022[21]), adapted from SCI-Network (2012[46]); SCI-Network (2012[46]).

In the long term, North Macedonia should consider introducing quality standards for secondary materials and recycled construction materials to help support the uptake and reuse of CDW by enhancing confidence in the quality and performance of secondary construction materials. It is crucial to establish a system to assess and certify the quality of the recycled construction materials for their reuse. Standards that define and certify the quality and safety of recycled construction materials place them on an equal footing with their virgin alternatives, thereby enhancing market confidence in their quality and performance (Nadazdi, Naunovic and Ivanisevic, 2022[47]). A lack of quality standards has been identified as one of the most important impediments in the marketing and use of recycled materials and construction products (Nadazdi, Naunovic and Ivanisevic, 2022[47]). Such a quality standard would provide metrics for performance measurements and reliable and repeatable tests and calculation procedures, which would help to ascertain impurity levels or suitability for high-grade recycling (European Commission, 2015[48]). A feasibility study will be required prior to the implementation of such quality standards to ensure that the local market can respond to and keep up with the standard. National standards for recycled aggregates have been widely implemented across countries.[6] More specifically, the Austrian Construction Materials Recycling Association has developed a voluntary quality label for recycled construction materials which could serve as an example for implementing such an instrument in North Macedonia. Other examples of quality standards include the quality scheme for recycled CDW in the Netherlands, the recycled wood classification in France, and the standards for recycled waste electrical and electronic equipment at the EU level (EN 50625 and EN 50614).

References

ARUP (2016), *Circular Economy in the Built Environment*, ARUP, London, https://www.arup.com/perspectives/publications/research/section/circular-economy-in-the-built-environment. [4]

Breene, K. (2016), "Can the circular economy transform the world's number one consumer of raw materials?", https://www.weforum.org/agenda/2016/05/can-the-circular-economy-transform-the-world-s-number-one-consumer-of-raw-materials. [1]

Bruxelles Environnement (2019), *Feuille de Route des Acteurs de la Construction à Bruxelles: Vers une Économie Circulaire*, Bruxelles Environnement, https://www.circulareconomy.brussels/wp-content/uploads/2019/06/BE_beCircular_feuille-de-route-CD_def_FR1.pdf. [16]

Cambridge Dictionnary (n.d.), *fly-tipping*, https://dictionary.cambridge.org/fr/dictionnaire/anglais/fly-tipping. [51]

Circle Economy (2020), *Will You Be My Partner? Nine Steps to Identify and Establish Successful Collaborations for a Circular Economy*, Circle Economy, https://www.circle-economy.com/resources/will-you-be-my-partner-collaborations-in-the-circular-economy. [11]

Circle Economy et al. (2018), *A Framework for Circular Buildings: Indicators for Possible Inclusion in BREEAM*, Circle Economy et al., https://www.dgbc.nl/publicaties/framework-voor-circulaire-gebouwen-nieuwbouw-27. [5]

Climate Watch (2022), "Global historical emissions", https://www.climatewatchdata.org/ghg-emissions?end_year=2020&source=Climate%20Watch&start_year=1990 (accessed on 4 December 2023). [9]

data.gouv.fr (2022), *Base de données nationale des bâtiments*, https://www.data.gouv.fr/fr/datasets/base-de-donnees-nationale-des-batiments. [27]

Delgado, L. et al. (2009), *End-of-Waste Criteria*, EUR 23990 EN, European Commission, Luxembourg, https://doi.org/10.2791/28650. [37]

Dodd, N., E. Garbarino and M. Gama Caldas (2016), *Green Public Procurement Criteria for Office Building Design, Construction and Management: Technical Background Report and Final Criteria*, Joint Research Centre, Institute for Prospective Technological Studies, Publications Office of the European Union, https://doi.org/10.2791/28566. [42]

Economic Chamber of North Macedonia (2021), "Association of Civil Construction, Building Materials and Non-metal Industries", https://www.mchamber.mk/Default.aspx?mId=13&id=6&lng=2. [39]

European Commission (2023), *2023 Communication on EU Enlargement Policy: North Macedonia 2023 Report*, European Commission, Brussels, https://neighbourhood-enlargement.ec.europa.eu/system/files/2023-11/SWD_2023_693%20North%20Macedonia%20report.pdf. [41]

European Commission (2023), "Waste Framework Directive", web page, https://environment.ec.europa.eu/topics/waste-and-recycling/waste-framework-directive_en#end-of-waste-criteria. [38]

European Commission (2022), *Proposal for a Regulation Laying Down Harmonised Conditions for the Marketing of Construction Products, Amending Regulation (EU) 2019/1020 and Repealing Regulation (EU) 305/2011*, European Commission, Brussels, https://ec.europa.eu/docsroom/documents/49315. [44]

European Commission (2022), *Proposal for a Regulation Laying Down Harmonised Conditions for the Marketing of Construction Products, Amending Regulation (EU) 2019/1020 and Repealing Regulation (EU) 305/2011*, COM (2022) 144, European Commission, Brussels, https://ec.europa.eu/docsroom/documents/49315 (accessed on 21 April 2022). [25]

European Commission (2021), *Analysis of the National Long-term Renovation Strategies*, SWD (2021) 365, European Commission, Brussels, https://energy.ec.europa.eu/system/files/2022-12/SWD-Analysis-of-2020-LTRS.PDF. [14]

European Commission (2021), *Service Contract on Management of Construction and Demolition Waste SR1: Final Report Task 2*, European Commission, Brussels, https://op.europa.eu/en/publication-detail/-/publication/0c9ecefc-d07a-492e-a7e1-6d355b16dde4. [35]

European Commission (2020), *Study to Assess Member States (MS) Practices on By-product (BP) and End-of Waste (EoW)*, European Commission, Brussels, https://op.europa.eu/en/publication-detail/-/publication/beb56eaa-9fc0-11ea-9d2d-01aa75ed71a1/language-en/format-PDF/source-130896232. [36]

European Commission (2018), *Updated Bioeconomy Strategy 2018*, European Commission, Brussels, https://knowledge4policy.ec.europa.eu/publication/updated-bioeconomy-strategy-2018_en#:~:text=The%202018%20update%20of%20the,well%20as%20the%20Paris%20Agreement. [30]

European Commission (2015), *Closing the Loop: An EU Action Plan for the Circular Economy*, COM(2015)614 final, European Commission, Brussels, http://eur-lex.europa.eu/resource.html?uri=cellar:8a8ef5e8-99a0-11e5-b3b7-01aa75ed71a1.0012.02/DOC_1&format=PDF. [48]

European Commission (2012), *Use of Economic Instruments and Waste Management Performances*, European Commission, Brussels, https://op.europa.eu/en/publication-detail/-/publication/566f28fd-3a94-4fe0-b52d-6e40f8961c7e. [32]

European Commission Construction Sector Observatory (2019), *Country Profile Denmark*, European Commission, Brussels, https://www.buildup.eu/sites/default/files/content/ecso_cfs_denmark_2020.pdf. [22]

European Construction Sector Observatory (2021), *Digitalisation in the Construction Sector*, European Commission, Brussels, https://ec.europa.eu/docsroom/documents/45547/attachments/1/translations/en/renditions/pdf. [24]

Fischer, C., M. Lehner and D. McKinnon (2012), *Overview of the Use of Landfill Taxes in Europe*, ETC/SCP Working Paper 1/2012, Topic Centre on Sustainable Consumption and Production, http://www.embopar.pt/folder/documento/99_Landfill%20taxes%20in%20Europe.pdf. [34]

Giorgi, S., M. Lavagna and A. Campioli (2018), "Guidelines for effective and sustainable recycling of construction and demolition waste", in *Designing Sustainable Technologies, Products and Policies*, Springer International Publishing, Cham, https://doi.org/10.1007/978-3-319-66981-6_24. [20]

Government of the Brussels-Capital Region (2019), *Stratégie de Réduction de l'Impact Environnemental du Bati Existant en Région de Bruxelles-Capitale aux Horizons 2030-2050*, Government of the Brussels-Capital Region, https://energy.ec.europa.eu/system/files/2020-03/bruxelles_capitale_2020_ltrs_0.pdf. [15]

Government of the Republic of North Macedonia (2022), *Programme for the Work of the Government of the Republic of North Macedonia for the Period 2022-2024*, Government of the Republic of North Macedonia, https://vlada.mk/sites/default/files/programa/2022-2024/programme_of_the_government_2022-2024.pdf. [7]

Hradil, P. et al. (2019), *PARADE. Best Practices for Pre-demolition Audits Ensuring High Quality Raw Materials*, EIT RawMaterials, https://www.researchgate.net/profile/Petr_Hradil2/publication/341232905_Best_practices_for_pre-demolition_audits_ensuring_high_quality_raw_materials/links/5eb50b81299bf1287f752ac3/Best-practices-for-pre-demolition-audits-ensuring-high-quality-raw-material. [29]

IEA and UNEP (2018), *Global Status Report: Towards a Zero-emission, Efficient and Resilient Buildings and Construction Sector*, International Energy Agency, Paris and United Nations Environment Programme, Nairobi, https://wedocs.unep.org/20.500.11822/27140. [2]

Invest North Macedonia (2023), "Electro-metal industry", https://investnorthmacedonia.gov.mk/export-electro-metal-industry. [6]

Kumar, K. and J. Davim (eds.) (2020), *Recycling of polyethylene: an attempt to sachet and bottled water sustainability in Ghana*, Woodhead Publishing, https://doi.org/10.1016/B978-0-12-819496-6.00010-5. [53]

MAKSTAT (2022), "Waste by section of economic activity", https://www.stat.gov.mk/PrikaziSoopstenie_en.aspx?rbrtxt=82. [8]

Ministry of Education and Science (2023), *Draft Smart Specialisation Strategy of the Republic of North Macedonia*, https://mon.gov.mk/stored/document/Draft%20S3%20MK.pdf. [49]

Ministry of Environment and Physical Planning (2023), "Current projects", https://www.moepp.gov.mk/en/%d0%bf%d1%80%d0%be%d0%b5%d0%ba%d1%82%d0%b8-2/%d0%bf%d0%be%d0%b4%d0%b4%d1%80%d1%88%d0%ba%d0%b0-%d0%bd%d0%b0-%d1%80%d0%b5%d0%bf%d1%83%d0%b1%d0%bb%d0%b8%d0%ba%d0%b0-%d0%bc%d0%b0%d0%ba%d0%b5%d0%b4%d0%be%d0%bd%d0%b8%d1%98%d0%b0-%d0% (accessed on 14 February 2023). [40]

Ministry of Environment and Physical Planning (2021), *Waste Management Plan of the Republic of North Macedonia, 2021-2031*, Ministry of Environment and Physical Planning. [19]

Ministry of Environment and Physical Planning (2020), *Rapid Assessment Report on the Benefits of Circular Economy on Mitigation of GHGs Emission in the Waste Sector*, Ministry of Environment and Physical Planning, https://api.klimatskipromeni.mk/data/rest/file/download/a6aebd5fbc39eb38094ab488c9ffd4c96b408a35d0d33abe126425ab7b4a1ad8.pdf. [18]

Ministry of Environment of the Slovak Republic (2019), *Greener Slovakia: Strategy of the Environmental Policy of the Slovak Republic until 2030*, Ministry of Environment of the Slovak Republic, Institute of Environmental Policy, https://www.minzp.sk/iep/strategicke-materialy/envirostrategia-2030. [31]

Ministry of Environment Physical Planning (2021), *Waste Management Plan of the Republic of North Macedonia*, https://www.moepp.gov.mk/%d0%b4%d0%be%d0%ba%d1%83%d0%bc%d0%b5%d0%bd%d1%82%d0%b8/%d0%bf%d0%bb%d0%b0%d0%bd%d0%be%d0%b2%d0%b8/. [10]

Ministry of Finance (2023), *MoF: More funds for green investments through the Energy Efficiency Fund within the Development Bank, EUR 10 million raised from the green bond auction*, https://finance.gov.mk/2023/10/04/mof-more-funds-for-green-investments-through-the-energy-efficiency-fund-within-the-development-bank-eur-10-million-raised-from-the-green-bond-auction/?lang=en (accessed on 12 November 2023). [50]

Ministry of the Interior of the Czech Republic (2019), *Strategy to Prevent and Combat Waste-Related Crime for the Years 2021-2023*, Ministry of the Interior of the Czech Republic, https://www.mvcr.cz/soubor/strategy-to-prevent-and-combat-waste-related-crime-for-the-years-2021-2023.aspx. [33]

Ministry of Transport, Information Technology and Communications of the Republic of Bulgaria (2020), *Digital Transformation of Bulgaria for the Period 2020-2030*, Ministry of Transport, Information Technology and Communications, Sofia, https://www.mtitc.government.bg/sites/default/files/digital_transformation_of_bulgaria_for_the_period_2020-2030_f.pdf. [23]

Nadazdi, A., Z. Naunovic and N. Ivanisevic (2022), "Circular economy in construction and demolition waste management in the Western Balkans: A sustainability assessment framework", *Sustainability*, Vol. 14/2, p. 871, https://doi.org/10.3390/su14020871. [47]

OECD (2022), "Closing the loop in the Slovak Republic: A roadmap towards circularity for competitiveness, eco-innovation and sustainability", *OECD Environment Policy Papers*, No. 30, OECD Publishing, Paris, https://doi.org/10.1787/acadd43a-en. [21]

OECD (2020), *The Circular Economy in Cities and Regions: Synthesis Report*, OECD Urban Studies, OECD Publishing, Paris, https://doi.org/10.1787/10ac6ae4-en. [13]

OECD (2015), *Effective Delivery of Large Infrastructure Projects: The Case of the New International Airport of Mexico City*, OECD Public Governance Reviews, OECD Publishing, Paris, https://doi.org/10.1787/9789264248335-en. [45]

Renolution (2023), "RenoLab call for projects", web page, https://renolution.brussels/fr/renolab (accessed on 7 December 2023). [17]

Schober, K. (2021), "It's time for construction to embrace the circular economy", https://www.rolandberger.com/en/Insights/Publications/It%E2%80%99s-time-for-construction-to-embrace-the-circular-economy.html. [3]

SCI-Network (2012), *Procuring Innovative and Sustainable Construction: A Guide for European Public Authorities*, SCI-Network. [46]

Tam, V., M. Soomro and A. Evangelista (2018), "A review of recycled aggregate in concrete applications (2000–2017)", *Construction and Building Materials*, Vol. 172, pp. 272-292, https://doi.org/10.1016/j.conbuildmat.2018.03.240. [52]

Tuscano, J. et al. (2022), *Electronic Registries for Waste Across Europe*, ETC CE Report 2022/3, European Topic Centre on Circular Economy and Resource Use, https://www.eionet.europa.eu/etcs/etc-ce/products/etc-ce-products/etc-ce-report-3-2022-electronic-registries-for-waste-across-europe/@@download/file/FINAL_Report%20Electronic%20Registries%20for%20Waste.pdf. [26]

Vlaanderen Circular (n.d.), "Circular construction", web page, https://bouwen.vlaanderen-circulair.be/nl. [12]

Wahlström, M. et al. (2020), *Construction and Demolition Waste: Challenges and Opportunities in a Circular Economy*, European Topic Centre on Waste and Materials in a Green Economy, Mol, Belgium, https://www.snpambiente.it/wp-content/uploads/2020/08/Clean-Version_CDW-and-CE-Report-version-January-10-2020_final.pdf. [28]

Wolf, O. et al. (2016), *Revision of Green Public Procurement Criteria for Road Design, Construction and Maintenance*, Joint Research Centre, Institute for Prospective Technological Studies, Publications Office of the European Union, https://doi.org/10.2791/683567. [43]

Notes

[1] Despite huge potential for circularity, there is currently no system for collection, separation and processing of CDW. Data on construction waste are, therefore, to be used with caution, as current practice shows that CDW in North Macedonia is mostly informally collected and illegally dumped. There is no solid statistical evidence for the generated and used amounts of such waste (Ministry of Education and Science, 2023[49]).

[2] The Energy Efficiency Fund holds potential for circular construction, as projects funded under it will contribute to energy savings, preserving natural resources and reducing environmental pollution (Ministry of Finance, 2023[50]).

[3] "The term recyclate is used to describe a raw material transported to a waste recycling facility or a material recovering plant for processing into a newly formed material or product" (Baffour-Awuah, Akinlabi and Jen, 2020[53]).

[4] Official statistics report that only 56 000 tonnes of CDW were generated in 2020, but estimations using the average per capita generation as an indicator from other countries point to around 8.5 million (including excavation waste).

[5] The activity of illegally leaving waste or unwanted objects next to a road, in a field, in a river, etc. (Cambridge Dictionnary, n.d.[51]).

[6] An international comparison is outlined by Tam, Soomro and Evangelista (Tam, Soomro and Evangelista, 2018[52]).

6 Circular transition for biomass and food in North Macedonia

This chapter formulates policy recommendations to facilitate the adoption of a circular approach in North Macedonia's biomass and food sector, with a particular emphasis on bioeconomy principles. It gives an overview of the current context in this sector and its underlying policy framework, identifies key areas for potential improvement, and presents specific policy recommendations based on relevant international best practices.

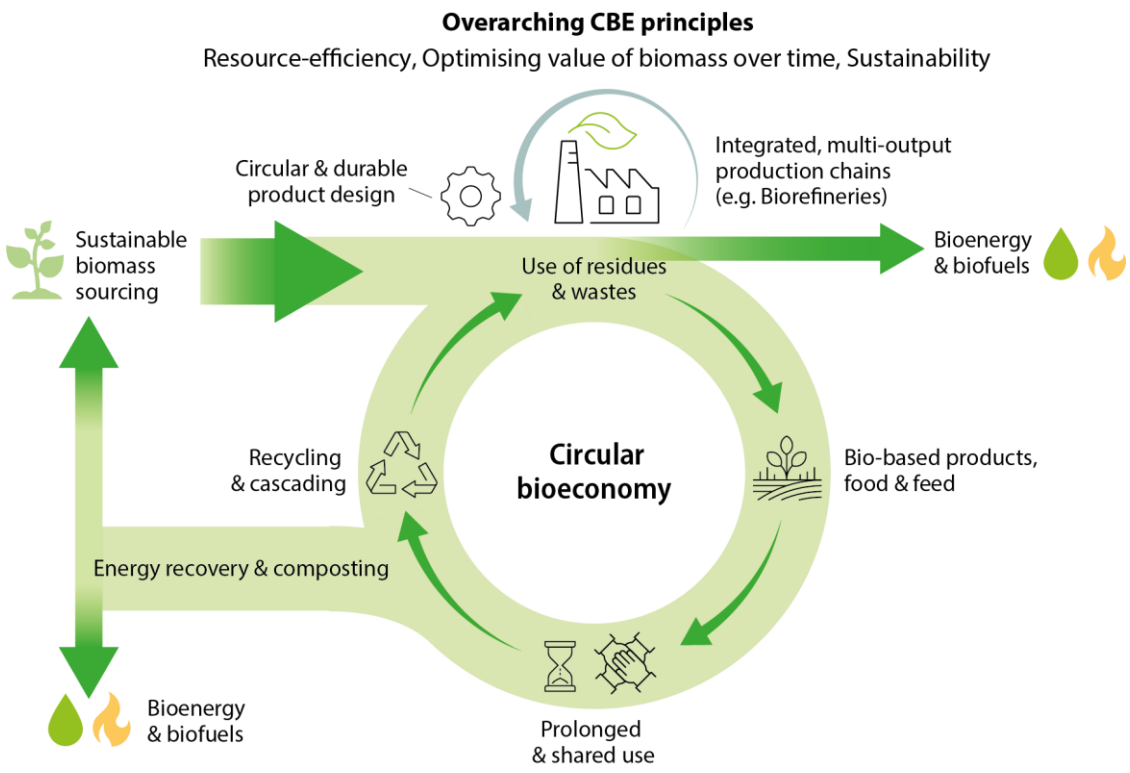
The circular bioeconomy in the biomass and food system

The circular bioeconomy builds on the concepts of bioeconomy and circular economy. The bioeconomy covers all sectors and systems that rely on biological resources: animals, plants, microorganisms and derived biomass, including organic waste, their functions and principles. The bioeconomy includes and interlinks land and marine ecosystems and the services they provide; all primary production sectors that use and produce biological resources (agriculture, forestry, fisheries and aquaculture); and all economic and industrial sectors that use biological resources and processes to produce food, feed, bio-based products, energy and services (European Commission, 2018[1]). The circular bioeconomy encompasses economic activities in which biotechnology contributes centrally to primary production and industry. At the same time, waste materials are drastically reduced, and waste is recycled, remanufactured and kept in the system for as long as possible (Kardung et al., 2021[2]).

Figure 6.1 summarises the central elements of the circular bioeconomy (based on Stegmann, Londo and Junginger (2020[3])). A closer look at the life cycle along the biomass and food system helps to identify numerous opportunities for the circular bioeconomy:

- **Primary production.** This refers to the sustainable management of land and forests, and efficient use of resources and inputs in agricultural and forestry management practices. The sustainable management of agricultural land and forests implies a fair and balanced distribution of land, water, biodiversity and other environmental resources between various competing claims, to secure human needs now and in the future. Various bio-based sources from all life cycle stages, such as biomass wastes and residues, can be used at this stage as feed, fertilisers, soil conditioners or for other purposes without pre-treatment.
- **Industrial processing and distribution.** Circularity can be enhanced at the level of both design, processing and distribution. The specific design of a product and production process can be crucial in ensuring the product has a longer lifetime as well as the potential to reduce waste and increase recycling, the use of regenerative materials and end of life (e.g. by ensuring biodegradability). This stage also includes the bio-based production of processed food, feed, fertilisers, chemicals, pharmaceuticals, nutraceuticals, cosmetic compounds, biomaterials, packaging processes and delivery to the consumer, and reprocessing of biomass at its highest material value before its conversion into bioenergy (so-called cascading). Packaging and product distribution can be geared towards greater circularity and less food waste, including by ensuring recyclability and limiting the overall environmental impact.
- **Consumption.** Three broad strategies can be identified at the core of this stage: 1) changing consumption patterns; 2) preventing waste; and 3) prolonging the use of products either through cascading use, reuse or recycling. This is particularly relevant for the consumption, use and disposal of food and bio-based products.
- **End-of-life.** This stage refers to the treatment of materials and products when they become waste. This includes residues and “bio-waste” generated at different stages of the agricultural and forestry supply chains as well as waste from processing, consumption and bioenergy production stages. The circularity of waste from biomass and bio-based products means improving waste sorting to facilitate use and recycling, improving recycling technologies and processes, and extracting valuable chemicals as components from processing. In addition, biomass and organic waste are important feedstocks for bioenergy production. However, energy recovery should only be used when higher options in the waste hierarchy (waste prevention, waste reduction, reuse and recycling) cannot be achieved.

Figure 6.1. The circular bioeconomy and its principles



Note: CBE: circular bioeconomy.
Source: Adapted from Stegmann, Londo and Junginger (2020[3]).

Motivations for the selection of biomass and food as a key priority area of the Roadmap

The biomass and food sector has been selected because of its relatively high economic and policy relevance, and high circularity and decarbonisation potentials for North Macedonia.

The sector contributes up to 10% of the national gross value added in primary production, or around 15% when combined with the food industry (Ministry of Education and Science, 2023[4]). Agriculture alone also generates around 10% of employment in the country, although jobs are mostly low-skilled and low-waged, mainly due to the prevalence of subsistence farming. The country has a long and well-developed tradition of producing a wide range of agri-food products, with established internal and external export links. Primary agriculture and the food industry have always been strategic export sectors for North Macedonia, with exports of agricultural and food products in 2021 constituting 9.6% of the country's total exports, mainly tobacco, lamb meat, fresh and processed vegetables and fruits, wine, and confectionery products (Invest North Macedonia, 2022[5]). Moreover, organic production has grown in recent years due to government support, with agricultural area under organic farming having more than tripled between 2015 and 2022, although it still represents less than 2% of total cultivated area (Eurostat, 2023[6]; MAKSTAT, 2023[7]).

The area also has high policy relevance, in particular as part of the National Strategy on Agriculture and Rural Development (2021-2027), whose objectives include improving the competitiveness and sustainability of the agriculture sector, notably through ecological practices in production processes. Such processes are supported by programmes implemented by the Agency for Financial Support in Agriculture and Rural

Development. Biomass and food is also one of the four areas to be addressed in the Smart Specialisation Strategy of North Macedonia for the period 2023-2027. In addition, the National Waste Prevention Plan (2022-2028) underscores the necessity to mitigate resource loss and address environmental impacts like soil contamination and unsustainable land use caused by landfilled waste. The Industrial Strategy (2018-2027) also aims to boost food industry exports by supporting small and medium-sized enterprises (SMEs) in export procedures and documentation, aligning with the broader development of a bioeconomy. Moreover, this area, especially food waste and bio-waste, has several obligations and targets under European Union (EU) legislation (for instance, EU member states are obliged to separately collect municipal bio-waste as of 1 January 2024), which North Macedonia will eventually have to comply with due to its status as an EU accession candidate.

The circularity and decarbonisation potential of the biomass and food sector is also high, as the sector can make a significant contribution to environmental protection and climate change mitigation over time by maintaining the value of bio-based products, materials and resources in the economy for as long as possible. Organic waste represents around 45% of the municipal waste stream (Ministry of Environment and Physical Planning, 2021[8]) and is a major source of greenhouse gas (GHG) emissions. Methane, generated from the decomposition of organic waste, stands out as the global solid waste sector's largest contributor to GHG emissions (Ministry of Environment and Physical Planning, 2021[9]). This is particularly noteworthy considering that the waste sector as a whole contributed to 5.6% of all GHG emissions in North Macedonia in 2019 (Ministry of Environment and Physical Planning, 2023[10]). In addition, biomass represents an opportunity for North Macedonia by providing additional natural resources for the economy and products, and by closing the biological cycle of biodegradable materials. The food system is one of the most frequently targeted priority areas in national circular economy strategies due to its high land, water and energy consumption and large waste production (Salvatori, Holstein and Böhme, 2019[11]).

Overview and approach for selecting the proposed policy recommendations

The approach for selecting the proposed policy recommendations for the biomass and food priority area is similar to that used for the other sectoral priority areas (construction, textiles and mining/metallurgy). The recommendations advocate for a life cycle approach with a focus on design, production, (re)use and end-of-life stages. This is because the entire life cycle, from primary production of biomass to its waste management, can create significant environmental pressures affecting the ecosystem's health and economic growth. The proposed measures also aim to bridge the gap between the current situation in North Macedonia and current and expected obligations and targets stemming from the national and EU legislation. For example, aligned with the National Waste Prevention Plan, reduction targets for bio-waste sent to landfills are set at 25% by 2026, 50% by 2031 and 65% by 2034 compared to 1995 levels. These measures extend to reducing food waste generation across primary production, processing, manufacturing, retail and food distribution, aligning with SDG 12 for halving per capita food waste by 2030. The proposed measures also aim to create synergies and complementarity with North Macedonia's Smart Specialisation Strategy and to tap the high circularity potential this area offers. It is proposed that the roadmap focus on improving the following four key areas:

1. managing agricultural waste and bio-waste and closing their biological cycle
2. more sustainable consumption of food
3. funding and technical support for circular bioeconomy projects
4. stakeholder engagement and collaboration, and awareness raising.

Table 6.1 provides an overview of the proposed policy recommendations to support these four key areas.

Table 6.1. Overview of the proposed policy recommendations in the priority area biomass and food for North Macedonia

Short term	Medium term	Long term
Establish a working group on a circular bioeconomy and improve multi-stakeholder collaboration	Introduce and scale up infrastructure for separate collection of bio-waste	Provide funding and technical support for circular bioeconomy projects
Raise awareness, education and skills on food waste prevention, separation of bio-waste at source and composting as well as the circular bioeconomy in general	Promote green public procurement of food and catering services	Strengthen the regulatory framework supporting the use of compost and digestate in agriculture, with a focus on a quality assurance system
Consider tax incentives to support food donations	Support investment into small-scale industrial composting and anaerobic digestion facilities to treat agricultural waste and municipal bio-waste	

Key proposed policy recommendations

1. Improve the management of agricultural waste and bio-waste and close their biological cycle

A number of steps are necessary to improve the management of agricultural waste and bio-waste and close their biological cycle. It is recommended that this roadmap focus on three:

- First, regarding bio-waste, adequate infrastructure for separate collection of bio-waste needs to be put in place and especially households need to learn how to separate their bio-waste.
- Second, there needs to be sufficient composting and anaerobic digestion capacity to deal with agricultural waste and the collected bio-waste domestically.
- Third, it will be important to close the biological cycle of agricultural waste and bio-waste by circulating these wastes back into the soil in the form of compost and digestate.

North Macedonia will need to introduce and scale up infrastructure and incentives for separate collection of bio-waste in the medium term. As North Macedonia has not yet introduced a mandatory separate collection of municipal bio-waste, municipalities will need to ensure that adequate infrastructure for separate collection of bio-waste is in place and that there are effective incentives for households to separate it. There may be fewer incentives for municipalities to put such infrastructure in place if bio-waste is cheaply landfilled or incinerated. Similarly, households will be less likely to separate their bio-waste if it is not easy to do or is more costly.

To improve the infrastructure for the separate collection of bio-waste, North Macedonia must ensure regular collection schedules, provide appropriately sized containers and bags, and establish an appropriate distance to waste facilities or adopt “door-to-door” collection. Regular and frequent collection will reduce issues with biodegradation (such as odours, flies or leaks) and preserve the value of the waste, which diminishes over time. Providing small kitchen caddies or bags to each household is particularly relevant for those residing in apartment buildings. Moreover, implementing measures such as maintaining an appropriate distance to the containers during kerbside collection or facilitating door-to-door collection of bio-waste can significantly enhance the convenience of separating bio-waste for households. North Macedonia could enhance its municipal bio-waste collection by implementing a door-to-door collection system. This approach has been successfully implemented in the European Union, notably in Italy, which has achieved near-complete sorting of kitchen waste in Milan using kitchen caddies provided to every household. North Macedonia may opt to limit the door-to-door collection to specific premises. For example, since 1 January 2023, the Slovak Republic mandates the separate door-to-door collection of bio-waste for households residing in single-family homes (amendment to the Ministerial Decree of the

Slovak Ministry of Environment No. 371/2015). The objective is to encourage municipalities and households to separate their waste.

The government and municipalities can also enhance the implementation of economic incentives to encourage better sorting and separation of bio-waste. This can be achieved by introducing landfill taxes, and/or "pay-as-you-throw" systems, where households are charged according to the amount of mixed municipal waste they produce.

North Macedonia will need to support investment in industrial composting and anaerobic digestion facilities to treat organic agricultural waste and municipal bio-waste domestically. If agricultural waste and bio-waste cannot be prevented or used in another way (e.g. for human consumption or valorised for feed or other bio-based applications), it must be treated or disposed of. Organic agricultural waste and bio-waste can be treated through processes like composting (for compost) and anaerobic digestion (for digestate and biogas) (once waste is prepared for such processes), as these products can be used on land or as an energy source. Bio-waste and forestry waste can also be incinerated for energy recovery. From a circular economy perspective, composting needs to be prioritised over anaerobic digestion, and anaerobic digestion over energy recovery. The EU Landfill Directive also requires that biodegradable municipal waste be diverted from landfills. While reported composting rates are currently non-existent (they dropped from 0.4% in 2015 to 0% in 2020 (World Bank, 2022[12])), municipalities have undertaken a few pilot projects to encourage composting, although they remain marginal. Such projects include the conversion of waste and wastewater into compost and biogas in the municipality of Kocani and the establishment of composting stations in the municipality of Resen. However, it should be noted that home composting is not included in reported figures, hence actual composting rates may be higher. To ensure that adequate investments are made in composting and anaerobic digestion capacities, countries often strengthen the financial support for such facilities. This is often achieved by allocating more funds to this area within existing programmes (in EU countries these are often EU Structural and Cohesion Funds) and making them more accessible (e.g. to additional actors). North Macedonia could follow this example and use these programmes: IPA III Agriculture and Rural Development (IPARD III) 2021-2027, Horizon Europe 2021-2027, and the Circular Bio-based Europe Partnership operating under Horizon Europe. Bio-waste treatment could also be integrated as part of existing or future waste management programmes funded by international development co-operation partners (see Annex B). Increasing composting and anaerobic digestion capacities must go hand-in-hand with separate collection of bio-waste to ensure that the compost/digestate is of high quality and that contamination with heavy metals and impurities is limited. Moreover, measures supporting the use of compost and digestate in agriculture also need to be in place to ensure that these products that enhance soil quality and can close the biological cycle of these wastes are used. Often compost that is not used (in agriculture or at home) tends to end up in landfills.

To encourage the use of compost and digestate in agriculture, North Macedonia will need to strengthen its regulatory framework for composting and anaerobic digestion, with a focus on inspections and developing a quality assurance system for compost in the long term. Encouraging the development of bio-based alternative products such as those related to biofertilisers and biostimulants is also an objective under North Macedonia's Smart Specialisation Strategy. Compost and digestate can improve soil quality but they also provide an opportunity to use agricultural waste and bio-waste for other applications and for climate change mitigation (compost stores more CO_2 than the atmosphere and terrestrial vegetation combined (Gilbert, Ricci-Jürgensen and Ramola, 2020[13]). Box 6.1 presents examples of best practices of leading countries such as Austria, Germany and Slovenia. An optimal legal framework needs to define requirements not only for the quality of the final product (e.g. through a quality label for compost) but also for the quality of inputs and the production processes, as inputs and the technological processes are the most important determinants of the final quality of the compost.

Box 6.1. Examples of regulatory frameworks to support the use of compost and digestate

Austrian waste legislation on compost products

Since 1995, the Austrian Bio-waste Ordinance (FLG No 68/1992) requires the source separation and biological treatment of organic waste (primarily through composting and anaerobic digestion), while the Compost Ordinance (FLG II No 292/2001) established end-of-waste regulation for compost produced from defined organic wastes, as well as monitoring and external quality assurance obligations. In Austria, the aim has been to avoid recommending the imposition of excessive technical obligations to preserve the well-established decentralised, mostly on-farm, composting systems. Since the early 1990s, this has been widely recognised as a sustainable bio-waste recycling system. Compost can be classified and marketed as a product in Austria provided it meets certain quality criteria and has been processed from specific input ingredients. The minimum organic matter level of 20% is one of the most important requirements, as compared to artificial or dredged soils having substantially lower organic matter concentrations.

Slovenian Decree on the Treatment of Biodegradable Waste and the Use of Compost or Digestate

Slovenia became one of the first countries to introduce compulsory operations in the treatment of biodegradable waste and conditions for its use, as well as conditions for placing treated biodegradable waste on the market. The legislation on the recovery of biodegradable waste and the use of compost and digestate lays down, among others, the conditions for designing and operating biogas plants (e.g. applying to an environmental permit), the types of biodegradable waste that can be treated (listed in Annex 1), specific requirements for composting and anaerobic digestion, and quality control (first or second quality class in accordance with Annex 4) of compost and digestate. The regulation prescribes that digestate must be further composted following anaerobic degradation (Article 12) and that a quality control of the compost or digestate must be carried out by a company, public institution or private individual (Article 14).

Germany's quality assurance system for compost and digestate

Since 1989, Germany has successfully run a quality assurance system for compost and digestate made from bio-waste, which comprises a body (the Bundesgütegemeinschaft Kompost e.V., BGK) qualified to oversee the quality of compost and digestate and award a quality label. This quality assurance organisation was founded by composting plant operators in 1989, following the increasing uptake of separate bio-waste collection by German municipalities throughout the 1980s. BGK is an independent association that participates in the European Compost Network (ECN) and one of four national quality assurance organisations in the European Union to have been awarded the ECN Quality Assurance Standard conformity label. It implements the quality standards which are set at the national level by the German Institute for Quality Assurance and Certification. The costs of running such quality assurance standards, including the process of on-site audits and sample analyses for quality assurance, are indirectly financed by waste management fees.

Sources: Adapted from OECD (2022[14]); European Commission (2021[15]); Ministry for Agriculture and Forestry, Environment and Water Management of Austria (2009[16]); European Commission (n.d.[17]); Dollhofer and Zettl (2018[18]).

According to an analysis carried out by the European Environment Agency, 24 of the countries surveyed have national standards for compost quality, either in legislation, as stand-alone standards or under development, while a few countries/regions have also developed quality standards for digestate (e.g. Denmark, Flanders [Belgium], Germany, Sweden and the United Kingdom) (EEA, 2020[19]). A strengthened quality assurance system for compost (and digestate) would reassure farmers when using

these products on their agricultural land, as these products need to be of good quality in order to be used as soil improvers or fertilisers (EEA, 2020[19]). The ECN has also published guidelines (ECN, 2022[20]) to help EU member states implement separate collection of bio-waste and improve the quality of compost for agricultural use.

2. Moving towards a sustainable consumption of food

A variety of policy instruments can support the sustainable consumption of food. This may include food waste prevention, awareness raising, education measures and economic incentives (for example pay-as-you-throw household charges) that incentivise consumers and households to decrease the amount of food waste they generate. There are also circular business models that could be supported which develop digital tools to sell or donate surplus food from supermarkets and restaurants. It may also include making food and catering services more sustainable through green public procurement (GPP) and strengthening incentives for the food industry to make food donations. It is suggested that this roadmap focus on two economic instruments: 1) tax incentives for food donations to support a more sustainable consumption of food in North Macedonia; and 2) GPP of food products and catering services. These instruments have been widely and successfully implemented across EU member states and could be highly impactful in North Macedonia.

North Macedonia should consider introducing tax incentives to support food donations in the short term. In line with the waste hierarchy, the top priority is waste prevention, followed by waste reduction, then reuse, recycling, energy recovery and finally landfilling. In the case of food waste, if food surpluses cannot be avoided, the second best option is to prioritise food redistribution for human consumption before food is directed towards animal feed applications and lower down the waste hierarchy (OECD, 2022[14]). Food redistribution for human consumption can be facilitated by food donations. Although the primary objective of food donation is not to reduce food waste but to ensure the availability of good and healthy food to people from vulnerable groups, the potential to redirect unsold food to these end consumers is consistent with food waste prevention objectives. In North Macedonia, the Law on Donating Surplus Food Waste is currently undergoing final consultations, foreseeing collaboration with the food industry and the non-governmental sector on promoting food waste reduction strategies directed at consumers. The development of the law was supported by the association “Let’s do it Macedonia”, which has been active in preventing food waste in North Macedonia and has created a web platform connecting businesses with non-governmental organisations to redistribute surplus food. The Macedonian National Waste Prevention Programme includes tax incentives for encouraging businesses to donate food. Box 6.2 outlines the most common tax incentives for food donations. When introducing such tax incentives, it is important to consider: which foodstuffs and of which value are eligible for donations? Is foodstuff for which the best before date has passed eligible for donation? Who can receive donated food (only registered charitable organisations or others)?

Food banks and distribution channels also need to be in place. Present for more than 12 years, Food Bank Macedonia has been actively involved in redistributing food waste to aid vulnerable populations across North Macedonia, establishing localised branches in the process. The organisation received assistance from the European Union to enhance its food aid system, playing a crucial role in activities during its #WeStandTogether COVID-19 campaign. Through this initiative, Food Bank Macedonia successfully delivered over 35 tonnes of food to more than 1 500 families in 20 municipalities (Delegation of the European Union to North Macedonia, 2022[21]).

The recommended EU Guidelines on Food Donation and redistribution (European Commission, 2017[22]) provide information on how to interpret and apply relevant legislation related to food donation. Moreover, it is recommended to use tax incentives for food donations rather than regulatory instruments, for example mandatory donations for specific businesses and foodstuffs. This is because mandatory donations may lead to additional challenges, such as logistical problems for both retailers and charitable organisations,

as the receiving organisations need to have sufficient organisational and operational capacity to process an increased amount of donations (European Commssion, 2020[23]).

Box 6.2. Examples of tax incentives to support food donations

- **Reduced or exempt value-added tax (VAT) on food donations.** Some countries (e.g. Austria, Denmark, Germany, Italy and Slovenia) consider the monetary value of the donated food to be low or zero, akin to its value when close to its "best before/use by" date, equating to a very low or no VAT payable on the donated food (irrespective of the original value of the food).
- **Corporate tax credits on food donations.** For example, in France, 60% of the net book value of donated food can be claimed as a corporate tax credit that can be deducted from the corporate revenue tax. The amount is 35% in Spain.
- **Enhanced tax deduction**, where donors can deduct more than 100% of the value of the food at the time of donation. For example, Portugal has an enhanced tax deduction of up to 140% in place if the food is used for a social purpose and limited to 0.008% of the donor's turnover.

Source: Adapted from OECD (2022[14]), European Commission (2017[22]); EU Platform on Food Losses and Food Waste (2019[24]).

North Macedonia should also use public authorities' purchasing power through GPP to promote sustainable consumption of food in the medium term. The GPP of food and catering services is a well-established intervention, playing an important role within public procurement in the European Union (Box 6.3). GPP schemes can target different levels of governance (national, regional and local), food products, environmental criteria as well as life cycle phases of public procurement (Neto and Gama Caldas, 2017[25]). They can also incentivise the sustainable production of food, as green criteria tend to be applied throughout the life cycle, including related to food production (for example, the provision of organic food), distribution and packaging (preference for local production and sustainable packaging) as well as food waste prevention (through, for example, meal planning). As mentioned in Chapter 4, the Law on Public Procurement (2019) includes relevant provisions on GPP, and the corresponding Action Plan 2022 successfully achieved its measure to create a GPP manual with a catalogue of good practices for potential suppliers. North Macedonia also plans to introduce mandatory GPP criteria in procurement bids (National Plan for Waste Management 2021-2031). However, the country will need to scale up the use of GPP, as outlined in Chapter 4. It may want to start focusing on the sectors targeted in this roadmap, including the procurement of food products and catering services. This could be achieved by increasing public authorities' understanding of how to implement GPP in this area and by raising awareness about its benefits. The authorities could also develop guidance on GPP methodology or training materials for public authorities and use the EU guidance and EU GPP criteria for food, catering services and vending machines as an example (European Commission, 2019[26]).

Box 6.3. Green public procurement of food products and catering services in the European Union

According to a recent study by the Joint Research Centre, the purchase of food products and catering services plays an important role within public procurement. Many meals are provided by contracted catering companies to public services, including the education sector (e.g. kindergartens, schools and universities), the healthcare and welfare sector (e.g. hospitals and care homes), the defence sector (e.g. army, navy and air force), the judicial sector (e.g. prisons and correctional services) and government office canteens. The study reports that the overall volume of meals served to public institutions is estimated to be 55% of the total number of meals provided by catering companies in Europe. The share distribution, in number of meals, among the distinct food service sectors is the following: 43% healthcare and welfare (e.g. hospitals and care homes), 31% education (e.g. schools and kindergartens), 18% business and industry (e.g. government building canteens), and 8% others (e.g. prisons or military services).

The study analysed the extent of the use of green criteria in the public purchase of food products and catering services in the European Union (EU) on a sample of 23 green public procurement (GPP) schemes (8 national schemes, 3 regional schemes and 10 local schemes) across 12 EU member states.

Some of the findings include:

- The main food products covered by the criteria are fruits and vegetables, dairy products, fish and seafood, and meat.
- The majority of the schemes reviewed focus simultaneously on both aspects (procurement of food products and catering services).
- Criteria associated with kitchen equipment and vending machines are covered by some of the GPP schemes reviewed.
- Cities, municipalities and counties are, within the schemes reviewed, the main public authorities reporting procurement for the education sector while national GPP guidelines have a broader scope and are applicable to multiple sectors carrying out public tendering.
- Eight criteria are frequently used in the reviewed schemes: organic production (mentioned by 96% of the reviewed schemes); seasonal and fresh produce (83%); staff training (74%); transportation and packaging (both 65%); menu planning (61%); waste management (including food waste) (57%); marine and aquaculture products (52%); and animal welfare (48%).
- For food procurement, most of the reviewed schemes set environmental criteria related to the production of food products and packaging, and less so related to the transport associated with the supply of the food products.
- For the procurement of catering services, a large number of criteria is found to be related to the stage of the supply of the food service itself, followed by the life cycle stages of packaging and the production of food products.

Source: Eurostat (2023[27]), adapted from Neto and Gama Caldas (2017[25]).

3. Incentivising the development of the circular bioeconomy

Innovation and the adoption of circular business models play vital roles in facilitating the transition to a circular bioeconomy, as they enable companies to introduce or further develop bio-based products and services of a higher value, thereby enhancing their competitiveness in global value chains. Despite recent progress made in innovation policy implementation capacity in North Macedonia, overall investments in research and development remains low, at 0.4% of gross domestic product, and collaboration between businesses and academia as well the commercialisation of research needs to be further stimulated (OECD, 2022[28]). Macedonian SMEs, including in the biomass and food industry, continue to face challenges in significantly improving their innovation capacities, which could be mainly attributed to their engagement in low value-added activities, a lack of forward planning and a certain reluctance to innovate (BE-Rural, 2021[29]).

Funding and technical support for research and innovation projects are necessary to further incentivise the development of the circular bioeconomy in North Macedonia in the long term. Such projects would help process biomass, for example from the forestry industry, into higher value-added bio-based products and services. Technical and financial support for enterprises, as well as increased multi-stakeholder co-operation with the international research community (and across sectors), must be established to promote the development of biorefineries and biotechnology in North Macedonia. In particular, local SMEs face challenges to succeed in the circular bioeconomy market, as they typically face barriers to accessing finance and lack the skills to mobilise finance, have limited market access and knowledge as well as supply chain management issues (European Commission, 2019[30]). Numerous barriers hinder the advancement of the circular bioeconomy in North Macedonia, including: the absence of tangible measures integrated into existing strategic documents, inadequate infrastructure to support bioeconomy initiatives, insufficient dedicated funding, and the absence of robust financial models for both regional markets and broader financial support (BE-Rural, 2021[29]). To address these challenges, North Macedonia could establish a dedicated bioeconomy research and innovation programme with associated funding and technical support. Numerous regional and EU bioeconomy experts have also advocated for the establishment of bioeconomy research and innovation programmes across Central and Eastern Europe as a prerequisite for further development in this area (BIOEAST Consortium, 2021[31]). Several EU member states, including Germany, Italy and the Netherlands, have introduced bioeconomy strategies with dedicated research and innovation funding programmes for their domestic bio-based industries, such as the German SME Innovative: Bioeconomy funding scheme or the Dutch TKI Biobased Economy programme. Similar initiatives are being launched in many other European regions, such as Baden-Württemberg and North Rhine-Westphalia in Germany, Bio-based Delta in the Netherlands, Flanders in Belgium, and in some regions in Italy (Commission Expert Group for Bio-based Products, n.d.[32]).

The research and innovation support can also come through dedicated calls under some of the existing funding programmes, such as the National Programme for Financial Support of Rural Development,[1] planned to be leveraged under the Smart Specialisation Strategy with the aim to develop new innovative products, processes and technologies in the agricultural and food sector. The development of the circular bioeconomy could also be supported with the implementation of the Agriculture and Rural Development Strategy, which has a specific focus on strengthening research, technology and digitalisation in the agriculture sector (in particular in the areas of smart agriculture and production methods).

4. Improving stakeholder engagement and collaboration, and awareness raising

To achieve a circular economy transition in the biomass and food sector and implement actions along the life cycle, North Macedonia will need to put in place a number of cross-cutting measures. These primarily include improving multi-stakeholder collaboration and stakeholder engagement, raising awareness on the circular bioeconomy among companies and households, and educating citizens and municipalities. It is

also strongly recommended to co-ordinate these measures with similar ones proposed under the Smart Specialisation Strategy, as important synergies exist between the Smart Specialisation Strategy and the Circular Economy Roadmap in the biomass and food sector.

Collaboration across sectors, value chains and stakeholders is crucial for the success of a circular bioeconomy. This requires actors involved at various stages of the biomass and food value chains to collaborate towards shared objectives and goals. Evidence from some European countries suggests that a unified vision and collective efforts are necessary to build commitment for achieving overarching goals and targets (OECD, 2022[14]). In such an intricately interconnected value chain, every stakeholder has a vital role to play. However, they cannot operate effectively without partnering with other relevant actors.

The Law on Donating Surplus Food Waste, currently undergoing final consultations, foresees collaboration with the food industry and the non-governmental sector to promote food waste reduction strategies directed at consumers. The Smart Specialisation Strategy also includes actions that promote collaboration and partnerships towards smart agriculture and higher value-added food and the establishment of a number of working groups for this purpose. The inter-ministerial collaboration between the Ministry of Environment and Physical Planning and the Ministry of Agriculture, Forestry and Water Management will also need to be reinforced, as such collaboration is crucial for implementing the proposed recommendations in this sector.

In addition, a knowledgeable, well-informed and skilled population can stimulate action towards a circular bioeconomy and help provide solutions to the complex and interconnected challenges posed by the circular economy. Except for awareness-raising campaigns on food waste conducted by the association "Let's do it Macedonia", other awareness activities on the circular bioeconomy's potential remain scarce. The Faculty of Technology and Metallurgy of Ss. Cyril and Methodius University in Skopje has introduced some courses on topics related to the bioeconomy, such as the development of valorisation processes for biomass and natural waste materials. Nevertheless, an overarching curriculum on this topic is lacking. Recognition of these barriers is in alignment with the objective of cultivating a professionally led and knowledge-based agri-food sector, as outlined in the Smart Specialisation Strategy.[2]

In the short term, North Macedonia will need to strengthen multi-stakeholder collaboration across the entire biomass and food sector, including with relevant experts, knowledge institutes and ministerial departments. This can be achieved by establishing a dedicated working group on the circular bioeconomy, which could be formed and operate as a sub-group within the wider circular economy stakeholder group set up for the preparation and implementation of this roadmap. The biomass and food sub-group could further discuss the implementation of existing and planned measures, whose implementation would benefit from improved collaboration on issues of communication, financing and legislation in line with relevant legislation and objectives. It could also develop strategic guidance on additional measures that need to be implemented to achieve a circular bioeconomy in the country. The sub-group should co-ordinate with the working groups that are planned to be formed under the Smart Specialisation Strategy to prevent duplication of efforts.

Establishing a circular economy platform (see Chapter 4) or voluntary agreements could also enhance collaboration between various stakeholders and the sharing of best practices. As outlined in the Smart Specialisation Strategy, the creation of a platform for integrated information on policy instruments and measures related to the agri-food domain presents a valuable opportunity for advancing the bioeconomy. This initiative has the potential to serve as an outlet for fostering a thriving circular bioeconomy. By leveraging this platform, North Macedonia can enhance transparency and accessibility for potential beneficiaries, offering detailed insights into available options and calls specifically tailored to the circular bioeconomy sector. This aligns with the broader objective of promoting smart agriculture and enhancing the value of food production in North Macedonia, positioning the circular bioeconomy as a key sector in this strategic initiative. North Macedonia could also draw upon the guidance provided by the EU REFRESH project (Burgos et al., 2019[33]) to establish voluntary agreements and partnerships that prompt transformation in the food sector, if possible with the support of (international) experts with experience in

building voluntary agreements. In the featured five-step model, stakeholders can work together to achieve real change more rapidly and more cost-effectively (Box 6.4).

Box 6.4. Establishing voluntary agreements to strengthen multi-stakeholder collaboration on reducing food waste

Voluntary agreements (VAs) are bilateral agreements between a private party and the public administration, usually involving a subsidy for the private party to implement certain measures (e.g. changes in product design or technology through research, development and innovation), contingent upon improving environmental performance beyond regulatory obligations.

Voluntary agreements as a key policy area for reducing food waste

- The objectives of a VA are collectively designed in consultation with all supply chain actors to ensure that each actor's needs and specificities are represented, which facilitates the development of relevant and attainable targets.
- The voluntary and non-legal characteristics of a VA make its structure flexible, which is advantageous, as its targets and objectives can be quickly and easily adjusted in response to changing policy contexts.
- The potential for large savings and/or enhanced brand image creates a strong business case for participating members to join a VA, especially if key organisations and businesses are involved.

Creating a favourable context for a voluntary agreement

- Agree on a target (link to a pre-existing target or establish a new one) – in the absence of a legislative target, the United Nations Sustainable Development Goal 12.3, which aims to halve per capita food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses by 2030, could act as a guiding principle.
- Ensure long-term financing and governance (a donation/grant ideally from a mix of public and private funding operated by, for example, a steering committee with focused working groups).
- Establish an independent third party unrelated to other public or private entities (e.g. a company, university or research institution) to lead the VA (the main pillar of a VA's success).
- Consider wider supply chain issues in VA discussions.
- Define a short-list of the key actors across the value chain committed to the VA.
- Establish a measurement methodology to define progress and track results.

Sources: OECD (2023[27]) adapted from Burgos et al. (2019[33]); EEA (n.d.[34]).

To implement measures that promote a circular bioeconomy more effectively, **North Macedonia should build upon or collaborate on the measures proposed in the Smart Specialisation Strategy and focus on awareness raising, education and skills on preventing food waste; separating bio-waste at the source; and composting in the short term.** Citizens, public entities and companies in the circular bioeconomy area should all be targeted. Raising awareness and promoting education can be achieved by showcasing successful pilot projects, initiatives and campaigns; creating a dedicated platform; and implementing targeted consumer campaigns and interactive events. Such efforts can encourage positive changes in behaviour, attitudes and practices.

International good practices offer many tools to prevent food waste by companies and consumers, managing bio-waste, improving the sorting of such waste by households at its source, and utilising date marking or marketing practices to reduce food waste. Effective tools utilise behavioural science insights and engage retail and food industries as well as social media influencers, to incentivise positive behaviour (such as offering rewards) rather than imposing penalties (OECD, 2022[14]). For instance, sharing best practices via an online platform (e.g. a circular economy platform; see Chapter 4) can promote a standardised approach to bio-waste separation at the source across municipalities. EU countries have also been adopting national EU food waste and food losses platforms, in line with the EU Platform on Food Losses and Food Waste (European Commission, 2023[35]). The platform must have a precise and defined scope, drawing on existing inventories and information channels. The resources should be easily searchable while enabling the sharing of best practices and guidance materials (OECD, 2022[14]).

References

BE-Rural (2021), *Bioeconomy Development Roadmap for Strumica Region*, BE-Rural, https://be-rural.eu/wp-content/uploads/2021/12/BE-Rural_D5.3_SDEWES-Skopje_EN.pdf. [29]

BIOEAST Consortium (2021), *BIOEAST Foresight Exercise: Sustainable Bioeconomies Towards 2050*, BIOEAST Consortium, https://bioeast.eu/wp-content/uploads/2021/10/BIOeast-Report-2021_FINAL_compressed-1.pdf. [31]

Burgos, S. et al. (2019), *Voluntary Agreements as a Collaborative Solution for Food Waste Reduction*, EU Horizon 2020 REFRESH, https://eu-refresh.org/voluntary-agreements-food-waste.html. [33]

Commission Expert Group for Bio-based Products (n.d.), *Working Group on Evaluation of the Implementation of the Lead Market Initiative for Bio-based Products' Priority Recommendations*, Commission Expert Group for Bio-based Products, https://ec.europa.eu/docsroom/documents/13269/attachments/1/translations/en/renditions/native. [32]

Delegation of the European Union to North Macedonia (2022), "EU supports food banking: Reducing food waste – reducing hunger", https://www.eeas.europa.eu/delegations/north-macedonia/eu-supports-food-banking-reducing-food-waste-%E2%80%93-reducing-hunger_en?s=229 (accessed on 11 December 2023). [21]

Dollhofer, M. and E. Zettl (2018), *Quality Assurance of Compost and Digestate*, Federal Environment Agency, Dessau-Roßlau, Germany, https://www.umweltbundesamt.de/publikationen/quality-assurance-of-compost-digestate. [18]

ECN (2022), *Guidance on Separate Collection*, European Compost Network, Bochum, Germany, https://www.compostnetwork.info/download/ecn-guidance-on-separate-collection. [20]

EEA (2020), *Bio-waste in Europe: Turning Challenges into Opportunities*, European Environment Agency, Copenhagen, https://www.eea.europa.eu/publications/bio-waste-in-europe. [19]

EEA (n.d.), "Voluntary agreement", *EEA Glossary*, https://www.eea.europa.eu/help/glossary/eea-glossary/voluntary-agreement. [34]

EU Platform on Food Losses and Food Waste (2019), *Redistribution of Surplus Food: Examples of Practices in the Member States*, https://ec.europa.eu/food/system/files/2019-06/fw_eu-actions_food-donation_ms-practices-food-redis.pdf. [24]

European Commission (2023), *EU Platform on Food Losses and Food Waste*, https://food.ec.europa.eu/safety/food-waste/eu-actions-against-food-waste/eu-platform-food-losses-and-food-waste_en (accessed on 12 December 2023). [35]

European Commission (2021), *Carbon Economy: Studies on Support to Research and Innovation Policy in the Area of Bio-based Products and Services*, Publications Office of the European Union. [15]

European Commission (2019), *Bio-based Products: From Idea to Market "15 EU Success Stories"*, Publications Office of the European Union, Luxembourg, https://op.europa.eu/en/publication-detail/-/publication/23ab58e0-3011-11e9-8d04-01aa75ed71a1. [30]

European Commission (2019), *EU Green Public Procurement Criteria for Food, Catering Services and Vending Machines*, European Commission, Brussels, https://ec.europa.eu/environment/gpp/pdf/190927_EU_GPP_criteria_for_food_and_catering_services_SWD_(2019)_366_final.pdf. [26]

European Commission (2018), *Updated Bioeconomy Strategy 2018*, European Commission, Brussels, https://knowledge4policy.ec.europa.eu/publication/updated-bioeconomy-strategy-2018_en#:~:text=The%202018%20update%20of%20the,well%20as%20the%20Paris%20Agreement. [1]

European Commission (2017), *Commission Notice: EU Guidelines on Food Donation*, 2017/C 361/01, European Commission, Brussels, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52017XC1025(01). [22]

European Commission (n.d.), *Factsheet: Slovenia*, European Commission, Brussels, https://ec.europa.eu/environment/pdf/waste/framework/facsheets%20and%20roadmaps/Factsheet_Slovenia.pdf. [17]

European Commssion (2020), *Food Redistribution in the EU: Mapping and Analysis of Existing Regulatory and Policy Measures Impacting Food Redistribution from EU Member States*, European Commssion, Brussels, https://data.europa.eu/doi/10.2875/406299. [23]

Eurostat (2023), "Gross value added and income by A*10 industry breakdowns [nama_10_a10__custom_8247007]", https://ec.europa.eu/eurostat/databrowser/view/nama_10_a10__custom_8247007/default/table. [27]

Eurostat (2023), "Organic crop area by agricultural production methods and crops", https://ec.europa.eu/eurostat/databrowser/view/org_cropar/default/table?lang=en (accessed on 16 November 2023). [6]

Gilbert, J., M. Ricci-Jürgensen and A. Ramola (2020), *Benefits of Compost and Anaerobic Digestate When Applied to Soil*, International Solid Waste Association, https://www.altereko.it/wp-content/uploads/2020/03/Report-2-Benefits-of-Compost-and-Anaerobic-Digestate.pdf. [13]

Invest North Macedonia (2022), "Introduction to key industries", https://investnorthmacedonia.gov.mk/export-key-industries/#:~:text=Textile%20and%20clothing,of%20the%20country%20after%20metallurgy. [5]

Kardung, M. et al. (2021), "Development of the circular bioeconomy: Drivers and indicators", *Sustainability*, Vol. 13/1, p. 413, https://doi.org/10.3390/su13010413. [2]

MAKSTAT (2023), "Agricultural areas and crop production, 2022", https://www.stat.gov.mk/PrikaziSoopstenie_en.aspx?rbrtxt=127. [7]

Ministry for Agriculture and Forestry, Environment and Water Management of Austria (2009), *The State of the Art of Composting*, Austrian Government, https://www.bmk.gv.at/dam/jcr:69c43c71-1844-4c52-8d0c-20e0d9ced59f/Richtlinie_Kompost_en.pdf. [16]

Ministry of Education and Science (2023), *Draft Smart Specialisation Strategy of the Republic of North Macedonia*, https://mon.gov.mk/download/?f=EN-%20S3-MK%2020.12.2023.docx#:~:text=The%20%E2%80%9CSmart%20Specialisation%20Strategy%20of,a%20strategic%20vision%2C%20priorities%20and. [4]

Ministry of Environment and Physical Planning (2023), *Fourth National Climate Change Communication*, Government of the Republic of North Macedonia, https://unfccc.int/sites/default/files/resource/EN%2C%20IV%20NCCC.pdf. [10]

Ministry of Environment and Physical Planning (2021), *North Macedonia Waste Management Plan 2021-2031*, Republic of North Macedonia, https://www.moepp.gov.mk/%d0%b4%d0%be%d0%ba%d1%83%d0%bc%d0%b5%d0%bd%d1%82%d0%b8/%d0%bf%d0%bb%d0%b0%d0%bd%d0%be%d0%b2%d0%b8/. [9]

Ministry of Environment and Physical Planning (2021), *Waste Management Plan of the Republic of North Macedonia, 2021-2031*, Ministry of Environment and Physical Planning. [8]

Neto, B. and M. Gama Caldas (2017), "The use of green criteria in the public procurement of food products and catering services: A review of EU schemes", *Environment, Development and Sustainability*, Vol. 20/5, pp. 1905-1933, https://doi.org/10.1007/s10668-017-9992-y. [25]

OECD (2023), *Towards a National Circular Economy Strategy for Hungary*, OECD Publishing, Paris, https://doi.org/10.1787/1178c379-en. [36]

OECD (2022), "Closing the loop in the Slovak Republic: A roadmap towards circularity for competitiveness, eco-innovation and sustainability", *OECD Environment Policy Papers*, No. 30, OECD Publishing, Paris, https://doi.org/10.1787/acadd43a-en. [14]

OECD (2022), *SME Policy Index: Western Balkans and Turkey 2022: Assessing the Implementation of the Small Business Act for Europe*, SME Policy Index, OECD Publishing, Paris, https://doi.org/10.1787/b47d15f0-en. [28]

Salvatori, G., F. Holstein and K. Böhme (2019), *Circular Economy Strategies and Roadmaps in Europe: Identifying Synergies and the Potential for Cooperation and Alliance Building*, European Economic and Social Committee, Brussels, https://doi.org/10.2864/554946. [11]

Stegmann, P., M. Londo and M. Junginger (2020), "The circular bioeconomy: Its elements and role in European bioeconomy clusters", *Resources, Conservation & Recycling: X*, Vol. 6, p. 100029, https://doi.org/10.1016/j.rcrx.2019.100029. [3]

World Bank (2022), *Western Balkans Regular Economic Report No.21: Steering Through Crises*, World Bank Group, Washington, DC. [12]

Notes

[1] The Agency for Financial Support in Agriculture and Rural Development administers the National Programme for Financial Support of Rural Development, which aims to enhance the effective implementation of agricultural and rural development policies in North Macedonia. With a budget of MKD 1 346 366 000 (approximately EUR 21 852 400), the programme includes measures to support agricultural producers through training and information, promote the involvement of young people and women in the sector, invest in modern technologies and infrastructure for the processing of agricultural products, and address environmental protection concerns (particularly water use and biodiversity).

[2] Several measures are proposed to enhance human resources through quality education and training (e.g. offering master, doctoral and post-doctoral grants to support research related to the agri-food domain or supporting twinning opportunities for knowledge transfer). This strategic approach also aims to create conditions conducive to retaining young professionals in rural areas engaged in agriculture, food processing and marketing (e.g. prioritise the sector in scholarship schemes or conducting student contests).

7 Establishing a circular textile industry in North Macedonia

This chapter outlines recommendations for North Macedonia to establish a circular textile industry, defining the sector's role in the broader transition to a circular economy. It provides an overview of the current situation and policy framework. The gap analysis informs the subsequent formulation of policy recommendations, emphasising a shift from a focus on production efficiency and textile waste treatment to integrating circular economy principles throughout the textile value chain. This includes elements like ecodesign and awareness-raising initiatives to influence consumer habits.

Circular economy in the textile industry

The textile industry covers a large variety of textile products and applications. Textile products can be classified into apparel (e.g. clothes, accessories and footwear), industrial textiles (e.g. for different applications in the medical, sports, transportation, construction, agriculture and packaging sectors) and household textiles (e.g. used in the kitchen, bedroom and bathroom). The textile value chain contains the following activities in a linear economy (UNEP, 2020[1]):

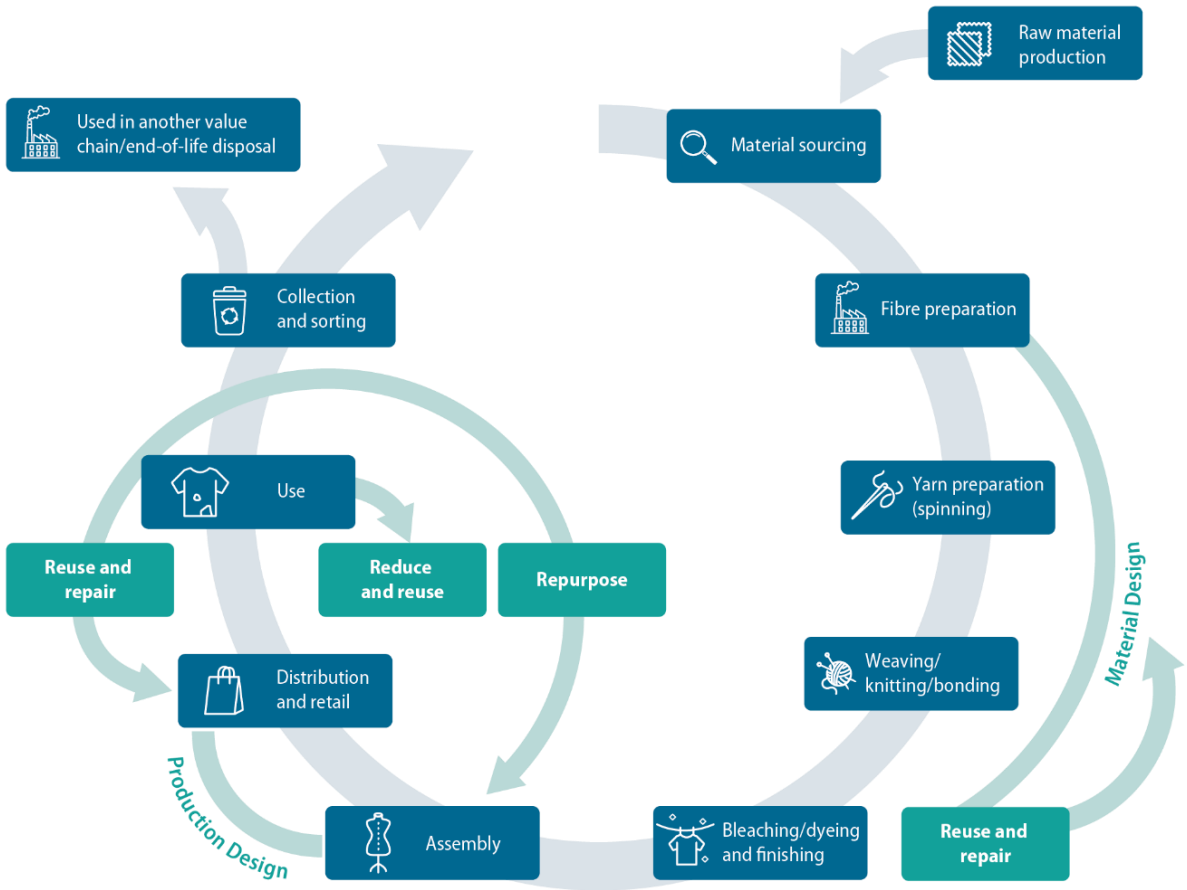
- fibre production (raw material production, material processing and sourcing, fibre preparation)
- yarn and fabric production (spinning, weaving/knitting/bonding)
- textile production (bleaching/dyeing/finishing, assembly)
- consumption (distribution and retail, use)
- end-of-life (collection and sorting, landfilling/waste to energy).

Textiles create environmental impacts throughout their life cycle. In the upstream stage, the production of natural fibres necessitates land conversion and copious use of fertiliser and water while releasing greenhouse gases (GHGs), including methane. Synthetic fibres are produced from extracted mineral resources or through energy-intensive chemical resin production. The "wet processing" during the spinning and weaving of yarn production and dyeing uses many chemicals, which result in soil and water pollution, further degrading these resources. For example, the Ellen Macarthur Foundation has estimated that, on average, 0.58 kg of chemicals are used per 1 kg of textile produced (Ellen Macarthur Foundation, 2017[2]). In the course of the life cycle, and particularly during the use phase, textile fibres are shed, which become a source of micropollutants. In the downstream stage, just a mere 1% of textiles undergo recycling to create a product of similar value, and they typically account for 3-6% of the weight of household residual waste composition surveys (Ellen Macarthur Foundation, 2017[2]). Additionally, a large share of used garments and textiles waste is exported to developing countries, which can overwhelm local waste management and compete with local production.

The circular economy offers several opportunities for transforming the textile industry into a more circular industry, where textile waste is minimised and material value is maintained in the textile value chain for as long as possible (Figure 7.1). These opportunities can be structured into four blocks of actions (adapted from UNEP (2020[1])):

- **Reduce by design** – this is an overarching guiding principle which aims to reduce the amount of (raw) material and hazardous chemicals consumed during production and/or use phases. Product design impacts the way products are produced and consumed, as well as how they are disposed of. In a circular economy, the aim is to rethink business models and consumption patterns and produce textile products that are durable and made of sustainable materials.
- **"User-to-user" value retention processes** – which includes refuse, reduce and reuse circular consumption practices. These translate into consumers buying less while buying more products made of sustainable materials, reusing more and keeping textile products in use for as long as possible. Actions in this value retention process also aim to address the fast fashion phenomenon where consumers purchase continuously cheap but stylish clothing that has moved quickly from design to retail stores to keep up with new trends.
- **"User-to-business" value retention processes** – links primarily to repair activities where a consumer engages a business to extend the lifetime of a textile product by repairing it.
- **"Business-to-business" value retention processes** – where a product loses its original function and is repurposed or recycled rather than disposed of.

Figure 7.1. Activities taking place in a circular textile value chain



Source: Adapted from UNEP (2020[1]).

Motivations for the selection of the textile industry as a key priority area of the Roadmap

The textile industry has been selected as a key priority area of the Circular Economy Roadmap for North Macedonia because of its high economic importance, strong policy relevance, and important circularity and decarbonisation potential for North Macedonia. North Macedonia's textile industry is the second biggest industrial sector and one of the most developed and diversified in terms of industrial production, employment and export earnings, accounting for 10% of total exports and 13% of industrial gross domestic product (Invest North Macedonia, 2022[3]). In 2019, the sector represented 7% of total employment or around one-fourth of employees in the manufacturing industry (Invest North Macedonia, 2022[3]).

From a policy perspective, there are several existing and planned European Union (EU) obligations on textiles that North Macedonia will need to align with as part of the EU accession process. This area also offers momentum for North Macedonia to become an important player in the circular textile value chain as countries globally are preparing for increased reuse and recycling of textile waste and for changing business models and consumption practices to mitigate the negative environmental impacts of textile production, use and waste management. EU obligations include the obligation for EU member states to

introduce mandatory separate collection of municipal textile waste from 2025 (Waste Framework Directive), potentially new ecodesign requirements (EU proposal for Ecodesign for Sustainable Products Regulation), and a mandatory and harmonised extended producer responsibility (EPR) scheme (proposal for a revision of the Waste Framework Directive). The aim is to reduce the high generation of textile waste and its incineration and landfilling in the European Union as recycling technologies are currently in their infancy.

The textile industry is still characterised by landfilling (4.7% of the total municipal solid waste landfilled), low recycling, low reuse and fabric underutilisation, placing considerable pressure on resources (Jordeva et al., 2018[4]; EEA, 2021[5]). While textile companies in North Macedonia are not involved in the production and design phase of fabrics, the circularity potential lies mainly in sustainable textile production processes (manufacturing, treatment and dyeing) and waste reduction in fabric use during the production of textile products.

Textiles also generate significant GHG emissions throughout their value chain, as the sector contributes to 10% of total carbon emissions worldwide, surpassing those of aviation and marine shipping (European Commission, 2020[6]). With its associated CO_2 emissions projected to increase by more than 60% globally by 2030, “a new textile economy” based on a circular model will, therefore, be key to reaching climate-neutral targets (Design4Circle, 2021[7]).

Overview and approach to selecting the proposed policy recommendations

The approach to selecting the proposed policy recommendations for the textiles priority area is similar to that used for the other sectoral priorities. Recommendations aim at improving the circularity of the industry along the textiles life cycle, with a focus on design, production, (re)use and end-of-life stages. They also try to bridge the gap between national and EU obligations and the current situation in North Macedonia. North Macedonia’s textile industry positions itself in the apparel production stage of the textile life cycle. Around 75% of production is organised as a cut-make-trim model and the remaining 25% as a full production package (from design to garment completion). The main challenges of the textile industry in North Macedonia underlined during stakeholder consultations include the amount of waste produced in textile production processes, the limited amount of training on sustainable practices (including digital tools) for textile engineers and workers, and the lack of relevant infrastructure for textile waste. Considering the local context and stakeholder discussions, it is proposed that the roadmap focus on three key areas:

1. developing a national strategy on sustainable and circular textiles
2. reducing and better managing textile waste from production and households
3. strengthening the circular design of textiles.

This does not imply that other areas do not need to be addressed, but that they can be addressed at a later stage or through other strategies.

Table 7.1 provides an overview of the proposed policy recommendations to support these three key areas.

Table 7.1. Overview of the proposed policy recommendations in the priority area textiles for North Macedonia

Short term	Medium term	Long term
Develop a national strategy on sustainable and circular textiles	Introduce ecodesign requirements for textiles to make them last longer, easier to repair and recycle, as well as requirements on minimum recycled content	Financially support circular design projects and innovation
Provide financial and technical support for projects that reduce textile waste in manufacturing	Introduce mandatory separate collection of textile waste for households	
	Introduce an extended producer responsibility take-back scheme for textiles	
	Support investment in recycling and reuse of textiles	

Key proposed policy recommendations

1. Develop a national strategy on sustainable and circular textiles

Apart from their inclusion as a priority area in the National Plan for Waste Management (2021-2031) and the National Waste Prevention Plan (2022-2028), policy does not currently address sustainability and circularity of textiles sufficiently in North Macedonia. Besides waste management, governments need to address upstream production and use phases to achieve a sustainable and circular textile value chain.

In the short term, North Macedonia could develop a national strategy on sustainable and circular textiles that considers the entire textile value chain in North Macedonia. The strategy could map the state-of-play of the industry and the current regulatory framework; present the key trends and recent developments, including data on textile waste generation and management; and outline the key challenges and barriers to sustainability and circularity in the industry. The strategy should describe the overall strategic objectives, goals, policy measures and possibly targets to improve the sustainability and circularity of textiles in the country. The strategy could also address unsustainable consumer consumption practices of textile products, such as the fast fashion phenomenon, mainly through awareness raising and the promotion of second-hand shopping. Fast fashion involves increased consumption of textiles, the quick discarding of clothing and is linked to a diminishing quality of clothing items, which hampers reuse and recycling.

Mechanisms for reporting textile waste data could also be established as part of the strategy. The textile industry is not legally obligated to report textile waste data or achieve targets, but this may change in the near future, as the industry has recently started to receive policy attention at the EU level as well as globally. Consulted stakeholders in North Macedonia expressed interest in in-depth data analyses of textile waste generation, in particular related to the pre-consumption stage. The amount of imported textile fabrics and products is also unknown in North Macedonia as there is no mandatory registration in place for Customs to record such information.

To develop such a strategy, North Macedonia could learn from the example of Albania, which launched a Zero Draft Roadmap on Sustainability and Resource Use in the Textiles, Clothing, Leather and Footwear industries in October 2022 within the framework of the Business Partnerships and Solutions for SDGs, a project funded and implemented by international co-operation partners. The overall objective of that roadmap is to improve the sustainability of the textiles, clothing, leather and footwear sector in Albania with evidence on its environmental, social and economic impacts, and to work with a wide range of stakeholders all along the supply chain to support the transition to formality and fill existing sector gaps regarding waste

collection, separation, recycling, energy efficiency and water treatment (ILOSTAT, 2023[8]). Another example is the European Union's Strategy on Sustainable and Circular Textiles (2022-2030), which lays out a forward-looking set of actions, such as design requirements for textiles to make them last longer (including a minimum recycled content), the introduction of a Digital Product Passport, mandatory EPR rules for textiles and support for circular business models in the textile sector.

2. Reduce and better manage textile waste

Results of a research study indicate that 25-40% of the total fabric used in garment production becomes fabric leftovers or textile waste (Aus et al., 2021[9]). In general, cutting is the major stage among the various processes of textile production where most of the fabric waste/leftovers is generated (Aus et al., 2021[9]). Reducing and better managing textile waste from production is a high priority for North Macedonia, as Macedonian companies are heavily involved in cutting. According to the circular economy stakeholders consulted for the development of this roadmap, a significant amount of textile waste is generated from cutting processes, as these processes are not optimised and employ low levels of digitalisation and automation. Education and training for engineers would be needed to increase digitalisation and automation of processes. Furthermore, textile waste is often disposed of in landfills that are not specifically designed for this purpose. Additionally, some textile waste is incinerated in cement factories due to a lack of recycling capacity. Based on this local context, it is proposed that the roadmap address textile waste by focusing on reducing textile waste in manufacturing and increasing the recycling, reuse and repair of textiles.

Reducing textile waste in manufacturing by improving production processes

In the short term, North Macedonia needs to provide financial and technical support, including training, to businesses and their employees to improve production processes and reduce textile waste from production. The aim of this support would be to increase the efficiency of production processes through better technologies and equipment which minimise textile waste generated from cutting. Digital tools, such as computer-aided design and computer-aided manufacture, can support such processes. Another possible objective of the support could be to help companies grow and scale up their production (by, for example, investing in new technologies), which may increase the efficiency of production processes. For example, a research study found that larger factories produce less textile waste as they generally operate more efficiently and larger orders help them better minimise cut waste from routines and fewer alterations (Aus et al., 2021[9]). The financial support could be provided through more general funding for digitalisation and technology development, or through one of the funding programmes that support green investments in North Macedonia, as outlined in Chapter 4. This may require focusing on the textile industry in the calls for projects as a key priority of the circular economy roadmap. In addition, universities or research centres that work to develop expertise on sustainable textile practices could provide financial and technical support. The Faculty of Technology and Metallurgy of the Ss. Cyril and Methodius University in Skopje has some funds available to increase the use of resources in the textile sector. This programme could be scaled up to further support designers and manufacturers' access to expertise and invest in new technologies to reduce waste from production processes. The Future Fashion Factory, led by the University of Leeds in the United Kingdom, represents a good practice in this regard (Box 7.1) The funding support also needs to be combined with support for education and training for employees working in the industry to improve their digitalisation and engineering skills to deal with new software and technologies that help optimise production process and reduce generated waste. Developing ecodesign, innovative textile production, and repair and reuse skills are also crucial and will become even more so in the future (EU Strategy on Sustainable and Circular Textiles).

Box 7.1. The Future Fashion Factory

The Future Fashion Factory represents an innovative collaboration driven by industry-led research and development dedicated to exploring and advancing digital and sophisticated textile technologies for the purpose of fostering innovation within the UK fashion and textile sector.

Spearheaded by the University of Leeds and in partnership with the University of Huddersfield and the Royal College of Art, the programme's primary objective is to facilitate collaborative efforts among designers and manufacturers, allowing them to leverage the expertise of fashion and textile researchers. Their collective focus is on developing technologies that enhance productivity, reduce lead times, cut costs and minimise waste. The Future Fashion Factory concentrates on five core research themes aimed at cultivating cutting-edge technologies, enabling businesses to create precisely tailored products for their intended customers at the opportune moment:

1. late-stage customisation
2. sustainability and circular economies
3. digital communication of fabric aesthetics
4. data-driven design
5. skills and education.

The Future Fashion Factory boasts a membership exceeding 250, with over 100 located in the Leeds City Region, comprising independent fashion brands, textile mills and various technology providers. Companies join the Future Fashion Factory's network to access exclusive events and resources and foster a collaborative community where industry leaders and members can exchange and cultivate ideas. Membership grants access to a wealth of information about emerging technologies within the core research themes, providing opportunities to pilot these innovations or become early adopters.

Source: West Yorkshire Combined Authority (2020[10]).

Increasing recycling and reuse of textiles

Recycling, including chemical recycling,[1] and reuse of all textile waste, including industrial and household textile waste, should be encouraged. To increase the recycling and reuse of textiles, North Macedonia will need to ensure that there is domestic recycling capacity and/or the textile waste is exported for recycling and reuse elsewhere. On the other hand, to support the recycling and reuse of household textiles, textile waste from households should be separately collected to ensure that it does not end up in municipal landfills or illegal dumpsites or is incinerated for energy recovery in the future. Moreover, implementing the polluter-pays principle by introducing an EPR take-back scheme for textiles could help fund recycling and reuse by shifting some of the waste management costs from municipalities to the manufacturers and importers of textiles. An EPR take-back scheme for textiles is planned as part of the new Waste Management Law and sub-acts adopted in 2021.

In the medium term, North Macedonia needs to support investments in recycling and reuse projects for textiles and/or facilitate the export of textiles for recycling and reuse. There are currently around ten registered entities that collect and export or recycle textile waste in the country. North Macedonia should first assess (for example through a diagnostics study) the current state regarding these companies then propose the best strategy to increase national recycling and reuse rates. This may be done by increasing domestic recycling and reuse capacity, the export of textile waste for recycling and reuse, or a combination of both. As mentioned earlier, globally, less than 1% of textile waste is estimated to be recycled into new textiles (Ellen Macarthur Foundation, 2017[2]). This is because recycling textiles is

challenging with the current technology due to the materials used in textile products. For instance, fibres are often blended with others (e.g. polyester with cotton), and added elastane can act as a contaminant in textile fibres recycling technologies, making recycling more difficult and costly (European Commission, 2022[11]). If textile waste cannot be recycled into new products of the same value, textile waste materials can be transformed into products of lesser value, or so-called "downcycled". Currently, most common textile recycling activities consist of producing insulation materials for the automotive and construction industries and using absorbent textiles to produce cleaning cloths (Switchmed, 2020[12]). If downcycling options are not possible, textile waste, depending on its composition, can be a good source for producing refuse derived fuel.[2]

Domestic recycling and reuse capacity can be increased by providing support for investments for building new infrastructure or projects that support recycling and reuse of textiles. For example, within the United Kingdom's Resource Action Fund, there is a specific grant programme for recycling and reusing textiles supporting projects put forward by commercial and not-for-profit organisations (Wrap, n.d.[13]). Funding supports capital expenditure for equipment costs and technologies enabling the recycling and/or reuse of textile waste materials sourced from either post-consumer textiles from municipal sources or pre-consumer (or post-industrial) textiles for recycling projects. Investments into chemical recycling would increase the amount of waste that can be recycled.

North Macedonia is a party to the Basel Convention, which regulates and facilitates transboundary movements of waste, including textile waste. North Macedonia could develop guidelines for exporters and customs to facilitate the export of textile waste along with an electronic register for shipments of waste, as suggested during the stakeholder consultations. As these measures go beyond textile waste, they can facilitate transboundary shipments of waste in general, and help align North Macedonia with the EU Waste Shipments Regulation. In the scope of regional initiatives or existing platforms, North Macedonia could suggest the development of a regional recycling company that will collect and recycle regional textile waste, as suggested by consulted stakeholders.

In the medium term, North Macedonia will also need to introduce mandatory separate collection of textile waste from households. Such a requirement will become mandatory for EU member states on 1 January 2025. There are different approaches for achieving mandatory separate collection of textile waste. Currently, separate collection of textiles is voluntary in EU member states and is organised by municipalities or charitable organisations. The collected textile waste from households is currently sent for recycling or sale on reuse markets, albeit primarily to developing countries where the waste is not always managed in an environmentally sound manner. Governments thus need to ensure that shipments of textile waste only take place when there are guarantees that the shipped waste can be properly treated and recycled. Countries are also discussing the option of using retailers or postal services to collect textile waste from households (e.g. Canada, the United Kingdom). If North Macedonia decides to use municipalities or charitable organisations' networks to separately collect textile waste from households, it should try to ensure that the collected waste is first prepared for reuse to the extent possible (e.g. resold or donated), and only if it cannot be reused, sent for recycling. Recycling should be prioritised over energy recovery and landfilling. A good example of this is the greater Helsinki Region in Finland, which has implemented pilots since 2019 (See Box 7.2).

Box 7.2. Finland: Collecting and sorting textile waste in the absence of an extended producer responsibility scheme

Finland made the separate collection of textile waste mandatory in 2023.[1] The environmental services of the greater capital region of Helsinki had been implementing collection pilots since 2019. In the region, textile waste, including clothing, is gathered at outdoor stations with a charge (though this was

discontinued due to significant contamination) and at free-of-charge collection points in ten shopping malls. Citizens receive instructions on acceptable donations of clothing and household textiles through a dedicated regional guide. The initial sorting for textile reuse occurs at a waste service centre through a company selected via public tender. Using scanning technology, textiles are sorted based on quality, fibre and recyclable material. Non-reusable textiles are sent to a recycling plant, forming part of a public-private partnership, for further sorting and processing. At the recycling plant, end-of-life textile waste undergoes mechanical processing. While the regional structures strongly support the recycling of waste, the Finnish Waste Law explicitly prioritises reuse over recycling, offering additional advantages to local charities and vintage markets. While acknowledging the positive direction taken, municipalities recognise the need for increased recycling capacities to align with the volume of textile waste requiring sorting and recycling.

Note: [1] 978/2021 Waste Decree, pursuant to the decision of the government, under the Waste Act (646/2011).
Source: Zero Waste Europe (2023[14]).

Mandatory separate collection of textile waste could also be achieved by introducing EPR obligations for textiles, for example through a mandatory EPR take-back scheme. The EPR approach has proven effective in improving the separate collection and recycling of waste but its effectiveness for textile waste is yet to be seen as only a few countries have such a scheme in place. The EPR should, in principle, also incentivise product design that promotes circularity throughout the life cycle if eco-modulated fees are applied within the system. A few EU member states (e.g. Belgium, France and the Netherlands) have already introduced or are considering introducing an EPR take-back scheme for textiles to fulfil their obligation under EU waste legislation to establish mandatory separate collection of textile waste by 1 January 2025 (see for the example of France's well-established EPR scheme for textiles). North Macedonia adopted a set of laws targeting specific waste streams in 2021, in parallel with the Law on Waste Management. These include, among others, the Law on Extended Producer Responsibility regulating EPR schemes for different waste streams, including textile waste. However, the Law on EPR for textiles is not fully implemented, as Customs does not require mandatory registration of companies importing textile materials. The quantities of textile materials and products imported are also not recorded. According to the consulted stakeholders, this slows down the proper functioning of producer responsibility organisation (PROs) and of the EPR system as such. There is also a need to improve the traceability of post-consumption textile waste placed on the domestic market, as highlighted by consulted stakeholders. To effectively implement an EPR for textiles, North Macedonia could tap into the experience of other EU countries, such as France (Box 7.3). More practice and guidelines will become available in the coming years as more countries gain experience implementing such schemes.

Box 7.3. Extended producer responsibility for textiles and clothing in France

The extended producer responsibility (EPR) scheme for textiles (clothing, shoes and household linen) was introduced in France in 2007 under Article L-541-10-3 of the Environmental Code and further regulated by the enactment of the Anti-Waste and Circular Economy Law in 2020. It placed obligations on firms in the textiles and clothing sector in France to ensure a given standard of recovery and recycling. Firms could achieve this directly through their own actions or by contributing to an accredited producer responsibility organisation (PRO). In practice, a single non-profit PRO, Re_fashion (formerly Eco-TLC – Eco-organisme du textile, du linge et de la chaussure), has emerged as the sole vehicle for collective action in this sector. It was initiated in 2008 by a consortium of some 30 large retailers, manufacturers, wholesalers and industry organisations. In 2022, the PRO collected 260 kilotonnes from more than 6 500 marketers submitting declarations, comparable with the 827 kilotonnes of textiles placed on the market. While the collection rate increased by more than 15 000 tonnes compared to 2021, it remained below the national target (50% of products placed on the market).

Member contributions are based on the previous year's sales of items in four size categories of clothing and two categories of footwear. The contribution for a clothing item of average size was about EUR 1.16 cents in 2021. New eco-fees specifications are to be defined for the 2023-28 period. Reduced contribution rates ("eco-modulation") apply to producers promoting eco-design initiatives in three main areas: 1) durability; 2) the integration of recycled post-consumer materials; and 3) the introduction of recycled post-production materials. In 2021, the application of these reduced rates appears limited to less than 1.6% of total output, because the benefit of the reduced rates was insufficient to warrant the audit documentation that must be supplied. In 2022, the PRO carried out prospective studies for new eco-modulation criteria to address these challenges.

Re_fashion provides financial support for sorting and recycling facilities owned by private operators, including the non-profit organisations Le Relais and Emmaüs. Subject to meeting various performance and traceability requirements, a rate of 80 EUR/tonne is paid for items sent for reuse, 180 EUR/tonne for items sent to recycling and 20 EUR/tonne for items sent for energy recovery. Higher rates are paid to operators hiring disadvantaged workers. These subsidy payments account for about two-thirds of revenues from member contributions. Much of the remainder is devoted to consumer awareness campaigns and funding innovative demonstration projects and research.

In 2022, the reuse rate of collected textiles was roughly 59.5%. From its introduction in 2009 to 2022, the share of collected garments used as material for garnetting (recycling) grew from 14% to 31.3%; however, energy recovery also grew from 0% to 8.2%.

Source: OECD (2022[15]); Re_fashion (2023[16]); Bukhari, Carrasco-Gallego and Ponce-Cueto (2018[17]);

3. Strengthen the circular design of textiles

As highlighted above, circular design of textiles is an overarching guiding principle to make the textile value chain more sustainable and circular. A mix of policy instruments, from financial and economic incentives to ecodesign requirements and awareness-raising and education measures, can strengthen the circular design of textiles. The circular design of textiles also requires good data and feedback loops from the different life cycle stages, including how much material is wasted in production and knowledge of available recycling technologies and processes, in order to design textile products in a way that maximises the use of waste as a resource but also allows for reuse and recycling. It is proposed that North Macedonia focus on two key measures to support the circular design of textiles: 1) introducing ecodesign requirements to extend the lifetime of textile products, in line with the EU proposal for Ecodesign for Sustainable Products

Regulation in the medium term; and 2) financially supporting innovative projects that aim to develop circular design and cut patterns, with a focus on optimising textile waste generated in production in the long term, as this is one key issue in the country.

Introduce ecodesign requirements for textiles to make them last longer, easier to repair and recycle, as well as requirements on minimum recycled content

Ecodesign and labelling measures have positively reduced GHG emissions associated with a range of products in the European Union. These measures not only lead to consumer savings but also enhance business revenues and create job opportunities (European Commission, 2021[18]). This is particularly crucial in the realm of textiles, considering their significant environmental footprint. Embracing ecodesign principles would not only contribute to reducing the environmental footprint of the textile industry but would also align with global sustainability trends, enhancing North Macedonia's competitiveness and fostering responsible consumption and production practices. Moreover, it can empower consumers in North Macedonia by providing them with clear and transparent information about certain features of the products, such as their durability, reparability and environmental performance, enabling more informed and sustainable purchasing decisions.

In the medium term, North Macedonia must introduce ecodesign requirements for textiles to make textile products more circular, **in line with the EU proposal for Ecodesign for Sustainable Products Regulation, as the country is a key exporter of textiles to the European Union, and as such will need to comply with these requirements.** Under this proposal, the European Commission aims to develop binding product-specific ecodesign requirements to increase textiles' performance in terms of durability, reusability, reparability, fibre-to-fibre recyclability and mandatory recycled fibre content; minimise and track the presence of substances of concern; and reduce the adverse impacts on climate and the environment. The ecodesign requirements will include performance requirements and information requirements. The performance requirements can take the form of either a quantitative level or a non-quantitative requirement that aim to improve a certain product aspect, such as, for example, recyclability. Information requirements will be related to the adoption of digital product passports and requirements related to substances of concern. The digital product passports will provide the means to electronically register, process and share product-related information among supply chain businesses, authorities and consumers (EU proposal for Ecodesign for Sustainable Products Regulation). There will also be a need for co-operation among supply chain actors, manufacturers, public authorities and other competent bodies to ensure the product complies with such requirements. The introduction of ecodesign requirements will also need to be supported by eco-labels to comply with the information requirements. Box 7.4 presents the ecodesign criteria for consumer textiles that might be relevant to consider when introducing ecodesign requirements. Companies can also start preparing by paying attention to traceability and impact calculation of their textile products.

Box 7.4. Mapping possible ecodesign criteria for circular fashion and textiles

Description of the research in Flanders, Belgium

In 2020, the Public Waste Agency of Flanders facilitated a study focused on ecodesign criteria for circular textiles. Collaboration with stakeholders allowed identifying key aspects to enhance the circularity of the textile chain.

The criteria outlined in the published report emphasise factors such as longevity, reuse, disassembly, repair, upcycling and high-quality recycling, which play a crucial role in fostering a transparent and sustainable textile chain. The report defines distinct product categories for ecodesign in textiles, spanning:

- clothing
- protective clothing
- bath, bed and kitchen textiles
- curtains
- upholstery fabrics
- mattress ticking
- floor coverings.

To support the implementation of ecodesign, the study investigated standards that could serve as requirements within a regulatory framework. These elements were identified then categorised into three main aspects related to the ecodesign of textile products: 1) life prolongation; 2) closing the loop; and 3) responsible production.

Life prolongation as an aspect of ecodesign for circular textiles

Among the textile industry stakeholders involved in the study, life prolongation emerged as the most crucial aspect of ecodesign, recognised for its potential to swiftly achieve significant environmental gains. Within its subcategories – quality, repairability and maintenance – the predominance of quality was emphasised as key for extending a product's life. Criteria were formulated for each product category, establishing the minimum quality threshold that designates a textile product as suitable for prolonged use. The selection of these criteria was guided by insights from standards associated with the product category and Centexbel's (scientific centre for the Belgian textile industry) expertise as a testing lab. The proposed quality criteria for the final product group consist of a comprehensive set of test standards, minimum test values and product standards, incorporating categorisation based on quality considerations.

The following steps are deemed necessary to develop a solid quality standard for all product categories:

1. Identifying the reasons for the end-of-life of a particular textile product category and, if necessary, breaking it down into subcategories.
2. Linking these end-of-life reasons to specific product quality parameters (for clothing these are usually the strength of seams, tears, colour, appearance after a wash/dry cleaning, etc.).
3. Identifying a suitable test method for each identified parameter.
4. Determining minimum limits for every test method through a correlation study examining the relationship between the lifetime of a textile product and the outcomes of the test method.
5. Consolidating the various test methods and their associated minimum limits into a comprehensive set of requirements.

Source: OVAM (2021[19]).

Financial support to circular design projects and innovations

North Macedonia should provide financial support to projects that promote and implement circular design projects and innovations in the textile industry in the long term. Around 95% of the domestic apparel production is export-oriented, meaning that the product design is developed in the exporting countries, mainly in Europe. Supporting local projects in circular design is of key importance to minimise textile waste from production. This could include projects that aim to develop product designs for longevity, recycling or disassembly, including, for example, modular designs, removable stiches/glue, mono-material designs, or 3D design and pattern development. Other supported projects could focus on design and cut patterns development to help optimise efficiency in textile production and minimise textile waste and fabric

leftovers from cutting (the so-called upcycling approach). Providing innovative circular design methods for fabric leftovers and textile waste can significantly reduce the environmental impact of the fashion and textile industry (Aus et al., 2021[9]). Upcycling is generally understood as a design-based circular fashion approach, where pre- or post-consumer textile waste material is repurposed to create new garments (Aus et al., 2021[9]). Such financial support could be provided in the context of supporting the uptake of circular business models, as outlined in Chapter 4 (this would be more relevant for scaling up upcycling), or through GPP that could focus on promoting the uptake of the use of recycled textile fibres (see Box 7.5 for an example from Italy).

Box 7.5. Supporting the circular design of textiles through green public procurement

In Italy, since 2016, all public entities are obliged to apply green public procurement (GPP) criteria for products and services for which GPP criteria have been defined (Italian Public Contract Code). For some products, the presence of recycled content constitutes an award criterion that improves the evaluation score for the good or service. This is the case, for instance, for GPP criteria for textile products that reward the presence of recycled textile fibres, for by-products from industrial symbiosis processes, and goods prepared for reuse and the presence of additional repair and maintenance services offered for the goods supplied (Ministerial Decree 30/06/21). Specific voluntary labelling and certification schemes enable companies to declare compliance with GPP criteria (both minimum and award criteria), such as the Remade in Italy environmental certification for recycled content. Moreover, minimum recycled content requirements constitute eligibility criteria to benefit from certain tax benefits targeted at enterprises.

Source: OECD (2024[20]).

Government support for the circular design of textiles is relatively new, and there therefore is a lack of examples of international good practices. However, more examples will become available in the near future, in particular in EU member states as the European Commission rolls out its plan for sustainable and circular textiles. Upscaling of upcycling and of other circular design approaches will, nevertheless, require multi-stakeholder collaboration throughout the value chain, including collaboration between designers and manufacturers but also recyclers to better understand the waste flows and the opportunities brought by new designs and materials used in textile production. Such collaboration could be facilitated by industrial symbiosis within green industrial zones in North Macedonia and promoted as part of a circular economy business platform, as recommended in Chapter 4.

References

Aus, R. et al. (2021), “Designing for circular fashion: Integrating upcycling into conventional garment manufacturing processes”, *Fashion and Textiles*, Vol. 8/34, https://doi.org/10.1186/s40691-021-00262-9. [9]

Bukhari, M., R. Carrasco-Gallego and E. Ponce-Cueto (2018), “Developing a national programme for textiles and clothing recovery”, *Waste Management & Research: The Journal for a Sustainable Circular Economy*, Vol. 36/4, pp. 321-331, https://doi.org/10.1177/0734242x18759190. [17]

Design4Circle (2021), "Circular economy in the textile and footwear industry: Skills and competences for a sector renewal", https://design4circle.eu/wp-content/uploads/2021/04/CIRCULAR%20ECONOMY_IN_THE_TEXTILE_AND_FOOTWEAR_INDUSTRY_SKILLS_COMPETENCIES_FOR_SECTORAL_RENEWAL.pdf. [7]

Eco-TLC (2019), *2018 Annual Report*. [16]

EEA (2021), *Municipal Waste Management: Country Fact Sheet North Macedonia*, European Environment Agency, Copenhagen, https://www.eea.europa.eu/themes/waste/waste-management/municipal-waste-management-country/north-macedonia-municipal-waste-factsheet-2021. [5]

Ellen Macarthur Foundation (2017), *A New Textiles Economy: Redesigning Fashion's Future*, Ellen Macarthur Foundation, Cowes, Isle of Wight, United Kingdom, https://ellenmacarthurfoundation.org/a-new-textiles-economy. [2]

European Commission (2022), *EU Strategy for Sustainable and Circular Textiles*, European Commission, Brussels, https://environment.ec.europa.eu/publications/textiles-strategy_en. [11]

European Commission (2021), *Ecodesign Impact Accounting Annual Report 2021*, European Commission, Directorate-General for Energy, Publications Office of the European Union, https://op.europa.eu/en/publication-detail/-/publication/392bc471-76ae-11ed-9887-01aa75ed71a1/language-en. [18]

European Commission (2020), "The impact of textile production and waste on the environment (infographics)", https://www.europarl.europa.eu/news/en/headlines/society/20201208STO93327/the-impact-of-textile-production-and-waste-on-the-environment-infographics (accessed on 4 December 2023). [6]

Gold Standard (2023), *Rule Clarification - Refuse derived fuel*, https://globalgoals.goldstandard.org/standards/RC-2023-Refuse-Derived-Fuel.pdf (accessed on 14 December 2023). [21]

ILOSTAT (2023), "Country profile North Macedonia", https://ilostat.ilo.org/data/country-profiles/?. [8]

Invest North Macedonia (2022), "Introduction to key industries", https://investnorthmacedonia.gov.mk/export-key-industries/#:~:text=Textile%20and%20clothing,of%20the%20country%20after%20metallurgy. [3]

Jordeva, S. et al. (2018), "Sustainability of the textile waste stream in Macedonia", *Advanced Technologies*, Vol. 7/1, pp. 74-78, https://doi.org/10.5937/savteh1801074J. [4]

OECD (2024), *Material consumption* (indicator), https://doi.org/10.1787/84971620-en (accessed on 27 February 2024). [20]

OECD (2022), *Closing the Loop in the Slovak Republic: Annexes*, OECD, Paris, https://www.oecd.org/env/waste/Closing-the-Loop-in-the-Slovak-Republic-Annexes.pdf. [15]

OECD (2022), *Global Plastics Outlook: Economic Drivers, Environmental Impacts and Policy Options*, OECD Publishing, Paris, https://doi.org/10.1787/de747aef-en. [22]

OVAM (2021), *Ecodesign Criteria for Consumer Textiles*, Public Waste Agency of Flanders, https://circulareconomy.europa.eu/platform/sites/default/files/ecodesign_criteria_for_consumer_textiles.pdf. [19]

Switchmed (2020), *Circular Business Opportunities in the South Mediterranean: How Can Businesses Lead the Way to Sustainable Fashion?*, Regional Activity Centre for Sustainable Consumption and Production, http://www.cprac.org/en/news-archive/general/scp/rac-lance-un-nouveau-rapport-opportunites-commerciales-circulaires-dans-le-. [12]

UNEP (2020), *Sustainability and Circularity in the Textile Value Chain: Global Stocktaking*, United Nations Environment Programme, Nairobi, https://wedocs.unep.org/20.500.11822/34184. [1]

West Yorkshire Combined Authority (2020), *Leeds City Region: Textiles Sector Showcase*, Leeds City Region Enterprise Partnership, https://www.westyorks-ca.gov.uk/media/5423/textiles-project.pdf. [10]

Wrap (n.d.), "Textiles Recycling and Re-use Grant", web page, https://wrap.org.uk/what-we-do/our-services/grants-and-investments/resource-action-fund/textiles-recycling-and-re-use-small-scale-grant (accessed on 14 December 2023). [13]

Zero Waste Europe (2023), *How to Collect, Sort, and Reuse Textile Waste Locally? An Overview of Policy Options for Municipalities*, Zero Waste Europe, https://zerowasteeurope.eu/wp-content/uploads/2023/12/zwe_Dec23_guidance_textile_collection_and_sorting.pdf. [14]

Notes

[1] Chemical recycling processes plastic waste by applying chemical agents that break down waste material into its building blocks (either polymers, monomers or fuels) (OECD, 2022[22]).

[2] Refuse derived fuel is a fuel produced from different types of combustible waste that are commonly used in cement plants or as a co-combustion fuel in power and other industrial plants (Gold Standard, 2023[21]).

8 Circular potential in mining and metallurgy in North Macedonia

This chapter outlines the circular economy potential of North Macedonia's mining and metallurgy sectors, examining key aspects such as mining and metal processing value chains, material flows, research and innovation, and industrial symbiosis. It identifies crucial levers to make the sectors more circular. The analysis reviews the existing circular economy-related policy landscape, pinpoints areas for improvement and presents specific policy recommendations, enriched with insights from international best practices.

The circular economy in the mining and metallurgy sectors

Minerals and metals are central to the circular economy transition. They are key material inputs into other sectors of the economy, including manufacturing, construction and energy, driving the green transition. The mining and metallurgy sectors in this chapter are defined as including:

- mining operations (extraction, aggregating, hauling, etc.)
- processing operations (concentration, separation, dewatering, etc.)
- material production (smelting, refining, cutting, etc.).

To date, primary resource sectors, such as mining and metals production, and how to improve circularity in these sectors, have received comparatively less attention from scholars and policy makers. According to the most common definitions of a circular economy, the consumption of primary minerals and metals is simply to be reduced, while the focus of primary materials management is on circular production (manufacturing), consumption and waste management. As a result, these sectors are also often not included in circular economy strategies or roadmaps. Nevertheless, a few studies explore circular economy strategies that could be applied to mining and metal production value chains.

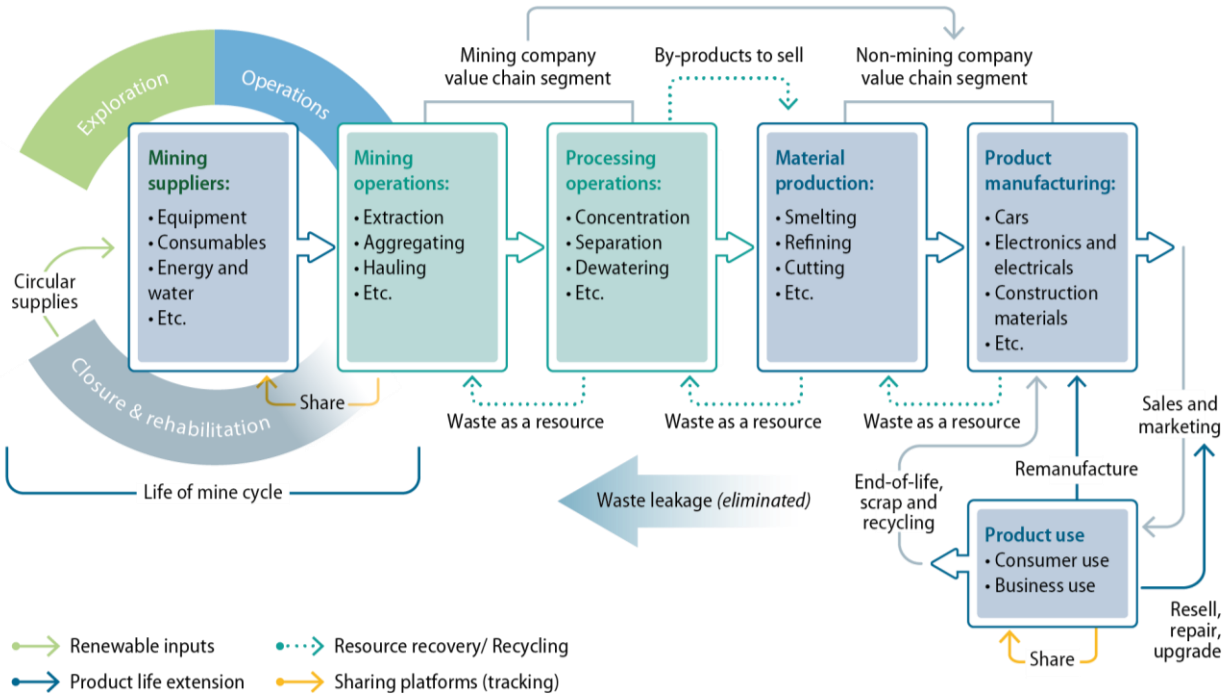
Based on such studies (Young, Barreto and Chovan, 2021[1]; Smart Prosperity Institute, 2021[2]), companies can apply different circular business models to make their value chains more circular (Figure 8.1) These are primarily resource recovery models but can also include circular supply and sharing models. Upstream circular practices could be classified into two blocks of actions (adapted from Young, Barreto and Chovan (2021[1]) and Smart Prosperity Institute (2021[2])):

1. Actions directed at more circular supply and use of the physical infrastructure, equipment and assets of a mining and processing company. This may include procurement of mining and material production equipment that is more circular (e.g. refurbished, used or bearing recycled content). It may also include recycling, upcycling, redeploying of products and equipment that are already on-site, and refurbishment and remanufacture of on-site products to extend their value. Companies can also share, rent, prolong and maintain their equipment to optimise use and value.
2. Actions directed at more circular management of resources that are extracted and used in mining and processing operations. This may include extracting embedded value from mining and processing wastes by recycling, repurposing, redirecting and reprocessing such wastes on-site. It may also include waste exchanges with other industries and selling by-products through industrial symbiosis.

Motivations for the selection of the mining and metallurgy sectors as a key priority area of the Roadmap

The mining and metallurgy sectors were selected as a key priority area of this roadmap because of their high economic importance, strong policy relevance and important decarbonisation potential. While the circular economy potential is less understood, these sectors could adopt a number of circular practices and business models that would lead to more circular supply and use of products and equipment that are used on-site and in metal processing as well as better management of extracted and used resources and waste.

Figure 8.1. The circular economy in the mining and material processing and production value chains in North Macedonia and their downstream linkages



Source: Adapted from Smart Prosperity Institute (2021[2]) and Accenture (2019).

Mining and quarrying accounted for 1.3% of gross domestic product (in 2018) and 10.9% of industrial production (in 2021) in North Macedonia and has a long history in the economy (Macedonian Mining Association, 2021[3]). North Macedonia is rich in different materials – metallic minerals found in its territory include copper, silver, gold, zinc and lead; non-metallic minerals include bentonite, talc, gypsum, quartz and quartz sand; and energy materials include coal (lignite) (Macedonian Mining Association, 2021[3]). The employment figures in this sector are relatively low compared to other sectors, but the sector accounts for 2.8% of total exports (Macedonian Mining Association, 2021[3]). The mining sector has been particularly backed by important foreign direct investment in the past decade due to lower restrictions on procedures for issuing permits and concessions. However, mining methods of extraction have resulted in long-lasting water and soil pollution, affecting biodiversity and the health of the local population.

Metallurgy, or basic metals production (most exported products include ferroalloys, hot-rolled steel, goateed flat-rolled steel, steel pipe and tubes, and steel bars) is one of the largest industrial sectors of the Macedonian economy. It is comprised of complex technical and technological stems for production as well as modern equipment and technologies for advanced processing of basic metals, making it significantly important and strategic for the economy (Invest North Macedonia, 2023[4]). Basic metals production represented 13.6% of exports in 2021, the vast majority being exported to the European Union (EU) (World Bank, 2023[5]), with iron and steel imports representing 8.9% of the European Union's total imports from North Macedonia in 2022 (European Commission, 2023[6]).

A Strategy for Geological Research and Sustainable Use and Exploitation of Mineral Resources for 2025-2045 is currently being drafted – evidence of the increasing policy relevance of the mining sector in North Macedonia. The metal industry is also covered under the Industrial Strategy (2018-2027). While the strategy does not foresee sustainability and circular considerations, it does envisage the diversification of

metal products through more complex production processes. This area has also been gaining increasing attention from governments around the world, as certain materials, in particular certain metals with high supply risks, are critical or strategic for their economies and green transitions in particular. Ensuring secure and sustainable supply chains of these so-called critical and strategic raw materials is a key objective of the European Union's proposal for a Critical Raw Materials Act. For instance, copper, which can be found in North Macedonia, is a strategic raw material according to the 2023 list of critical raw materials for the European Union (European Commission, n.d.[7]).

These two sectors also have an important decarbonisation potential, as metals and minerals extraction and production account for a significant share of total greenhouse gas emissions. Estimates vary from around 45% to 67% of total emissions, depending on the geographical scope, the methodological approach (including the scope of activities and materials associated with materials management) and the time period of the analysis (OECD, 2022[8]). The majority of emissions related to materials are associated with the production of materials, goods and infrastructure and include energy-related emissions to manufacture products and materials. Considering the operationalisation of the European Union's Carbon Border Adjustment Mechanism[1] in 2026 and its impact on exports of goods with a high risk of carbon leakage (including iron, steel and aluminium), transitioning to circular production processes of metal products could be beneficial for North Macedonia.

Overview and approach to the selection of the proposed policy recommendations

The approach used for selecting the proposed policy recommendations that would consider the entire life cycle of a product or material as used in the textiles, construction, and biomass and food priority areas is less applicable to this area because of the area's focus on upstream sectors only. The proposed policy recommendations for this priority area are, therefore, structured according to the different types of government support, including multi-stakeholder collaboration, awareness raising and education, financial and economic incentives, and regulatory measures (Table 8.1). Not all of the proposed policy recommendations are relevant for both mining and metals production value chains. Typically, metals production/metallurgy sectors already implement circular practices within their value chains, in particular, metals recycling and the use of scrap, as it is profitable to do so. It is mostly the application of circular practices in the mining value chain and the creation of the linkages between the different industrial sectors (e.g. through industrial symbiosis) to facilitate recycling and the use of secondary raw materials that could be supported further by policy intervention.

Table 8.1. Overview of the proposed policy recommendations in the priority area mining and metallurgy for North Macedonia

Short term	Medium term	Long term
Develop a study to understand the circular economy potential in the mining and metal processing value chains in North Macedonia	Facilitate industrial symbiosis to further support the use of waste from the mining and metal processing/production companies and creation of markets for secondary raw materials	Apply circular principles in procedures for issuing permits and concessions
Incorporate circularity principles in the new Strategy for Geological Research and Sustainable Use and Exploitation of Mineral Resources for 2025-2045	Improve understanding of circular practices on-site and data availability to map material flows of metals and minerals	Consider introducing recovery obligations to support material recovery and secondary raw materials production
	Support upstream eco-innovation and research and development to enhance metal and mineral value chains for a low-carbon economy	

Key proposed policy recommendations

The key proposed recommendations are structured according to the type of policy instrument:

1. awareness-raising initiatives, education and multi-stakeholder co-operation to improve the understanding and application of circular practices in the upstream value chains
2. financial support measures and economic instruments to support upstream eco-innovation and research and development (R&D)
3. supporting legislation and policies for circular value chains in mining and metallurgy.

1. Improving stakeholder engagement, education and collaboration, and raising awareness

The understanding and application of circular principles in primary resource sectors is, in general, limited (Smart Prosperity Institute, 2021[2]). Moreover, there is limited evidence on the potential of applying circular practices in these sectors in North Macedonia. The country should also explore how green industrial zones could be used to facilitate waste exchange among different industries, including from mining and metallurgy processes. North Macedonia should thus introduce a set of measures to:

- develop understanding of the circular economy potential in the mining and metal processing value chains in North Macedonia
- improve understanding of circular practices on-site and data availability to map out material flows of metals and minerals
- facilitate industrial symbiosis in green industrial zones.

Develop a study to understand the circular economy potential in the mining and metal processing value chains in North Macedonia

In the short term, North Macedonia should develop a study to better understand the circularity potential in its domestic mining and metal processing value chains. While applying a circular economy in the metallurgy sector is not new – for example, steel scrap is often used to produce steel – this may be less so for other materials and the mining value chain. The study could map relevant stakeholders in the mining and metal production value chains, analyse the current situation, identify data gaps and key issues, and propose solutions that are feasible within a certain time frame. The study can be commissioned by a dedicated working group on mining and metal processing, which could be formed and operate as a sub-group within the wider circular economy stakeholder group set up for the preparation and implementation of this roadmap. The action plan for the extractive industry developed in Finland provides a good practice example in this regard (Box 8.1). The study may also specifically focus on industrial symbiosis and using waste as a resource in the green industrial zones.

Improve understanding of circular practices on-site and data availability to map out material flows of metals and minerals

Once the circularity potential in the Macedonian mining and metallurgy sectors is better understood, North Macedonia should also improve understanding of circular practices on-site as well as data on material flows of metals and minerals in the medium term. There is a need to invest in increasing recognition and understanding of circular economy practices and potential “value from waste” at the mine site (Young, Barreto and Chovan, 2021[1]). In North Macedonia, this may require supporting the education and training of workers as well as setting up material flow data systems to inform prospective demand, and thereby investments and R&D priorities. The Macedonian Mining Association, in co-operation with the Ministry of Economy, could take the lead in conducting such trainings. For example, to support

the development of regional markets for secondary raw materials among the mining, processing and construction industries, the Finnish circular economy strategy foresaw the organisation of a training seminar on the topic, where a working model for using secondary materials in infrastructure construction would be presented to key operators (Sitra, 2016[9]).

Box 8.1. Example of an action plan for the extractive industry developed in Finland

In 2013, the Finnish government developed an action plan together with mining companies, regional representatives and other stakeholders. The aim of the action plan was to make Finland a leader for the sustainable extractive industry. An Extractive Industry Working Group, consisting of officials from several ministries, monitors the implementation of the action plan through yearly roundtable forums. The action plan outlines a total of 35 measures and assigns a responsible stakeholder for each measure. Examples of measures are:

- The creation of water management plans for mines and the development of water technology. Mining companies are responsible for the implementation of this measure.
- A research strategy was prepared for the extractive industry, comprising key fields of research and the development of research infrastructure. Responsible stakeholders are, for example, research institutes, universities, extractive industry companies, and the Finnish Funding Agency for Technology and Innovation.
- The energy efficiency of the extractive industry has been systematically addressed. The responsible parties for this include extractive industry companies and the Finnish Association of Extractive Resources Industry.
- Obstacles to the recycling of metal scrap in the metal processing sector were identified and eliminated. In addition, instruments, steering methods and incentives were created for the recycling and reuse of side rock, tailings, construction masses and mineral products. Here, the government, several ministries, municipalities and government agencies are responsible.

Source: OECD (2019[10]).

Facilitate industrial symbiosis in green industrial zones

To further support the use of waste from the mining and metal processing/production companies and **creation of markets for secondary raw materials, North Macedonia should enhance industrial symbiosis in the green industrial zones in the medium term.** Green industrial zones or eco-industrial parks are a key policy approach to promote industrial symbiosis (Domenech et al., 2018[11]). As outlined in Chapter 4, ongoing amendments to the Law on Industrial and Green Zones could incorporate provisions to promote resource recovery and recycling among the mining industry, processing industry and construction, thereby creating an environment conducive to strengthening business partnerships and collaboration. Business partnerships could be further promoted by the proposed circular economy business platform. To support the scaling of industrial symbiosis in North Macedonia, the government could get inspiration from existing practices and policy guides in EU member states. For example, Ireland has developed a guide for policy making related to industrial symbiosis that provides insights for supporting greater implementation and scaling of industrial symbiosis (Impoco, Arodudu and Brennan, 2021[12]).

2. Financial support and economic incentives for upstream eco-innovation and R&D to enhance metal and mineral value chains for a low-carbon economy

Besides the decarbonisation potential of a circular economy in materials management, as outlined above, the circular economy also has a role to play in advancing strategic metal and mineral contributions to a low-carbon energy transition. This includes new research programmes, partnerships and policy initiatives to advance the potential for circularity in specific metal and mineral value chains that contribute to a low-carbon economy, as well as accelerating innovation and derisking circular economy investment with a high decarbonisation potential in strategic metals and minerals. Metal processing practices in North Macedonia tend to be outdated, dating back to before the 1990s (OECD, 2019[10]). In addition, as underlined during the stakeholder consultations, more incentives are needed for Macedonian companies to make a behavioural shift from using primary materials to using secondary and waste materials.

To achieve the net zero ambition by 2050, North Macedonia will need to support upstream eco-innovation and R&D to enhance metal and mineral value chains that contribute to a low-carbon economy in the medium term. This can be achieved by introducing new research programmes to foster building partnerships for upstream eco-innovation and R&D and to support innovative metal production techniques to accelerate innovation or innovative recovery technologies to recover strategic or critical raw materials that are relevant for a low-carbon economy transition (e.g. renewable technologies). For instance, in the upstream, innovative exploitation methods should minimise environmental nuisance, foster recycling, and further use co-products and by-products of mining and environmentally manage the waste produced as a result of the mining activity. Partnerships should include co-operation between academia and industry as well as industrial symbiosis. This was also highlighted during stakeholder consultations. Fostering the application of digital technology also has vast potential to improve circularity in the metal processing sector, for example, in the areas of storing and communicating information about the location, condition and availability of scrap. For example, Maersk, an integrated container logistics company, uses digital product passports to recover and sort steel from its decommissioned vessels more effectively, recycle it to a higher quality, and reuse it for building new vessels (Ellen MacArthur Foundation, 2019[13]; EPEA, 2011[14]). Likewise, digital technology, such as blockchain-based pilot projects, can improve traceability in logistics to enable optimal stock utilisation, thus reducing material waste and transport costs (OECD, 2019[10]; 2022[15]). Some of the funding programmes to increase circular business models (see Chapter 4), and in particular funding that will be available in the green industrial zones, could be used for this purpose.

Supporting upstream eco-innovation could also be supported by green public procurement (GPP) to promote the use of secondary raw materials when supplying products and works, in particular public construction works. For example, in Italy, the use of GPP criteria is mandatory for products and services for which such criteria have been defined (Italian Public Contract Code). This includes criteria for by-products from industrial symbiosis processes (Ministerial Decree 30/06/21) to support the use of recycled content.

3. Supporting legislation and policies for circular value chains in mining and metallurgy

Besides financial and economic incentives, North Macedonia will also need to develop a regulatory framework that supports circularity in domestic mining and metallurgy value chains. This is even more timely as the European Union and other countries around the world advocate for more circular supply chains of critical and strategic raw materials. The mining sector is currently regulated by the Law on Mining (2012), which was adopted with the aim of lowering restrictions on procedures for issuing permits and concessions to secure important foreign direct investment in the past decade. However, mining methods of extraction have resulted in long-lasting water and soil pollution,[2] affecting biodiversity and the local population's health. As a result, the legal and policy framework targeting raw materials and the mining sector are being reinforced to include social and environmental requirements. The law was amended

in 2019 and 2021 to better protect the population's health and the environment, after citizens led protests against the rapid increase of government-issued mining concessions. The Ministry of Economy is currently also developing a new Strategy for Geological Research and Sustainable Use and Exploitation of Mineral Resources for 2025-2045 in close consultation with the Macedonian Academy for Science and Arts and the Mining Association. The strategy will aim to further develop the mining sector, with a focus on sustainable use of resources and environmental protection standards (Chamber of Commerce of North Macedonia, 2023[16]).

Despite these developments, North Macedonia's regulatory framework needs to be strengthened to make mining and metallurgy value chains more circular. It is proposed that the roadmap focus on three regulatory measures to enhance circularity in the mining and metallurgy sectors:

- incorporating circularity principles into the new Strategy for Geological Research and Sustainable Use and Exploitation of Mineral Resources for 2025-2045
- applying circular principles in procedures for issuing permits and concessions
- considering introducing recovery obligations to support material recovery and secondary raw materials production.

Incorporating circularity principles into the new Strategy for Geological Research and Sustainable Use and Exploitation of Mineral Resources for 2025-2045

To address challenges inherent in the extraction of raw materials and support the development of mining projects that are environmentally as well as socially sustainable, a coherent and co-ordinated policy approach is needed that considers environmental, regional and economic policies.

In the short term, the government of North Macedonia should ensure that circularity principles are mainstreamed into the new Strategy for Geological Research and Sustainable Use and Exploitation of Mineral Resources for 2025-2045. These principles should include provisions that non-renewable natural resources be used sustainably and that mining side streams be utilised. During material processing and the material development stage, different materials should be returned into the value chain at the end of their useful life. To promote circularity in mining, and minerals and metals processing and production, North Macedonia could take inspiration from the OECD *Handbook on Environmental Due Diligence in Mineral Supply Chains* (OECD, 2023[17]), the EU Critical Raw Materials initiative or one of the EU member states that have adopted secondary raw materials policies (see the example of the Czech Republic in Box 8.2). North Macedonia's future strategy could also include considerations for promoting regional industrial symbiosis.

Box 8.2. Secondary raw materials policy of the Czech Republic

Czechia's Secondary Raw Materials Policy was developed in collaboration with experts from academia and industry, and approved by the Czech government in 2014. It is the first document establishing a national strategic framework for the use of secondary raw materials, defining 5 strategic objectives and 16 measures, with specific tasks being developed in a separate action plan. The policy includes the circular economy in its vision. It also sets out strategic goals for the extraction, processing and use of secondary raw materials from domestic and imported sources, with a focus on ten priority commodities that are of particular value for the country's production and export. The policy's overall objective is to increase the share of secondary raw materials in the total consumption of materials in the Czech economy to reduce the material and energy intensity of production. The five strategic objectives are:

1. increasing Czechia's self-sufficiency in raw materials by substituting primary sources with secondary raw materials
2. supporting innovation and circular economy development in businesses
3. supporting the use of secondary raw materials as a tool to reduce the energy and material intensity of industrial production while at the same time eliminating the negative impacts on the environment and human health
4. supporting education and training in the area of the circular economy
5. updating statistical findings in the area of secondary raw materials to monitor and evaluate the circular economy.

The list of priority materials remains open to updates as business needs and the economy change.

Czechia also has a separate Raw Materials Policy, which addresses energy and non-energy raw materials, ore and non-ore commodities, including energy, construction and high-tech mineral resources. The strategy's main goal is the security of supply of raw materials.

Sources: OECD (2021[18]; 2023[19]); Ministry of Industry and Trade of the Czech Republic (2016[20]).

North Macedonia's strategy should outline an action plan developed together with mining companies, regional representatives and other stakeholders to achieve the goals of the new strategy. Such a plan may include, for example, a measure to establish a database of extractive waste facilities and require operators to submit waste management plans, including for hazardous waste, or a measure to introduce end-of-waste (EoW) criteria for certain wastes from the metallurgy sectors that could be used as by-products by other industries. For example, steel slag from steel production can be used for the production of construction aggregates if it complies with the EoW criteria. The EoW criteria would set out the quality criteria for how the aggregate should be produced so that it is no longer considered waste material. This will reduce the regulatory burden on the producers and users of steel slag aggregate. A number of countries have adopted EoW policies and criteria for steel slag. Box 8.3 presents examples from the United Kingdom. Moreover, considering the document's 20-year timeline, a mid-term monitoring and evaluation mechanism should be embedded in the strategy to assess the continued relevance of the priorities and progress made towards achieving its planned objectives.

Box 8.3. Aggregate from waste steel slag: Quality protocol in the United Kingdom

The steel slag aggregate quality protocol was developed as a joint initiative between the Environment Agency and WRAP (Waste & Resources Action Programme) in consultation with Natural Resources Wales and the steel slag industry. It sets end-of-waste criteria for the production and use of steel slag aggregates in construction applications.

The quality protocol specifies that aggregate products made from waste steel slag will be regarded as fully recovered and no longer subject to waste controls provided it is shown that:

- only the correct waste steel slag materials were used
- only the permitted products were made
- compliance is ensured with the relevant European standard, specification and quality controls for the relevant product, and all required tests have been passed
- a manual of the factory production control exists
- the product has been marked to the circular economy requirements of the Construction Products Regulations
- the waste steel slag and the final product have been transported, stored, handled and processed following good practice guidelines
- the customer has been supplied with delivery documents confirming the product meets the quality protocol.

Under the quality protocol, the correct waste steel slag can be processed to make specified unbound, semi-bound or fully bound aggregate products for use in the civil engineering and construction industries. End uses for unbound ones are aggregates for sub-base, capping, fills and pipe bedding. For semi-bound ones, the end use is aggregates for surface dressing and those for fully bound ones are both: aggregates for asphalt and concrete and aggregates and activators for hydraulically bound mixtures.

The quality protocol also provides good practices on necessary inspection, measuring and testing equipment; staff training; and paperwork and a records checklist.

Source: UK Environment Agency (2016[21]).

Applying circular principles in procedures for issuing permits and concessions

To ensure that mining value chains are sustainable, North Macedonia will need to apply circular principles in procedures for issuing permits and concessions in the long term. This may be done by incorporating the circular economy into environmental impact assessment studies preceding the issuance of permits. For example, the Greek National Circular Economy Strategy foresees the following steps to achieve this (Ministry of Environment and Energy of Greece, 2018[22]):

- identifying the possibilities for improving environmental legislation to facilitate the uptake of circular economy approaches
- integrating circular economy criteria into the environmental permits of investments and infrastructure and accelerating the relevant administrative procedures
- investigating possibilities to facilitate industrial symbiosis, e.g. by not requiring a fully fledged environmental impact assessment when testing the possibility to use by-products in industrial processes and relying only on a technical assessment.

Moreover, the Finnish National Circular Economy Strategy includes as a measure the need to plan and describe the side streams produced during the project, such as surplus spoil in the environmental impact assessment and environmental permit processes (Sitra, 2016[9]). Other circular principles that can be considered include supporting recycling and off-site repurposing of end-of-life items; promoting and supporting environmental, social and governance standards across the mining and metal processing value chains; and introducing mandatory requirements to rehabilitate a mine site to eliminate contamination on-site and off-site. In Canada, for example, mine reclamation plans, including financial securities, are a condition of granting mine permits (Smart Prosperity Institute, 2021[2]).

Consider introducing recovery obligations to support material recovery and secondary raw materials production

In the long term, North Macedonia should further support material recovery and secondary raw materials production. Secondary raw materials production from mining sites involves extracting valuable materials from waste or by-products generated during the primary mining and processing of ores. Examples include reprocessing tailings (leftover materials after the valuable minerals have been extracted from ore); slag recycling (by-product formed during the smelting or refining of metals); recycling scrap metal from mining operations or recovery from waste rock, separated during the initial stages of mining (Blengini et al., 2019[23]). Supporting such processes can be done, for example, by establishing requirements to recover a share of valuable residual minerals from mining waste and historical mining waste sites. The European Commission has also outlined this in its Proposal for a Critical Raw Materials Act.[3] Processing secondary raw materials from mining waste, which are already mined and crushed, can cost less than extracting them from primary deposits, particularly those located at substantial depths. Researchers suggest that the cost of reprocessing tailings can be 40% lower than that of primary sources (Marín, Kraslawski and Cisternas, 2022[24]). This might be particularly relevant for North Macedonia considering that mining waste represents 35% of total industrial waste. This may also help achieve substantial greenhouse gas emissions reductions. For example, roughly 95% of energy is saved per tonne in the production of aluminium using scraps compared to primary aluminium production (European Aluminium, 2016[25]). The recovery obligations may also include an obligation for operators to submit waste management plans outlining the potential recovery of certain raw materials from the extractive waste stored in the facility and from the extractive waste being generated, in current and historical mining sites.

However, material recovery policies by themselves are not sufficient. Competitive and environmentally sustainable practices should also include redesign (e.g. using products with less materials), reuse, repair, remanufacturing and refurbishment strategies to reduce and avoid waste in the metal processing sector (OECD, 2020[26]). North Macedonia may want to align with EU efforts on recycled content and aim to benefit from it by becoming a supplier of recycled metals.

References

Barteková, E. and P. Börkey (2022), "Digitalisation for the transition to a resource efficient and circular economy", *OECD Environment Working Papers*, No. 192, OECD Publishing, Paris, https://doi.org/10.1787/6f6d18e7-en. [15]

Blengini, G. et al. (2019), *Recovery of Critical and Other Raw Materials from Mining Waste and Landfills*, European Commission, Joint Research Centre, Publications Office of the European Union, Brussels. [23]

Chamber of Commerce of North Macedonia (2023), "Sustainable mining, key aspects of the Strategy for Geological Research and Sustainable Use of Mineral Resources 2025-2045", web page, https://www.mchamber.mk/Default.aspx?mId=3&evid=130882&lng=1. [16]

Domenech, T. et al. (2018), *Cooperation Fostering Industrial Symbiosis Market Potential, Good Practice and Policy Actions*, Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, Publications Office of the European Union, Brussels, https://data.europa.eu/doi/10.2873/346873. [11]

Ellen MacArthur Foundation (2019), "Using product passports to improve the recovery and reuse of shipping steel: Maersk Line", web page, https://www.ellenmacarthurfoundation.org/circular-examples/using-product-passports-to-improve-the-recovery-and-reuse-of-shipping-steel. [13]

EPEA (2011), *Maersk Cradle to Cradle Passport: Total Vessel Recycling*, EPEA, https://www.youtube.com/watch?v=PRgp9tcOwaw. [14]

European Aluminium (2016), *Recycling Aluminium: A Pathway to a Sustainable Economy*, European Aluminium. [25]

European Commission (2023), *European Union, Trade in Goods with North Macedonia*, European Commission, Brussels, https://webgate.ec.europa.eu/isdb_results/factsheets/country/details_north-macedonia_en.pdf. [6]

European Commission (n.d.), "Critical raw materials: Ensuring secure and sustainable supply chains for EU's green and digital future", web page, https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials_en. [7]

Impoco, G., O. Arodudu and G. Brennan (2021), *Industrial Symbiosis: Guide for Policy Making*, Irish Manufacturing Research, https://www.epa.ie/publications/circular-economy/resources/2021_REP_EPA_SymbioBeer_Policy_Guide_FIN.pdf. [12]

Invest North Macedonia (2023), "Electro-metal industry", https://investnorthmacedonia.gov.mk/export-electro-metal-industry. [4]

Macedonian Mining Association (2021), *Review of the Situation in the Mining and Quarrying Sector*, https://www.mchamber.mk/upload/%D0%98%D0%9D%D0%A4%D0%9E%D0%A0%D0%9C%D0%90%D0%A6%D0%98%D0%88%D0%90_%D0%97%D0%90_%D0%A0%D0%A3%D0%94%D0%90%D0%A0%D0%A1%D0%A2%D0%92%D0%9E%D0%A2%D0%9E.pdf. [3]

Marín, O., A. Kraslawski and L. Cisternas (2022), "Estimating processing cost for the recovery of valuable elements from mine tailings using dimensional analysis", *Minerals Engineering*, Vol. 184/107629, https://doi.org/10.1016/j.mineng.2022.107629. [24]

Ministry of Environment and Energy of Greece (2018), *National Circular Economy Strategy*, Greek Government, http://www.ypeka.gr/LinkClick.aspx?fileticket=pYSLQXgjjOU%3D&tabid=37&language=en-US. [22]

Ministry of Industry and Trade of the Czech Republic (2016), *Secondary Raw Materials Policy of the Czech Republic*, Ministry of Industry and Trade of the Czech Republic, https://www.mpo.cz/en/industry/politics-of-secondary-raw-materials-czech-republic/secondary-raw-materials-policy-of-the-czech-republic--221854. [20]

OECD (2023), *Handbook on Environmental Due Diligence in Mineral Supply Chains*, OECD Publishing, Paris, https://doi.org/10.1787/cef843bf-en. [17]

OECD (2023), *Towards a National Circular Economy Strategy for Hungary*, OECD Publishing, Paris, https://doi.org/10.1787/1178c379-en. [19]

OECD (2022), "Closing the loop in the Slovak Republic: A roadmap towards circularity for competitiveness, eco-innovation and sustainability", *OECD Environment Policy Papers*, No. 30, OECD Publishing, Paris, https://doi.org/10.1787/acadd43a-en. [8]

OECD (2021), "Towards a national strategic framework for the circular economy in the Czech Republic: Analysis and a proposed set of key elements", *OECD Environment Policy Papers*, No. 27, OECD Publishing, Paris, https://doi.org/10.1787/5d33734d-en. [18]

OECD (2020), *OECD Workshop on International Trade and the Circular Economy: Summary Report*, OECD, Paris, https://www.oecd.org/env/workshop-trade-circular-economy-summary-report.pdf. [26]

OECD (2019), *Circular Approach and the Sustainability of the Agro-food System: Closing Resource Loops to Improve Sustainability (archived)*, OECD, Paris, https://www.oecd.org/agriculture/events/circular-approach-and-the-sustainability-of-the-agro-food-system-3-april-2019.htm. [10]

Sitra (2016), *Leading the Cycle. Finnish Road Map to a Circular Economy 2016-2025*, Sitra Studies 121, Finnish Innovation Fund, Helsinki, https://media.sitra.fi/2017/02/28142644/Selvityksia121.pdf. [27]

Sitra (2016), *Leading the Cycle: Finnish Road Map to a Circular Economy 2016-2025*, Sitra Studies 121, Finnish Innovation Fund, Helsinki, https://media.sitra.fi/2017/02/28142644/Selvityksia121.pdf. [9]

Smart Prosperity Institute (2021), *Primary Materials in the Emerging Circular Economy: Implications for Upstream Resource Producers and Primary Material Exporters*, Smart Prosperity Institute, https://institute.smartprosperity.ca/sites/default/files/emerging_circular_economy_report.pdf. [2]

UK Environment Agency (2016), "Aggregate from waste steel slag: Quality protocol", web page, https://www.gov.uk/government/publications/aggregate-from-waste-steel-slag-quality-protocol/aggregate-from-waste-steel-slag-quality-protocol (accessed on 19 December 2023). [21]

World Bank (2023), "North Macedonia trade", *World Integrated Trade Solution*, https://wits.worldbank.org/countrysnapshot/en/MKD (accessed on 16 November 2023). [5]

Young, A., M. Barreto and K. Chovan (2021), *Towards a Circular Economy Approach to Mining Operations: Key Concepts, Drivers and Opportunities*, Enviro Integration Strategies Inc., MERG, https://circulareconomyleaders.ca/wp-content/uploads/2022/01/Towards-a-Circular-Economy-Approach-to-Mining-Operations.pdf. [1]

Notes

[1] The Carbon Border Adjustment Mechanism is expected to become operational in 2026 and gradually apply to a selected number of goods with a high risk of carbon leakage (iron and steel, cement, fertiliser, aluminium, and electricity generation). As EU importers will buy carbon certificates corresponding to the carbon price that would have been paid had the goods been produced under the European Union's carbon pricing rules, non-EU producers, such as North Macedonia, will be encouraged to green their processes and lower production-related emissions.

[2] Concessions for mines in North Macedonia granted before the 2019 Amendment Law on Mining mainly used sulfuric acid, cyanide, thallium and arsenic to extract minerals from the ore.

[3] The document outlines the European Commission's proposals for ensuring stable access to critical raw materials crucial for strategic sectors like net zero and digital industries, aerospace, and defense. It prioritises setting action goals, identifying key materials, and establishing benchmarks for domestic capacity and supply chain diversification by 2030. It emphasises creating secure and resilient EU supply chains, simplifying permitting and supporting strategic projects. To address supply risks, the act introduces monitoring and co-ordination of critical raw material supply chains among EU member states. It mandates audits of strategic supply chains for certain large companies. The proposal stresses investment in research, innovation and skills to promote breakthrough technologies and partnerships relevant to critical raw materials. It highlights the importance of environmental protection through improved circularity in the European Union and globally. Internationally, the European Union aims to diversify critical raw material imports, engaging with reliable partners. Initiatives include establishing a Critical Raw Materials Club, strengthening the World Trade Organization, and forming strategic partnerships for economic development in emerging markets and developing economies (European Commission, n.d.[7]).

9 Monitoring framework

This chapter puts forth a monitoring framework with specific indicators tailored to each recommendation within the five priority areas presented in the roadmap for North Macedonia. This framework is a crucial tool for the effective implementation of the circular economy roadmap, playing a key role in assessing progress towards strategic targets and goals set for North Macedonia's circular transition.

Defining key indicators and monitoring progress

Establishing a monitoring framework for a circular economy is essential to track the progress towards specific targets and goals included in the roadmap for North Macedonia. This framework, using a set of indicators, plays a crucial role in evaluating the overall transition to a circular economy in North Macedonia over time. It will enable the policy makers of North Macedonia to grasp the country's performance on selected circular economy measures, identifying areas that need further intervention. The monitoring process is not only instrumental in setting new long-term priorities for the circular economy, as emphasised by the European Commission (2018[1]), but also for providing feedback for the development of strategies and planning documents among different economic actors (Alaerts et al., 2019[2]). This approach aligns with the dual purpose of indicators: forward-looking to offer guidance and backward-looking to provide feedback and evaluate performance (Ekins et al., 2019[3]).

A circular economy monitoring framework can take various forms, utilising a broad range of existing indicators and those still in development. These frameworks typically incorporate a comprehensive set of relevant indicators, recognising the complexity of the concept and the difficulty of capturing it with a single metric due to its multifaceted and expansive nature. These frameworks may adopt the structure of distinct, not necessarily interconnected, indicators, or they can be organised employing a multi-tiered approach. This approach may involve a limited number of headline indicators for communication purposes, supplemented by a dashboard featuring specific thematic indicators. Such a multi-layered approach facilitates the inclusion of more detailed information at additional levels, such as regional, city, sectoral or product group levels, and allows focusing on specific strategic objectives and recommendations.

The academic literature strongly recommends a departure from commonly used macro-level indicators. Instead, it advocates the inclusion of indicators that provide direct feedback to policy makers regarding specific products and services. These indicators should also address consumer and business behaviour, as well as societal needs, pertaining to the circular economy (Alaerts et al., 2019[2]; Ekins et al., 2019[3]; Giljum et al., 2011[4]; Potting et al., 2018[5]). Furthermore, there is a recognised necessity for additional indicators to precisely measure the effects and processes of the transition itself. This involves establishing connections between the circular economy and environmental impacts while capturing potential rebound effects (Potting et al., 2018[5]; Alaerts et al., 2019[2]).

Two sets of indicators proposed for North Macedonia's monitoring framework

The proposed monitoring framework, designed to facilitate the implementation of the roadmap's recommendations (Table 9.1), adopts a two-tier structure.

1. A set of headline indicators designed to track the broader circular transition of the Macedonian economy (Table 9.2). These draw heavily on the EU Circular Economy Monitoring Framework (European Commission, 2023[6]) and are categorised into five categories: 1) production and consumption; 2) waste management; 3) secondary raw materials; 4) competitiveness and innovation; and 5) global sustainability and resilience.
2. A set of indicators assigned to each priority area to oversee progress in specific recommendations (Table 9.3). Some of these indicators may take a qualitative form, such as operational metrics monitoring the progress made on a specific recommendation (e.g. the implementation has started, is ongoing or completed). Others are presently in an experimental phase requiring further refinement of the indicator or additional data collection (e.g. monitoring the revenues generated from specific environmental taxes).

The proposed sets of indicators offer a comprehensive overview of relevant metrics for monitoring both the implementation of recommendations and the overall circular economy transition in North Macedonia. During the preparation of the future policy framework or an action plan, North Macedonia may consider reassessing these exhaustive lists of indicators and opt for those for which data are currently, or might become, available. Nevertheless, for effective and evidence-based policy making, there is a need to enhance data collection and co-ordinate the collection process. Priority should be given to addressing existing gaps in the availability and quality of key circular economy-related data, particularly those pertaining to waste generation and waste management. Establishing an impact assessment mechanism is a potential solution to ensure that the monitoring framework is effectively executed and to secure its long-term continuity.

Table 9.1. Complete list of recommendations for each priority area

Priority area	Short term	Medium term	Long term
Circular business models for SMEs	Provide awareness-raising campaigns and training programmes on the circular economy for small and medium-sized enterprises (SMEs), including showcasing of good practices and access to finance	Implement supporting legislation and economic instruments for resource recovery and a circular supply of materials models	Implement supporting legislation and economic instruments for product life extension, sharing and product service models
	Introduce calls for circular business models projects within existing funding programmes, including technical support for the public administration for the development and implementation of such programmes	Consider establishing a dedicated funding programme for SMEs to scale up circular business models	Organise investor-entrepreneur matchmaking events
	Provide financial and technical assistance to SMEs (business support, access-to-finance support)	Support capacity building and entrepreneurship skills, vocational training, and acceleration and mentoring programmes	
	Support collaboration between SMEs and academia, as well as regional and international collaboration on research and development (R&D) and innovation	Establish a circular economy stakeholder/business platform to strengthen collaboration within and across value chains	
Towards a circular construction sector	Establish a working group on circular construction	Launch circular construction and renovation pilots	Introduce end-of-waste criteria for certain construction materials
	Support scaling up innovation and ensure funding for innovative circular construction and renovation projects (initially through donor funding, link with the Smart Specialisation Strategy)	Introduce (mandatory) selective demolition in combination with a gradually increasing landfill tax for construction and demolition waste	Introduce quality standards for secondary and recycled construction materials
	Improve measurement and monitoring of construction and demolition waste flows	Strengthen green public procurement of construction works by public entities	
		Promote digitalisation of the construction industry	
Towards a circular biomass and food system	Establish a working group on the circular bioeconomy and improve multi-stakeholder collaboration	Introduce and scale up infrastructure for separate collection of bio-waste	Provide funding and technical support for circular bioeconomy projects
	Raise awareness, education and skills on food waste prevention, separation of bio-waste at source, composting, and the circular bioeconomy in general	Promote green public procurement of food and catering services	Strengthen the regulatory framework supporting the use of compost and digestate in agriculture, with a focus on a quality assurance system
	Consider tax incentives to support food donations	Support investment into small-scale industrial composting and anaerobic digestion facilities to treat agricultural waste and municipal bio-waste	

Textile industry	Develop a national strategy on sustainable and circular textiles	Introduce ecodesign requirements for textiles to make them last longer, easier to repair and recycle, as well as requirements on minimum recycled content	Financially support circular design projects and innovation
	Provide financial and technical support for projects that reduce textile waste in manufacturing	Introduce mandatory separate collection of textile waste for households	
		Introduce an extended producer responsibility take-back scheme for textiles	
		Support investment in recycling and reuse of textiles	
Mining and metallurgy	Develop a study to understand the circular economy potential in the mining and metal processing value chains in North Macedonia	Facilitate industrial symbiosis to further support the use of waste from the mining and metal processing/production companies and creation of markets for secondary raw materials	Apply circular principles in procedures for issuing permits and concessions
	Incorporate circularity principles into the new Strategy for Geological Research and Sustainable Use and Exploitation of Mineral Resources for 2025-2045	Improve understanding of circular practices on-site and data availability to map out material flows of metals and minerals	Consider introducing recovery obligations to support material recovery and secondary raw materials production
		Support upstream eco-innovation and R&D to enhance metal and mineral value chains for a low-carbon economy	

Table 9.2. Proposed headline indicators based on the EU Circular Economy Monitoring Framework to monitor the economy-wide circular transition in North Macedonia

No.	Indicator group	Indicator name
Production and consumption		
1	Material consumption	Material footprint (tonnes per capita)
2		Resource productivity (index 2000=100)
3	Waste generation	Total waste generation per capita (kg per capita)
4		Generation of waste excluding major mineral wastes per GDP unit (kg per EUR 1 000, chain linked volumes [2010])
5		Generation of municipal waste per capita (kg per capita)
6		Food waste (kg per capita)
7		Generation of packaging waste per capita (kg per capita)
8		Generation of plastic packaging waste per capita (kg per capita)
Waste management		
9	Overall recycling rate	Recycling rate of municipal waste (%)
10		Recycling rate of all waste excluding major mineral waste (%)
11	Recycling rates for specific waste streams	Recycling rate of overall packaging (%)
12		Recycling rate of plastic packaging (%)
13		Recycling rate of waste electrical and electronic equipment separately collected (%)
Secondary raw materials		
14	Contribution of recycled materials to raw materials demand	Circular material use rate (%)
15	Trade in recyclable raw materials	Imports (thousand tonnes)
16		Exports (thousand tonnes)
Competitiveness and innovation		
17	Private investment, jobs and gross value added related to circular economy sectors	Private investments (% of GDP at current prices)
18		Persons employed (% of total employment)
19		Gross value added (% of GDP at current prices)
20		Industrial symbiosis initiatives (number)
21	Innovation	Patents related to waste management and recycling (number)
Global sustainability and resilience		
23	Global sustainability from circular economy	GHG emissions from production activities (kg per capita)
24	Resilience from circular economy	Material import dependency (%)

Notes: GDP: gross domestic product; GHG: greenhouse gas.
Sources: Eurostat (2023[7]); OECD (2021[8]).

Table 9.3. Proposed dashboard of specific indicators for five priority areas for North Macedonia

Indicator[1]	Description	Link to recommendation	Source[2]
Circular business models for SMEs			
Awareness-raising campaigns on the circular economy	Number of campaigns	**Provide awareness-raising campaigns and training programmes on the circular economy for SMEs**	Data to be provided by the Agency for Promotion of Entrepreneurship of the Republic of North Macedonia (APPRM), the Fund for Innovation and Technological Development (FITD), or chambers of commerce and industry
Small and medium-sized enterprises' (SMEs) awareness of circular business models	Share of SMEs aware of the circular economy		Regional Cooperation Council (Balkan Barometer Survey) or nationwide survey
Mainstreaming education on the circular economy into university-level curricula	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)	**Support capacity building and entrepreneurship skills, vocational training, and acceleration and mentoring programmes on the circular economy**	Data to be provided by the Ministry of Education and Science
Environment-related research and development (R&D) and innovation expenditure by state and business sectors	Gross expenditure on research and development (GERD) %	**Support collaboration between SMEs and academia, as well as regional and international collaboration on R&D and innovation**	Indicator to be developed based on Eurostat by the Agency for Research, Technology and Innovation. Data to be provided by the APPRM or the FITD
Creation of a circular economy platform[3]	Action-specific indicator for monitoring the creation of the platform (yes/no)	**Establish a circular economy stakeholder/business platform**	Data to be provided by the co-ordinating institution (e.g. Ministry of Economy)
Number of platform members[3]	Number		
Number of events/workshops organised as part of the platform[3]	Number		
Matchmaking events organised	Number of events	**Organise investor-entrepreneur matchmaking events**	Data to be provided by the APPRM or the FITD
Budget allocated to circular economy projects under a concrete programme	Amount (MKD)	**Introduce calls for circular business models projects within existing funding programmes.** **Provide financial, combined with technical, assistance to SMEs (business support, access to finance support)**	Data to be provided by the APPRM or the FITD
Training courses on circular business models	Number of events organised Number of technical modules created as part of funding programmes		
SMEs benefitting from financial support for the creation of new circular business models	Number of SMEs		
SMEs benefitting from non-financial support for the creation of new circular business models	Number of SMEs		
Technical support for the public administration for the development and implementation of such programmes	Number of trainings		Data to be provided by the Ministry of Economy, the APPRM or the FITD
SMEs supported by funding programmes to scale up circular business models	Number of SMEs	**Consider establishing a dedicated funding programme for SMEs to scale up circular business models**	Data to be provided by the APPRM or the FITD

Extended producer responsibility (EPR) schemes established	Number	**Strengthen legislation and economic instruments to support resource recovery and circular supply of materials business models**	Data to be provided by the Ministry of Environment and Physical Planning (MoEPP)
Recovery rate of waste covered under EPR schemes	Ratio of overall waste prepared for reuse, recycled or subject to material recovery to waste generated (%)		
Green public procurement (GPP)	GPP share in public contracts (in volume and value) across all procured products and services (%)		Data to be provided by the Public Procurement Bureau
Products/services covered by minimum recycled content criteria in GPP	Number		
SMEs with certification based on life cycle or eco-design	Number	**Focus on strengthening legislation and economic instruments that support product life extension, sharing and product service models**	Data to be provided by the MoEPP
Awareness-raising activities on the benefits of green certificates and eco-labels	Number		
Introduction of quality standard for reused or recycled products	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)		
Construction			
Creation of a working group on circular construction	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)	**Establish a working group on circular construction**	Data to be provided by the co-ordinating institution (e.g. Ministry of Transport and Communication or Ministry of Economy)
Initiatives carried out through the working group	Number of initiatives (including events like workshops, fairs, etc.)		
Financial resources mobilised for circular construction projects	Amount provided through grants (MKD)	**Support scaling up innovation and ensure funding for innovative circular construction and renovation projects**	Data to be provided by the Ministry of Transport and Communication or the Ministry of Economy
	Number of companies/projects supported through existing or new funding schemes		
Subsidies and other tax incentives for research and innovation laboratories	Number of companies/projects benefitting from tax incentives		
	Amount of subsidy provided to circular construction project (MKD)		
Creation of national or regional renovation/research programmes	Number of programmes established		
	Grants provided for business model innovation in the construction sector (amount in MKD)		
	Guides developed on enhancing circularity in the built environment (action-specific indicator for monitoring the implementation of the recommendation [yes/no])		
Ongoing/completed construction and renovation pilots	Number	**Launch circular construction and renovation pilots**	Data to be provided by the Ministry of Transport and Communication or the Ministry of Economy
Construction projects applying to certification programmes and the inclusion of eco-designed products	Share		
Launched/completed feasibility studies for circular construction and renovation projects	Number		

Establish a monitoring system for the use of construction material	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)	**Improve measurement and monitoring of CDW flows**	Data to be provided by the Ministry of Transport and Communication, the Ministry of Economy, or the MoEPP
Inventory of waste produced by construction and demolition by quality specifications	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)		
Trainings of construction companies on reporting waste production (through audits, inspections, surveys, tracking devices)	Number		
Construction and demolition waste (CDW) generation	Amount (kg) Share of total waste generated (%) Share of industrial waste generated (%)		Data to be provided by the MoEPP or MAKSTAT
Recovery rate of CDW	Ratio of overall CDW prepared for reuse, recycled or subject to material recovery to CDW waste generated (%)		
Introduced digital tools, such as materials passports or building information modelling	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)	**Promote digitalisation of the construction industry**	Data to be provided by the Ministry of Transport and Communication, the Ministry of Economy
Developed national legislation for mandatory selective demolition for CDW	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)	**Introduce (mandatory) selective demolition for CDW**	Data to be provided by the Ministry of Transport and Communication, the Ministry of Economy, or the MoEPP
Issued environmental permits for selective demolition	Number		
Developed technical standards for the design and execution of selective demolitions	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)		
Revenue generated from a landfill tax on inert CDW	Amount in MKD	**Implement landfill taxes, including for CDW, in combination with better enforcement of waste legislation**	Data to be provided by the Ministry of Transport and Communication, the Ministry of Economy, or the MoEPP
Initiated awareness-raising campaigns for strengthening enforcement of adequate CDW collection	Number		
Enforcement and supervision mechanisms to prevent illegal dumping of waste	Amount of fines (MKD) Number of abusive practices fined by enforcement authorities		
Developed national legislation for granting end-of-waste status to construction and building materials	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)	**Introduce end-of-waste criteria for certain construction materials**	Data to be provided by the Ministry of Transport and Communication, the Ministry of Economy, or the MoEPP
Waste streams with introduced end-of-waste criteria	Number		
GPP of construction and renovation activities	GPP share in public infrastructure contracts (in volume and value)	**Strengthen the use of GPP criteria in the construction sector to stimulate demand**	Data to be provided by the Public Procurement Bureau
Feasibility study on the quality and performance of secondary construction materials	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)	**Introduce quality standards for secondary and recycled construction materials**	Data to be provided by the Ministry of Transport and Communication or the MoEPP
Quality standards introduced	Number		

Biomass and food			
Adequate infrastructure for the separate collection of municipal bio-waste	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)	**Introduce and scale up infrastructure for separate collection of bio-waste**	Data to be provided by the MoEPP
Recycling rate of municipal waste – composting	Share (%) and amount in kg		Data to be provided by the MoEPP or MAKSTAT
Uptake of home composting	Number of homes conducting composting		
Subsidies for municipalities to adopt pay-as-you-throw schemes	Amount of subsidies (MKD)		Data to be provided by the MoEPP
Monitoring and enforcement to deter illegal landfilling (including fines)	Amount of fines (MKD) and number of fines attributed		Data to be provided by the MoEPP and the inspection office
Financial support for composting and anaerobic digestion facilities	Amount (MKD); can be from local or international funds	**Support investment in industrial composting and anaerobic digestion facilities to treat organic agricultural waste and municipal bio-waste domestically**	Data to be provided by the MoEPP
Assessment examining the required legislative changes to provide stronger incentives for greater use of compost and digestate on agricultural land	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)	**Strengthen the regulatory framework supporting the use of compost and digestate in agriculture, with a focus on a quality assurance system**	Data to be provided by the MoEPP
Amendment to the legislation regulating the management of bio-waste and specifying the technical requirements for composting to introduce elements of an improved quality assurance system for compost and digestate	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)		
Uptake of food donations	Quantity of donated food and trend over years	**Consider tax incentives to support food donations**	Data to be provided by the MoEPP
Guidance manual on GPP methodology for public authorities (consider the EU guidance and EU GPP criteria for food, catering services and vending machines)	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)	**Promote GPP of food and catering services**	Data to be provided by the Public Procurement Bureau
Uptake of GPP of food and catering services in public contracts	In volume and value		
Establishment of a dedicated bioeconomy research and innovation programme	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)	**Provide funding and technical support for circular bioeconomy projects**	Data to be provided by the APPRM, the FITD or the MoEPP
Businesses/entities benefitting from financial support to promote the development of biorefineries and biotechnology	Number of SMEs		
Businesses/entities benefitting from technical support to promote the development of biorefineries and biotechnology	Number of SMEs		
Creation of a working group (or sub-group) on the circular bioeconomy	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)	**Establish a working group on a circular bioeconomy and improve multi-stakeholder collaboration**	Data to be provided by the co-ordinating institution (e.g. Ministry of Economy, the MoEPP)
Initiatives carried out through the working group	Number of initiatives (including events like workshops, fairs, etc.)	**Introduce and scale up infrastructure for separate collection of bio-waste**	
Establishment of voluntary agreements	Number		

Awareness campaigns on the circular bioeconomy	Number of campaigns Number of entities involved	**Raise awareness, education and skills on food waste prevention, separation of bio-waste at source and composting as well as the circular bioeconomy in general**	Data to be provided by the co-ordinating institution (e.g. Ministry of Economy, the MoEPP)
Textile industry			
Mapping of the state-of-play of the textile industry (key trends, recent developments and key challenges)	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)	**Develop a national strategy on sustainable and circular textiles**	Data to be provided by the Ministry of Economy
Establishment of reporting mechanisms for textile waste data	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)		
Financial support for businesses on circular production practices in the textile industry	Number of businesses supported	**Provide financial and technical support, including training, to businesses and their employees to improve production processes and reduce textile waste from production**	Data to be provided by the Ministry of Economy or chambers of commerce
Training courses on circular production practices in the textile industry	Number of events organised Number of technical modules created as part of funding programmes		
	Number of businesses supported		
Textile waste generated as part of production processes	Share of textile waste generated as part of production processes out of total textile waste generated (%) Share of textile waste out of total share of fabric used in production processes (%)		Survey-based, data to be provided by the Ministry of Economy
Assessment of national recycling and reuse capacities for textile waste	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)	**Support investments in recycling and reuse projects for textiles and/or facilitate exports of textile for recycling and reuse**	Data to be provided by the MoEPP or MAKSTAT
Establishment of infrastructure for textile waste recycling and reuse	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)		
Recycling and reuse of all textile waste	Recycling rate of industrial textile waste (%) Recycling rate of household textile waste (%)		
	Reuse rate of industrial textile waste (%) Reuse rate of household textile waste (%)		
Landfilling of textile waste	Share of total textile waste (%)		
Incineration of textile waste	Share of total textile waste (%)		
Guidelines for exports and customs on shipment of textile waste	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)		Data to be provided by the Customs Administration
Exports of textile waste for recycling and reuse	Share of textile waste exported (%)		Data to be provided by the Customs Administration
Collection of textile waste from households	Share of households covered by textile waste collection services (%) Number of textile waste collection points	**Introduce mandatory separate collection of textile waste from households**	Data to be provided by the MoEPP
Establishment of an EPR scheme for textile	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)	**Introduce EPR obligations for textiles**	Data to be provided by the MoEPP

Collection and recycling rate of textile waste through EPR scheme	Amount of collected textile waste through EPR scheme (tonnes) Reuse share of collected textile waste through EPR scheme (%) Recycling share of collected textile waste through EPR scheme (%)		
Development of ecodesign requirements	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)	**Introduce ecodesign requirements for textiles to make textile products more circular, in line with the EU proposal for Ecodesign for Sustainable Products Regulation**	Data to be provided by the Ministry of Economy
Textile companies with ecodesign	Number		Survey-based, data to be provided by the Ministry of Economy
Introduction of eco-labels on textile	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)		Data to be provided by the Ministry of Economy
Financial support for businesses on circular design projects in the textile industry	Number of businesses supported	**Provide financial support to projects that promote and implement circular design projects and innovations in the textiles industry**	Data to be provided by the Ministry of Economy or chambers of commerce
Companies with upcycling business models	Number		
Supporting circular design of textiles through GPP	GPP with textile recycled content (in volume and value)		Data to be provided by the Public Procurement Bureau
Support for industrial symbiosis in the textile industry	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)		Data to be provided by the Ministry of Economy or chambers of commerce
Mining and metallurgy			
Mining waste	Share of total waste generated (%) and the generation trend	**Horizontal indicator – relevant for the entire priority area**	MAKSTAT
Study developed	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)	**Develop a study to understand the circular economy potential in the mining and metal processing value chains in North Macedonia**	Data to be provided by the Ministry of Economy or the Macedonian Mining Association
Trainings/seminars to present a working model for using secondary materials in infrastructure construction to key operators	Number	**Improve understanding of circular practices on-site and data availability to map out material flows of metals and minerals**	Data to be provided by the Ministry of Economy or the Macedonian Mining Association
Business partnerships established as part of the circular economy business platform	Number of partnerships established	**Facilitate industrial symbiosis to further support the use of waste from the mining and metal processing/production companies and creation of markets for secondary raw materials**	Data to be provided by the co-ordinating institution (e.g. Ministry of Economy)
Introduction of new research programme(s) that foster building partnerships for upstream eco-innovation and R&D and support innovative metal production techniques	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)	**Support upstream eco-innovation and R&D to enhance low-carbon metal and mineral value chains**	Data to be provided by the Ministry of Economy
Use of secondary raw materials through GPP	GPP with secondary raw materials (in volume and value)		Data to be provided by the Public Procurement Bureau
Principles incorporated	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)	**Incorporate circularity principles into the new Strategy for Geological Research and Sustainable Use and Exploitation of Mineral Resources for 2025-2045**	Data to be provided by the Ministry of Economy
End-of-waste criteria introduced	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)		
Operators/authorised companies with a waste management plan	Number		

Extraction rate of metal ores and concentrates'	Share of total domestic material extraction (%)		Data to be provided by the Ministry of Economy or MASTAT
Circular principles introduced in procedures for issuing permits and concessions	Action-specific indicator for monitoring the implementation of the recommendation (yes/no)	**Apply circular principles in procedures for issuing permits and concessions**	Data to be provided by the Ministry of Economy
Material recovery as part of mining operations	Share of recovered residual minerals from mining waste and from historical mining waste sites (%)	**Support material recovery and secondary raw materials production**	Data to be provided by the Ministry of Economy or MAKSTAT
Secondary raw materials production	Share of recycled materials to raw materials demand (%)		

1. Headline indicators outlined in Table 9.2 serve as the main benchmarks for monitoring progress in the implementation of the proposed recommendations. The indicators outlined in this table are complementary to those, capturing additional implementation aspects.
2. The source column refers to institutions already collecting relevant data or those that could be in charge of collecting such data in the future.
3. Circular economy stakeholders' platform-related indicators might differ depending on the format of the platform (on line, physical, hybrid).
Note: MKD – Macedonian denar.

References

Alaerts, L. et al. (2019), "Towards a more direct policy feedback in circular economy monitoring via a societal needs perspective", *Resources, Conservation and Recycling*, Vol. 149, pp. 363-371, https://doi.org/10.1016/j.resconrec.2019.06.004. [2]

Ekins, P. et al. (2019), *The Circular Economy: What, Why, How and Where*, background paper for an OECD/EC high-level expert workshop on "Managing the Transition to a Circular Economy in Regions and Cities", 5 July 2019, Paris, France, https://www.oecd.org/cfe/regionaldevelopment/Ekins-2019-Circular-Economy-What-Why-How-Where.pdf. [3]

European Commission (2023), "Circular Economy Monitoring Framework", https://ec.europa.eu/eurostat/web/circular-economy/monitoring-framework (accessed on 27 November 2023). [6]

European Commission (2018), *Communication on a Monitoring Framework for the Circular Economy*, European Commission, Brussels, https://ec.europa.eu/environment/circular-economy/pdf/monitoring-framework.pdf. [1]

Eurostat (2023), "Circular Economy Monitoring Framework", https://ec.europa.eu/eurostat/web/circular-economy/monitoring-framework (accessed on 27 November 2023). [7]

Giljum, S. et al. (2011), "A comprehensive set of resource use indicators from the micro to the macro level", *Resources, Conservation and Recycling*, Vol. 55/3, pp. 300-308, https://doi.org/10.1016/j.resconrec.2010.09.009. [4]

OECD (2021), *The OECD Inventory of Circular Economy Indicators*, OECD, Paris, https://www.oecd.org/cfe/cities/InventoryCircularEconomyIndicators.pdf. [8]

Potting, J. et al. (2018), *Circular Economy: What We Want to Know and Can Measure: Framework and Baseline Assessment for Monitoring the Progress of the Circular Economy in the Netherlands*, PBL Netherlands Environmental Assessment Agency, The Hague, https://www.pbl.nl/sites/default/files/downloads/pbl-2018-circular-economy-what-we-want-to-know-and-can-measure-3217.pdf. [5]

Annex A. Stakeholder engagement in developing the Circular Economy Roadmap for North Macedonia

Roadmap development approach and stakeholder engagement

Transitioning to a circular economy is a long-term process requiring broad societal consensus. The Roadmap Towards Circular Economy of North Macedonia was developed through a multi-step process which involved a wide range of stakeholders in a continuous dialogue. The design of the roadmap was undertaken as described below.

Establishment of the circular economy co-ordination mechanism

As part of the inception phase of the "Supporting Green Transition through Circular Economy Roadmaps", the OECD reached out to its existing contacts in respective ministries responsible for green economy, inviting them to nominate a circular economy (CE) co-ordinator.

The OECD held meetings with the CE co-ordinator from the Ministry of Economy and his team. During the discussions, the ministry and the OECD agreed to form a CE working group and to maintain a wider CE stakeholder platform to steer the roadmap design process and ensure that all parts of society were involved in the CE transition (Table A.1). To support the establishment of the working group and the CE platform, the OECD provided an initial list of relevant stakeholders from all parts of society to ensure an inclusive process: government institutions, international organisations (locally present and those working on the circular economy in North Macedonia), academia, civil society and the private sector. Additional members suggested by the co-ordinating ministry complemented the list and became members of the working group and the CE stakeholder platform.

In addition to the North Macedonia-specific CE platform, the OECD established a Regional Circular Economy Peer Dialogue platform at the Regional Kick-off event in Istanbul, comprised of the CE co-ordinators from all six Western Balkans economies and representatives from their respective CE working groups, supported by the OECD/EU member countries (e.g. Hungary, Italy and Türkiye). Participants endorsed the regional platform, whose objective is to facilitate bilateral and multilateral exchange, peer learning, and policy dialogue on circular economy transition efforts in the Western Balkans and beyond. Members of the platform contributed to the development of the CE roadmap of North Macedonia by sharing their feedback and lessons learnt in the design of their respective CE roadmaps during different phases of the development process (e.g. prioritisation exercise, drafting).

Table A.1. Stakeholders engaged in the North Macedonia Circular Economy Platform

Government institutions	International community	Civil society organisations	Academia	Private sector
Ministry of Economy (leading ministry)	European Union Delegation	In Vivo	Institute for Research in Environment, Civil Engineering and Energy	Economic Chamber of North Macedonia
Ministry of Environment and Physical Planning	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)	Macedonian Center for Energy Efficiency	Ss. Cyril and Methodius University in Skopje, Faculty of Agricultural Sciences and Food	Macedonian Chamber of Commerce
Office of the Prime Minister	Swiss-funded Increasing Market Employability Programme	National Centre for Development of Innovation and Entrepreneurial Learning Skopje	Ss. Cyril and Methodius University in Skopje, Faculty of Architecture	Western Balkans 6 Chamber Investment Forum
Agency for Foreign Investments	United Nations Development Programme	Organization for Social Innovation ARNO	Ss. Cyril and Methodius University in Skopje, Faculty of Civil Engineering	Brebo Ekotex LLC Bogdanci
Agency for Promotion of the Entrepreneurship of the Republic of North Macedonia	World Bank	Textile Trade Association – Textile Cluster	Ss. Cyril and Methodius University in Skopje, Faculty of Technology and Metallurgy	Kostal
Fund for Innovation and Technology Development	Helvetas		Sustainability Institute EKOS Skopje	Macedonia Export
Directorate for Technological Industrial Development Zones				Normak Investment Group
				Small Business Chamber

Kick-start meeting with key circular economy stakeholders in North Macedonia

After the establishment of the circular economy co-ordination mechanism, jointly with the CE co-ordinator, the OECD facilitated several stakeholder meetings to officially establish the circular economy platform and gather initial takeaways on the circular economy in North Macedonia. The main objectives of these meetings were to clarify the roles of the members of the platform, collect data and information on the development of strategic circular economy documents and activities, and consult stakeholders on economy-specific aspects to be considered during the drafting of the roadmap. During these meetings, the

OECD presented the main pillars, objectives and timeline for the project and outlined the steps that would be taken to support the design and implementation of the circular economy roadmap. The co-ordinator informed about government initiatives and priorities concerning the circular economy and moderated the discussion with the stakeholders. The OECD also liaised with locally present international actors (e.g. the United Nations Development Programme, the World Bank) working on circular economy-related projects to create synergies and avoid any duplication of efforts in driving the transition to a circular economy in North Macedonia.

Further to these meetings, the circular economy co-ordinator established a working group comprised of representatives of the key circular economy-related government and non-governmental institutions.

Identifying the state-of-play of the circular economy in North Macedonia

The first step in designing North Macedonia's Circular Economy Roadmap was dedicated to identifying the state-of-play of the circular economy in the country. The diagnostic built on the latest findings of the OECD *Competitiveness Outlook 2021* (see Chapter 16 on Environment policy [Dimension 13]) and the OECD *SME Policy Index 2022* (see Chapter 11 on SMEs in a green economy [Dimension 9]) and was complemented by extensive research. In particular, the OECD conducted a literature review of relevant policies, strategies and laws in North Macedonia; desk research on OECD and other renowned institutions' reports covering circular economy trends in North Macedonia; an analysis of circular economy strategic documents and roadmaps in OECD countries; and compiled statistical data. The diagnostic was further enriched with the feedback obtained during the meetings with stakeholders.

The diagnostic maps all policy and regulatory frameworks in North Macedonia relevant to the circular economy while outlining key economic features, recent circular economy and environmental trends, ongoing initiatives and projects, critical sectors, and horizontal policy areas for addressing the barriers to a circular economy.

Throughout the drafting process, the CE working group members provided written comments, feedback and any additional information that would enhance the analytical depth and comprehensiveness of the mapping documents. In addition, the OECD held a virtual meeting with the CE working group to discuss the draft roadmap and fill in remaining data gaps on the *status quo* of the circular economy in North Macedonia.

Reaching consensus on the priority areas for the Circular Economy Roadmap

The OECD presented a total of 11 pre-selected priority areas to the working group in a prioritisation meeting in September 2023 in Skopje, explaining their rationale and providing a set of preliminary recommendations set over the short, medium and long term. Lively discussions revealed a tentative preview of priorities and were enriched further by first-hand insights from experiences presented by an expert from Hungary, an OECD country and active member of the Regional Circular Economy Peer Dialogue platform.

Based on this, in a follow up meeting, the working group members selected five areas for the Circular Economy Roadmap of North Macedonia.

Wide consultations on the draft Circular Economy Roadmap and publishing

Further to the working group's final decision on the priority areas, the OECD developed detailed policy recommendations for each of the priority areas, which were largely accompanied by good practice examples. The OECD shared the draft roadmap with all members of the working group for review and

comment. It was also sent to a broader group of stakeholders for consultation, including international community representatives, the European Commission and the members of the Regional Circular Economy Peer Dialogue platform. Before its publication in the first quarter of 2024, the roadmap was validated by the Editorial Board of the OECD Global Relations and Co-operation Directorate.

Annex B. Development co-operation projects on the circular economy in North Macedonia

Table B.1. Projects undertaken by international donors in North Macedonia and financial opportunities

Organisation	Project title	Project details	Budget
European Bank for Reconstruction and Development (2022)	Regional Solid Waste Project	• A country-wide sovereign loan has been approved for the establishment of regional landfills in five administrative regions, in line with the new set of laws on waste management. • Covers: reconstruction/construction of selected regional sanitary landfills; and the procurement of bins and containers for recyclables and residual waste, transport vehicles and equipment.	EUR 55 million
EDA – Switzerland (2021-2024)	Smart Packaging Waste Management Project	• Supports North Macedonia by engaging with the non-profit private sector packaging recovery organisation Pakomak to enhance the effectiveness, efficiency and transparency of the national packaging waste recovery system through the digitalisation of the primary selection and collection process.	CHF 1 301 000 (EUR 1 375 903)
European Union (2022-2024), ***funded through IPA 2014-2020***	Support in the implementation of the waste management legislation and extended producer responsibility scheme	• The purpose of the project is to strengthen the capacity of the competent national authorities for waste management, stakeholders for modern waste management, and the online recording and reporting system.	EUR 1 million (IPA contribution: EUR 850 000, contribution from North Macedonia : EUR 150 000)
Environment Agency Austria (2022-2025), *funded through IPA 2021-2027*	EU4Green project	• The aim of EU4Green is to facilitate regional co-operation, improve exchange on climate and environmental matters, and provide knowledge and technical support to the Western Balkan economies on the implementation of the Green Agenda for the Western Balkans through greening and modernising the economy. • A "Green Business" facility is foreseen for 2024 and is intended to build the national authority's capacity for entrepreneurship and innovation and provide advisory assistance to the Fund for Innovation and Technology Development for distributing grants to selected enterprises that invest in sustainable and circular business models.	EUR 11 million *Of which EUR 10 million from the European Union and EUR 1 million from the Austrian Development Agency*
European Union (2019-2021), ***funded through IPA 2014-2020***	Development of the Environmental Monitoring Information System	• Development of a National Environmental Information System to improve the data collection process and introduce electronic systems for reporting, which will be capable of supporting the monitoring, processing, reporting and dissemination of environmental data. • As of 2022, the National Environmental Information System was enabled and on track for data entry.	EUR 1 369 050
European Union (2018-2022), *funded through Horizon 2020*	CINDERELA project	• The CINDERELA project aims to develop a new Circular Economy Business Model for the use of secondary raw materials in urban areas, connecting different industries, the construction sector and municipal services, decision makers, and citizens. • The objective is to use different streams of waste, i.e. construction and demolition waste, industrial waste, heavy fraction from municipal solid waste and sewage sludge, which are mostly landfilled and/or incinerated.	EUR 7 596 365

		• The project created a consortium of 17 partners from different countries, including North Macedonia. However, due to challenges in regulatory aspects (certification and technical documentation) and the lack of support, no advancements have been made in this regard in North Macedonia.	
EU (2023), ***funded through IPA 2014-2020***	Preparation and revision of the national waste planning documents	• No further information.	EUR 400 000
GIZ (2021-2025), *co-funded by the Delegation of the European Union to the Republic of North Macedonia*	EU4EG – Promoting economic growth in North Macedonia	• The project aims to improve business support services for micro, small and medium-sized enterprises and covers the circular and green economy.	EUR 9 750 000
GIZ (2022-2024), *funded through the Green Climate Fund*	Building capacity towards sustainable human capital development in North Macedonia	• Supports the development of human capital towards improved climate change adaptation and mitigation. • Aims at mainstreaming climate change in the education sector and boosting green jobs.	EUR 820 076
INTERREG (2021)	A knowledge Alliance in Eco-Innovation Entrepreneurship to Boost SMEs' Competitiveness "SMecoMP"	• Aims at achieving cross-border co-operation between businesses and universities to promote and raise awareness of environmental innovation and entrepreneurship.	EUR 777 355
World Bank (2020)	North Macedonia Public Sector Energy Efficiency Project	• Aims to reduce energy consumption in the public sector and support the development and implementation of a sustainable financing mechanism for energy efficiency in the public sector.	EUR 25 million

Note: The list is non-exhaustive.

Annex C. Non-governmental stakeholders involved in circular economy initiatives in North Macedonia

Table C.1. Non-governmental organisations relevant to the circular economy transition in North Macedonia

Friends of the Earth Macedonia	• Co-ordinates the work of existing local groups working on environmental issues, e.g. Friends of the Earth International, Youth and Environment Europe, and the International Union for Conservation of Nature. • Raises public awareness about environmental protection, sustainable development and nature preservation with the lowest level of impact, e.g. giving Green or Rotten apple award.
In Vivo	• In Vivo's mission is to create and support initiatives for further improving living, learning and working conditions in North Macedonia. • One of its projects, YODA, which is funded by Civica Mobilitas, educates homeless people from the Skopje region in bio-humus production.
Let's do it Macedonia	• Association for a clean environment conducting studies on food waste, raising awareness on the issue of waste and conducting clean-up programmes. • Created a platform connecting businesses with non-governmental organisations to redistribute surplus food. • Supported the government in the development of the first Law on Donating Surplus Food.
Macedonian Center for Energy Efficiency (MACEF)	• MACEF has implemented more than 10 programmes for energy efficiency and more than 150 energy audits of various types of buildings (residential, educational, industrial facilities, hospitals, administrative premises, etc.). Recent initiatives target the circular economy.
National Centre for Development of Innovation and Entrepreneurial Learning	• Focuses on building relationships; promoting new, innovative ideas; and the development of entrepreneurial competences in students, teachers and the public/private sector. Supported by the government, economic chambers and academia. • Part of the Greenovet project that promotes green innovation and skills across Europe. Co-funded by the European Union. • Organises annual national competitions in secondary schools for the best business concept. The past four years the focus of the competition has been on green innovation.
O-Krug	• Initiative that upcycles orange peel waste and converts it into a line of products, including essential oil and natural air freshener, while also striving to reduce the youth unemployment rate. • Final waste is transported to the composting site of another circular social business.
Organisation for Social Innovation ARNO	• Works in the field of green and social entrepreneurship. Supports small and medium-sized enterprises in their education, access to market and funding. • Organises the annual "Green Ideas" competition, in which more than 300 companies have participated. Most companies are still active and some are conducting circular business activities (some examples include organic fertilisers, ice cream produced from leftover wine, furniture refurbishment).
Pakomak*	• Pakomak's main activity is managing packaging waste. Its clients get a free Green Dot symbol that signifies that a fee has been paid for handling end-of-life packaging. Companies are thus designated to comply with environmental standards defined by the law and EU directives. A company can become a member of Pakomak if, for one year, it places on the domestic market more than: 800 kilogrammes (kg) of glass bottles, 300 kg of paper or paperboard, and 100 kg of another type of packaging material.
REDI Recycling	• Social start-up employing individual Roma collectors while building a system for primary waste separation in households and businesses. Through this, the organisation turns secondary waste collectors into socially insured workers and creates a system for primary waste separation under safe working conditions. • The organisation is among the 15 selected organisations on the top list of the Center for Social

	Enterprises.
Youth Environmental Network – Go Green Skopje	• Youth environmental organisation whose activities are mainly in the areas of youth training and activism, education for climate change and sustainable development, the circular economy, green employment and eco-entrepreneurship, and social inclusion. • Its main target group is young people aged 15-29, mainly pupils from primary schools, including marginalised groups.
Zero Waste Skopje	• Educating people on what it takes to embrace a zero-waste lifestyle – and providing the means to make the transition. The social enterprise commercialises products with no or minimum packaging sourced from small domestic manufacturers. • In March 2021, the concept was one of the winners of the Organization for Social Innovation ARNO's RISE programme. The Skopje Goes Zero Waste team received EUR 2 500, as well as mentoring and expert support.

* Pakomak is a non-profit company founded by 11 manufacturing companies in North Macedonia. It is licensed by the Ministry of Environment and Physical Planning for the selection and processing of packaging waste.
Note: The list is non-exhaustive.

Table C.2. Academia relevant to the circular economy in North Macedonia

Faculty of Mechanical Engineering, Ss. Cyril and Methodius University in Skopje	• Includes a master programme for Product Lifecycle Management which provides knowledge and skills for students and professionals on all phases of new product development, starting from eco-design and eco-innovation to end-of-life. It also includes classes on engineering and the production of products based on sustainability, the efficient use of resources in line with environmental protection, cleaner production, and energy efficiency processes. • Published research papers on circular economy indicators related to opportunities for sustainable development, the green economy and reversible logistics in North Macedonia. • Preparation of a scientific report with the support of the United Nations Development Programme for detecting the main waste streams in North Macedonia and their potential for the circular economy. • Established the Centre for VET Excellence in Green Innovation (2021) with the non-governmental organisation Greenovet.
Faculty of Mechanical Engineering, Department for Industrial Engineering and Management, Ss. Cyril and Methodius University in Skopje	• Supports the PROMETHEUS project funded by the European Institute of Innovation & Technology, which aims to boost innovation and entrepreneurship in the domains of the circular economy, digital transformation and sustainable development. • Part of the European university network PROMETHEUS HEI, which supports capacity building for innovation, sustainability and circularity, and promotes circular and sustainable entrepreneurship.
Faculty of Agricultural Sciences and Food, Ss. Cyril and Methodius University Skopje	• Teaches the knowledge and skills necessary for profitable agricultural production while using natural resources in line with environmental protection. • Provides new specialised profiles of staff who will be technically trained to provide quick technological solutions for keeping products competitive and which are necessary to engage in present and future farm production, processors and scientific research work.
Faculty of Technology and Metallurgy, Ss. Cyril and Methodius University in Skopje	• Published a research paper on the valorisation of fly ash as a secondary raw material towards the implementation of a circular economy. • Conducts circular economy projects related to the use of waste as secondary raw materials and solutions that support the circular economy with renowned partner organisations and universities. • Examples include the development of valorisation processes for biomass and natural waste materials, funded by Ss. Cyril and Methodius University in Skopje, or the conversion of industrial waste powders into new functional materials, a bilateral project with Ningbo University of Technology, People's Republic of China.
Finance Think – Economic Research and Policy Institute	• Supports and encourages civic awareness and active societal participation. • One of the institute's programmes is focused on the green economy and captures topics such as green growth and employment, infrastructure and assets that allow reducing carbon emissions and pollution, enhancing energy, and resource efficiency.

Institute for Research in Environment, Civil Engineering and Energy, Institute for Research in Environment, Civil Engineering and Energy Skopje	• Conducts several activities and courses relevant to the circular economy, including:
	  ○ CATALYST, which aims at strengthening the sustainable competitiveness of professionals, students, and small and medium-sized enterprises through mentorship, guidance, and vocational education and training courses.
	  ○ Eco Skills for a Green Economy project, which provides in-depth knowledge on sustainability, cleaner production, waste management and energy management.
	  ○ A report mapping the skills necessary for the green transition and their related

	challenges (developed after six national roundtables) was published in February 2023.
Institute of Economics, Ss. Cyril and Methodius University Skopje	• Published a research paper on the circular economy, resource efficiency, challenges and opportunities for the green economy in North Macedonia.
Sustainability Institute EKOS Skopje	• Research and project implementation on topics closely related to environmental protection: sustainable transport, renewable energy sources and energy efficiency, sustainable waste management, protection against chemicals and heavy metals, and protection against genetically modified organisms.

Note: The list is non-exhaustive.

Table C.3. Private sector organisations relevant to the circular economy in North Macedonia

Chamber of Organic Producers	• Determines rules for organic production, communication systems, networking and support with companies and individuals; continuous education; and upgrading.
Economic Chamber of North Macedonia	• Conducts the project: "Private Sector Regional Integration Support Activity", which promotes activities to support the export capacity and competitiveness of Macedonian companies, with direct assistance to companies developing a circular economy.
Economic Chamber of North West Macedonia	• Organises, advances, protects interests and promotes businesses in the country and abroad, supporting the challenges of global competition.
Macedonian Chambers of Commerce	• Largest independent business association in North Macedonia. • Promotes and represents the business interests of thousands of member companies and connects them with more than 1 000 national, regional and international institutions and organisations.
Western Balkans 6 Chamber Investment Forum	• Joint project of the Western Balkans 6 chambers of commerce and industry established in 2017 that represents the region's business community, facilitates inter-corporate exchanges and promotes the region as an attractive investment location. • In 2021, organised a conference and business-to-business event on the construction industry in the Western Balkans which included topics on the green and circular economy. • Created a market access database that contains relevant data about potential suppliers in four sectors with the circular economy as a horizontal topic.

Note: The list is non-exhaustive.

Table C.4. Companies with circular economy business models in North Macedonia

Akron	• Recycles waste glass for repro-material to produce composite materials used for interior solutions.
Bastet Noir	• Sustainable, zero-waste clothing label whose designs are custom-made to the client's measurements. Every piece is made out of discarded materials and produced locally by a community of single parents in North Macedonia. Profits are reinvested to fund the growth of these women-owned businesses.
Bionovel	• Produces calcium as a dietary supplement from eggshells.
Civil Engineering Institute Macedonia	• Actively engaged in European research and education projects in the field of sustainability and circular economy business models. • Offers services to companies to manage industrial waste and circularity in construction. One of their circular products based on the "zero waste" principle has been certified for use in the construction industry. • Awarded environmental protection champion in North Macedonia by the Regional Competition for Companies from the Western Balkans in 2023.
Drivedrivecar	• Peer-to-peer platform that represents a modern business model through which users can rent cars directly from their owners.
ECONELEKTRON	• Company with a license for the treatment of electrical and electronic waste.
Eko-cirkon	• Buys raw materials from all industrial and technological facilities in North Macedonia, as well as from private individuals. After the purchase, materials are subjected to selection and separation, followed by their pressing, packaging and delivery to industrial facilities in North Macedonia and abroad, accompanied by all activities and documentation for transport and export.
Ekomozaik	• Consultancy offering integrated solutions for the efficient use of resources (raw materials, water, energy) and the use of renewable energy sources; introduction and implementation of

	cleaner production; and analysis of the products' life cycle and eco-design, among others.
Greenstar	• Paper and carton production from paper waste. Conversion of recycled paper to new products and new forms. A large range of packaging products are designed to provide an optimal level of strength and protection to meet any challenges in the supply chain. • All products are environmentally friendly, made from eco-friendly materials, highly biodegradable and compostable, sustainable for earth, with created maximum value for customers.
Johnson-Matthey	• Global company developing sustainable technologies for the automotive industry. • The world's largest recycler of platinum group metals (PGM) by volume. Its high-standard PGM extraction and separation processes recycle platinum, for example, to a minimum purity of 99.95%.
Kostal	• Engaged in mechatronics and manufacturing of spare car parts of globally operating automotive companies. • Offers the perspective of an internationally operating enterprise integrated into global value chains on the opportunities of the circular economy transition.
Modular Design Architects	• Promotes modern design of high-performance buildings, in line with nature's boundaries. Homes are built according to the ISO 9001: 2015 standard, optimising the use of insulation materials and heating.
Netam	• Makes insulation materials from textile waste: the company manufactures mattresses, quilts, pillows and bed linens. The collected textile waste from their production, but also from other sources, is recycled and processed into products such as insulating panels, rolls, geotextiles and other insulating materials that are then used in construction.
Nutrivet	• Connects supply and demand in the wastepaper business based on a large network. Access to wastepaper of all classes included in the EN 643 list of wastepaper classes and provides all types of paper. • Collects paper and sells it to manufacturing industry for paper and cardboard, where wastepaper is used as a raw material for processing to create new products based on a circular economy.
Sunilens	• From waste oil to energy: an innovative waste management system – collection, transportation, storage and treatment of used cooking oils and fats of vegetable origin. Oil is then used as feedstock for the production of renewable energy (biofuels).
VAJS Additives	• 2020 winner of the "Green Ideas" competition. • Processing pomace (a mixture of grape skin and seed) – one of the most abundant residues in the grape processing and wine production industry – into a multifunctional food additive.

Note: The list is non-exhaustive.
Sources: Stakeholders' mapping undertaken by the Regional Cooperation Council in the framework of its regional circular economy project; Env.net (2020[1]; 2020[2]).

References

Env.net (2020), *Circular Economy Country Specific Report*, Env.net, http://env-net.org/wp-content/uploads/2021/03/Circular-Economy-Status-Report_Balkan_Bridges_NM.pdf. [2]

Env.net (2020), "North Macedonia", *Environmental News*, http://env-net.org/wp-content/uploads/2021/03/DECEMBER_2020_env_net_Gazette-1.pdf. [1]

A Roadmap towards Circular Economy of North Macedonia

This roadmap is designed to aid North Macedonia's government in establishing a solid policy foundation for a successful transition to a circular economy.

As an EU candidate country, North Macedonia has pledged to align with European climate objectives, endorsing the Sofia Declaration on the Green Agenda for the Western Balkans, with a particular focus on the circular economy transition. Acknowledging the pivotal role of this transition in national and regional development and actively addressing challenges posed by climate change, reliance on imported raw materials and increased waste, North Macedonia is ready for a strategic framework and concrete actions to initiate this transformative process.

Derived from a comprehensive diagnostic of North Macedonia's circular economy landscape, the roadmap strategically integrates existing policy initiatives, fostering synergies across sectors, measures and involved actors. It emphasises five key areas – circular business models for SMEs, construction, biomass and food, textile industry and mining and metallurgy – revealing over 40 policy recommendations. These recommendations, supported by a monitoring framework, are poised to be a cornerstone for propelling North Macedonia towards a more sustainable and circular future.

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