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ADVANCING THE CIRCULAR ECONOMY IN THE REPUBLIC OF NORTH MACEDONIA: PRINCIPLES, POLICIES, AND STRATEGIC ACTIONS

Abstract

The circular economy (CE) is gaining momentum as a sustainable model that promotes resource efficiency, waste reduction, and long-term environmental and economic resilience. Republic of North Macedonia (RNM) has made progress in integrating CE principles into its policies, but challenges remain due to fragmented regulations, financial constraints, and limited institutional coordination. This paper¹ explores the core principles of the CE, examines environmental trends shaping its adoption in the Republic of North Macedonia, and evaluates the country's existing institutional framework. Key policy gaps and barriers are identified, and strategic actions are proposed to enhance circular economy implementation. Recommendations include developing a national Circular Economy Action Plan, improving waste management infrastructure, strengthening financial incentives for businesses, and fostering international cooperation. By aligning policies with EU directives and best practices, RNM can accelerate its transition toward a sustainable, low-carbon, and resource-efficient economy.

Keywords: circular economy, sustainability, waste management, policy framework, Republic of North Macedonia

JEL Classification: Q0, Q56, O44, P28, R11

Introduction

The shift toward a CE represents a fundamental departure from the traditional linear model of production and consumption, which follows a "take-make-dispose" approach. Instead, a CE focuses on minimizing waste, maximizing resource efficiency, and maintaining the value of materials for as long as possible. This approach is gaining recognition worldwide, with initiatives such as the EU Circular Economy Action Plan setting guidelines for integrating circular principles into national economies (European Commission, 2020).

RNM has taken important steps in adopting CE principles, particularly in waste management and energy efficiency. However, the transition remains slow due to weak policy coordination, limited financial support, and a continued reliance on fossil fuels. The country has committed to reducing greenhouse gas emissions and aligning its environmental policies with EU

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standards, yet the absence of a dedicated national CE strategy has hindered meaningful progress.

This paper explores the fundamental principles of the CE and the environmental trends shaping its adoption in RNM. It examines the country's current institutional framework, highlighting key policy gaps and implementation barriers. The paper also presents strategic recommendations aimed at improving regulatory enforcement, strengthening institutional collaboration, and fostering financial incentives to support circular business models. By addressing these challenges and leveraging international best practices, RNM can create new economic opportunities while advancing its sustainability goals.

1. Overview of Circular Economy Principles

The CE represents a transformative economic model that seeks to decouple economic growth from resource depletion by promoting sustainable resource management, waste minimization, and long-term resilience (Geissdoerfer et al., 2017). Unlike the traditional linear economic model which follows a "take-make-dispose" approach, the CE is regenerative by design and focuses on maintaining the value of materials, products, and resources for as long as possible (Kirchherr et al., 2018). This approach not only enhances economic efficiency but also contributes to environmental conservation and societal well-being, and at its core, is guided by three fundamental principles (Ellen MacArthur Foundation, 2023):

- **Eliminating Waste and Pollution**-A core circular strategy is designing out waste, enabling companies to reduce pollution, conserve resources, and lower their carbon footprint.
- **Circulating Products and Materials (at Their Highest Value)**-Extending material use through reuse, repair, refurbishment, and recycling preserves value and prevents premature waste.
- **Regenerating Nature**-A sustainable economy restores nature by enhancing biodiversity, soil health, and reducing ecological harm.

The successful transition to a CE requires a multi-stakeholder approach, where governments, businesses, and civil society collaborate to reshape production and consumption systems. To facilitate this shift, several global best practices and policy frameworks have been developed:

- **Policy and Regulatory Support**-Governments play a crucial role in setting legal frameworks that encourage circular practices. Regulations promoting eco-friendly product design, extended producer responsibility (EPR), and sustainable waste management have been implemented across the European Union and OECD member states, setting an example for other regions to follow (European Commission, 2022).
- **Collaborative Supply Chains**-Companies are increasingly forming strategic partnerships to close material loops by designing take-back programs, repair initiatives, and circular material exchanges. These collaborations help reduce waste and improve supply chain efficiency (Lacy & Rutqvist, 2015).
- **Digitalization and Data Analytics**-Emerging technologies such as blockchain, artificial intelligence, and IoT (Internet of Things) enable better tracking of material flows, product lifecycles, and waste management processes. By leveraging data-driven decision-making, businesses can optimize resource use and design more effective circular models (Kalmykova et al., 2018).

- Innovative Business Models-Business are evolving toward service-based approaches, where products are leased, rented, or shared instead of being purchased outright. This shift encourages extended product lifespans, resource efficiency, and waste reduction by promoting durability, upgradability, and reparability. By maintaining responsibility for the product throughout its lifecycle, businesses can enhance customer value, reduce environmental impact, and create more sustainable economic models (Ramdani et al., 2019).
- International Cooperation-The transition to a CE requires global collaboration to ensure knowledge-sharing and coordinated policy actions. Initiatives such as the EU Circular Economy Action Plan, OECD Circular Economy Framework, and United Nations Sustainable Development Goals (SDG 12: Responsible Consumption and Production) provide guidelines and incentives for countries to adopt circular principles (Schroeder et al., 2019).

By adopting these principles and drawing insights from global best practices, countries and businesses can shift towards a CE, fostering sustainable economic development, environmental conservation, and societal well-being. Similarly, by integrating the core principles of the CE and aligning with international best practices and policy frameworks, RNM can achieve substantial economic, environmental, and social advantages.

2. Environmental trends shaping the circular economy in the Republic of North Macedonia

As a Non-Annex-I signatory to the United Nations Framework Convention on Climate Change (UNFCCC) and its Paris Agreement, RNM has committed to reducing GHG emissions to 82% of 1990 levels by 2030. Furthermore, in alignment with the EU's ambition to become climate-neutral by 2050, RNM has endorsed the Green Agenda for the Western Balkans, pledging to achieve carbon neutrality by 2050.

Despite these commitments, RNM still faces significant environmental challenges. According to the Emissions Database for Global Atmospheric Research (EDGAR) 2023 report, RNM's greenhouse gas (GHG) emissions have undergone notable changes over recent decades (Table 1.). In 1990, the country's total GHG emissions were approximately 16.5 million tonnes of CO₂ equivalent (Mt CO₂eq). By 2022, this figure had decreased to around 12.3 Mt CO₂eq, representing a reduction of about 25.5% over the 32-year period. This decline can be attributed to various factors, including economic transitions, shifts in energy production, and the implementation of environmental policies aimed at reducing emissions. However, the energy sector remains the largest contributor to emissions, primarily due to the country's continued reliance on fossil fuels for electricity generation and heating. Efforts to transition towards renewable energy sources and enhance energy efficiency are crucial for RNM to continue its trajectory towards lower emissions and to meet international climate commitments.

Table 1. Greenhouse Gas (GHG) Emissions Trends in the Republic of North Macedonia (1990-2022)

Year	GHG emissions Mt CO ₂ eq/yr	GHG emissions per capita t CO ₂ eq/cap/yr	GHG emissions per unit of GDP PPP t CO ₂ eq/kUSD/yr	Population
1990	14.469	7.248	0.637	1.995M
2005	12.440	6.038	0.545	2.060M
2015	10.645	5.120	0.340	2.079M
2022	11.184	5.354	0.317	2.089M

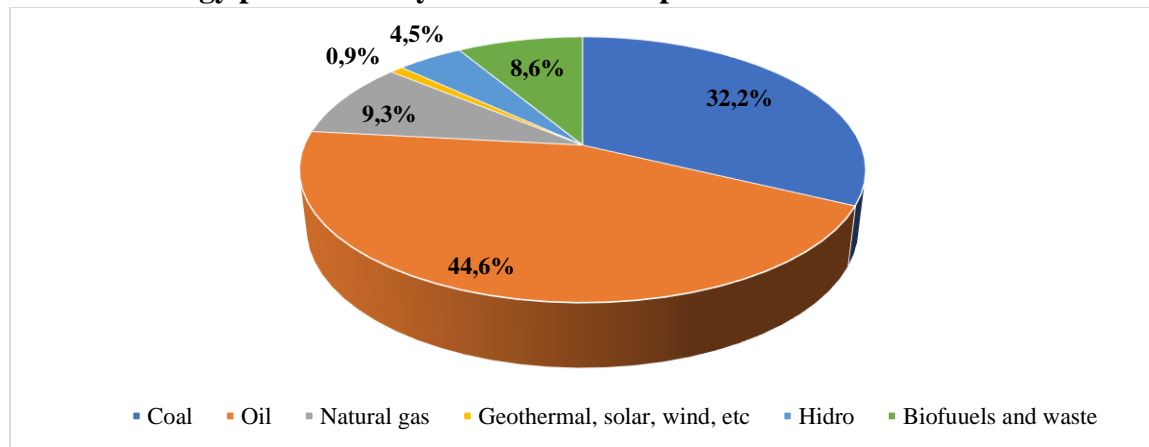
Source: EDGAR-Emissions Database for Global Atmospheric Research (2023): JRC SCIENCE FOR POLICY REPORT-GHG EMISSIONS OF ALL WORLD COUNTRIES, p. 818

CO₂ emissions account for 80% of RNM’s total GHG emissions (Ministry of Environment and Physical Planning, 2021). In 2022, energy-related CO₂ emissions reached 8 million tonnes, representing 0.02% of global emissions (IEA, 2023). The sectoral breakdown of CO₂ emissions in 2022 highlights that: (IRENA, 2024)

- Electricity and heat generation accounted for 80% of total emissions, reflecting the country’s reliance on fossil fuels.
- Industrial combustion contributed 17%, indicating the need for energy efficiency improvements in manufacturing.
- Transport accounted for 4%, showing that emissions from vehicles remain relatively low but could increase with rising mobility.

The relationship between energy production and GHG emissions is central to understanding RNM’s environmental footprint and sustainability challenges. As depicted in Chart 1., over 75% of country’s energy production still depends on fossil fuels, particularly oil (44.6%) and coal (32.2%). While the country's GHG emissions have declined over the past three decades due to policy-driven efficiency measures, it still faces significant challenges in decarbonizing its energy mix. Renewable energy sources, such as hydropower (4.5%), biofuels and waste (8.6%), and solar and wind (0.9%), remain underdeveloped despite their potential. The slow adoption of renewable energy highlights the urgent need for policy reforms, increased investment in green energy alternatives, and stronger incentives for sustainable energy production.

Chart 1. Energy production by source in the Republic of North Macedonia in 2022



Source: IEA-International Energy Agency (2025): Energy system of North Macedonia

Decarbonizing the energy sector by increasing renewable energy adoption and enhancing industrial energy efficiency can further strengthen the CE transition. The integration of renewable energy in manufacturing, alongside green infrastructure investments, can help optimize resource use, lower operational costs, and drive innovation in sustainable industries. As RNM aligns with EU climate goals, shifting to renewable energy and reducing reliance on fossil fuels is crucial for cutting emissions and ensuring sustainability. Embracing circular economy principles will further support environmental, economic, and social progress.

While energy production and fossil fuel dependency remain the primary drivers of greenhouse gas (GHG) emissions in RNM, waste management is another critical factor contributing to the country’s environmental footprint. Poorly managed municipal, industrial, and hazardous waste not only generates methane (CH₄), a highly potent greenhouse gas, but also poses serious risks to air, water, and soil quality. Despite ongoing efforts to modernize waste collection and recycling systems, more than 80% of municipal waste still ends up in landfills or illegal dumpsites, with recycling rates remaining below 5% (EEA, 2023). According to the State Statistical Office, as seen in Table 2, RNM generated 878.303 tonnes of municipal waste in 2023, equating to 503 kg per capita, a 7,7% increase from 2022. Of this, 621.686 tonnes were collected, with 82% from households and 18% from commercial entities. Notably, 99.8% of collected waste was disposed of in landfills. Of the total amount of generated waste in 2023, 70,8% was collected. By waste type, the highest amount of collected waste was mixed municipal waste, 85.4%, followed by organic waste 6.4%. The lowest amount was rubber waste, 0.2% of the total amount of collected waste.

Table 2. Generated municipal waste in the Republic of North Macedonia and annual amount of collected municipal waste (2014-2023)

Year	Generated municipal waste ¹⁾ (in tonnes)	Collected municipal waste ¹⁾ (in tonnes)
2014	765.156	569.794
2015	786.182	620.328
2016	796.585	160.289
2017	786.881	635.875
2018	854.865	625.386
2019	915.943	632.484
2020	913.033	630.086
2021	896.066	632.087
2022	856.766	605.638
2023	878.303	621.686

¹⁾ Data are estimated based on the number of resident population according to the Estimations of the Population, except for 2021 when the estimation is made according to the Census of Population, Households and Dwellings, 2021

Source: State Statistical Office (2024): Makstat Selection, p. 23

By investing in circular business models, closed-loop recycling systems, and waste-to-energy technologies, RNM can significantly reduce waste-related emissions, extend product lifecycles, and create new economic opportunities. 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. Moreover, implementing Extended Producer Responsibility (EPR) schemes and encouraging eco-innovation can foster sustainable production and consumption patterns, aligning the country with EU circular economy directives.

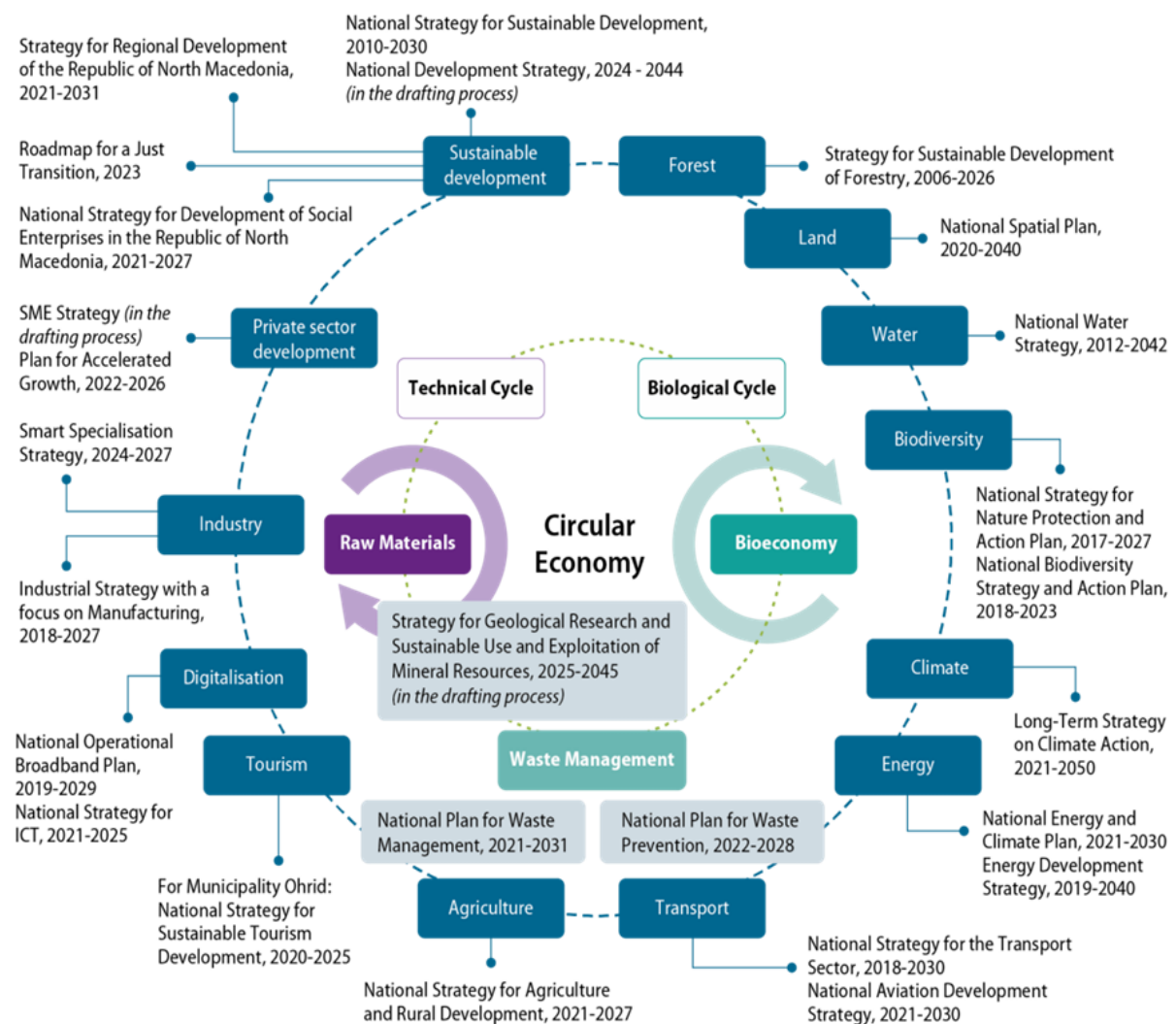
By combining CE initiatives with energy decarbonization strategies, RNM can accelerate its climate commitments, strengthen economic resilience, and establish itself as a leader in sustainable development within the Western Balkans.

3. Institutional Framework for the Circular Economy in the Republic of North Macedonia

The transition to a CE in RNM has been gradually progressing, yet there is no comprehensive policy framework to guide this transformation effectively. Various initiatives and regulations contribute to CE objectives, but these efforts remain fragmented, primarily driven by international organizations, civil society, and academia. The absence of a dedicated CE strategy limits the efficiency of ongoing initiatives and results in gaps in implementation and long-term planning (OECD, 2023).

Figure 1. illustrates the policy framework supporting CE initiatives in RNM, highlighting the institutions involved in policy development and implementation.

Figure 1. Policy Framework for the circular economy in the Republic of North Macedonia



Source: OECD (2023), A Roadmap towards Circular Economy of North Macedonia, p. 40

Several government institutions play a crucial role in shaping CE policies. 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 among the key entities responsible for policy development and execution. These ministries oversee various aspects of environmental sustainability, waste management, economic development, and infrastructure, all of which are critical for fostering CE principles (European Commission, 2023).

Beyond the central government, other institutions contribute to the promotion of CE. The Agency for Promotion of Entrepreneurship of RNM (APPRM) and the Fund for Innovation and Technological Development play an increasing role in supporting businesses through financial and technical assistance, particularly for enterprises implementing circular business models. Additionally, the State Statistical Office (MAKSTAT) is instrumental in collecting and analysing data that informs decision-making and measures progress in CE initiatives.

Despite the involvement of multiple institutions, the legal and policy framework in RNM does not yet provide a strong foundation for a full-scale transition to a CE. The country lacks an overarching environmental policy that integrates CE principles into national development strategies. However, a step forward was taken with the adoption of the Long-term Strategy on Climate Action in 2021, which includes provisions for fostering circularity in various sectors. While this strategy, alongside several sectoral policies, indirectly supports CE objectives, it lacks a unified and structured approach, resulting in inconsistencies in implementation (World Bank, 2022).

Existing policies related to the CE in RNM can be categorized into two groups. The first includes core policies that directly reference CE principles, such as resource efficiency and waste minimization. The second consists of supporting policies that contribute to sustainability but do not explicitly integrate CE measures. These policies address themes such as waste management, green infrastructure, and climate action. However, weak institutional coordination and the lack of a dedicated regulatory framework hinder the effective implementation of these policies.

RNM needs a clear, integrated CE strategy aligned with EU directives. Consolidating policies, strengthening regulations, enhancing financial incentives, and improving data collection will support circular business transitions. Greater collaboration among government, businesses, and civil society is key to advancing circular initiatives. (EEA, 2023).

The successful transition to a CE in RNM depends on a more cohesive institutional and policy approach. While existing initiatives provide a foundation for progress, significant improvements in policy design and governance mechanisms are necessary to accelerate implementation. Establishing a comprehensive framework that integrates environmental sustainability, economic incentives, and regulatory measures will be crucial for achieving long-term success in CE adoption. By addressing these gaps, RNM can position itself as a regional leader in CE practices and enhance its economic and environmental resilience in alignment with EU sustainability goals.

4. Policy recommendations and strategic actions for the circular economy in the Republic of North Macedonia

RNM is making progress toward a CE, but the transition remains slow due to fragmented policies, financial constraints, and a lack of coordination among key institutions (OECD, 2023). While various initiatives have been introduced, a more structured and integrated approach is needed to drive meaningful change.

One of the biggest challenges is the lack of a dedicated national strategy for the CE. To move forward, RNM should develop a Circular Economy Action Plan that sets clear targets for waste reduction, recycling, and resource efficiency. This plan should not only introduce regulations but also provide practical guidelines for industries to adopt circular practices. (World Bank, 2022). Strengthening regulations related to waste prevention and extended producer responsibility will also help enforce CE measures.

Institutional coordination is essential for better governance and policy implementation. Establishing a National Circular Economy Coordination Body could improve cooperation between government ministries, municipalities, and businesses. Local governments need more funding and technical support to enhance waste management, while stronger public-private partnerships could encourage investment in circular initiatives. A Circular Economy Advisory Board, with experts from government, business, and academia, could provide policy guidance and monitor progress to ensure long-term success (European Commission, 2023).

Financial constraints remain a major barrier, particularly for small and medium-sized enterprises looking to adopt circular business models (ICT, 2021). The government should create a Circular Economy Investment Fund to offer grants and low-interest loans for businesses implementing sustainable practices. Tax incentives for companies adopting eco-friendly production methods, along with eco-taxation policies discouraging wasteful practices, would further encourage investment in sustainability (Järvinen & Sinervo, 2020). Also, expanding access to EU funding would provide much-needed financial support for large-scale projects.

RNM still relies heavily on landfilling, and to reduce this, investment in waste management infrastructure is needed. Improving waste collection and sorting systems, expanding recycling programs, and implementing waste-to-energy solutions could help manage waste more effectively while also generating renewable energy. Municipalities should introduce mandatory waste separation programs, making it easier for businesses and households to recycle effectively (European Commission, 2023). Expanding producer responsibility programs, where manufacturers take back and recycle their own products, would also support waste reduction efforts.

Encouraging businesses to adopt circular models is another key priority. Providing financial incentives, research grants, and startup funding could help companies develop new solutions for waste reduction and sustainable production. Promoting leasing and sharing business models, as well as fostering industrial symbiosis where industries exchange and reuse materials instead of discarding them, would contribute to more efficient resource use (Zero Waste Scotland, 2020).

Raising public awareness and consumer engagement is key to successful CE policies. Educational system should integrate CE education, and national campaigns can promote recycling, responsible purchasing, and repair initiatives. Also, a national ecolabeling system would help consumers choose sustainable products (EEA, 2023).

In order to obtain implementable strategies and effective regulations, a National Circular Economy Monitoring System is essential. This will help to track progress, analysing waste and recycling data, and identifying areas for improvement (World Bank, 2023). Additionally, businesses should report sustainability efforts to ensure transparency and accountability (European Commission, 2023).

Finally, international cooperation is another important element in accelerating CE efforts. RNM should strengthen its ties with EU institutions, the OECD, and UN programs to leverage

their expertise and financial support. Participating in regional partnerships with neighbouring countries could help exchange best practices and improve CE implementation (UNDP, 2023). Aligning with the EU Green Deal and European CE directives would also open up new opportunities for investment and innovation in sustainable industries.

Conclusion

The transition towards a CE in RNM brings both challenges and opportunities. This transition is not only a response to pressing environmental concerns but also a chance to foster economic growth. As part of its EU integration efforts, the country is aligning its policies with European sustainability frameworks, including the EU Green Deal and the Circular Economy Action Plan.

While some progress has been made, gaps in policy enforcement, financial support, and institutional coordination continue to slow the country's efforts. Developing a national Circular Economy Action Plan with clear targets for waste reduction, resource efficiency, and sustainable industry practices will be essential to moving forward. Strengthening financial incentives, improving waste management infrastructure, and fostering collaboration between public and private sectors will also play a crucial role in advancing CE initiatives.

Raising public awareness and encouraging consumer participation is equally important. Education programs, national awareness campaigns, and clear ecolabeling systems can help businesses and individuals embrace more sustainable consumption practices. Additionally, improving data collection and monitoring mechanisms will allow policymakers to refine strategies and track progress effectively.

International cooperation remains a key driver of CE progress. Aligning policies with EU standards, participating in regional sustainability initiatives, and securing financial and technical support from global institutions will help RNM accelerate its transition toward a resource-efficient and low-carbon economy. Implementing these strategic actions will not only enhance environmental sustainability but also strengthen economic resilience and improve overall quality of life, positioning RNM as a leader in CE development within the Western Balkans.

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