

ANALYSIS OF THE POTENTIAL FOR CIRCULAR ECONOMY IMPLEMENTATION IN NORTH MACEDONIA: CHALLENGES AND OPPORTUNITIES

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Abstract: This paper investigates the potential for adopting a circular economy (CE) model in North Macedonia, a country with evolving economic landscape and ongoing EU accession aspirations. The study examines the challenges and opportunities associated with transitioning from a linear to a circular economic model in the context of North Macedonia's unique economic and environmental conditions. It explores how current policies, legislative frameworks, and industrial practices are aligned with the principles of the CE, particularly in key sectors such as agriculture, manufacturing, and energy. Given North Macedonia's reliance on resource-intensive industries and the environmental impacts of its economic activities, adopting a CE offers opportunities for enhanced resource efficiency, waste minimization, and sustainable growth.

However, barriers such as limited awareness, infrastructural gaps, regulatory challenges, and financial constraints represent significant obstacles. Despite these challenges, the paper identifies opportunities for North Macedonia to capitalize on innovation, public-private partnerships, and EU collaboration to foster circular solutions, particularly through green jobs and digital transformation. The analysis concludes by emphasizing the need for comprehensive policy reform, investments in circular infrastructure, and public awareness campaigns to successfully implement a circular economy in North Macedonia. By advancing toward a circular model, the country can simultaneously achieve environmental sustainability, economic resilience, and regional leadership in green development initiatives.

Keywords: circular economy, North Macedonia, green jobs, green economy, sustainability

1. INTRODUCTION

The concept of a circular economy (CE) represents a transformative approach to production and consumption, shifting from the traditional linear model of "take, make, dispose" to one that emphasizes resource efficiency, waste minimization, and sustainable economic growth. As the world faces increasing environmental challenges, such as resource reduction, pollution, and climate change, the CE offers a framework that aligns economic activities with environmental sustainability.

North Macedonia is in the process of aligning its policies and industries with the European Union's sustainability agenda. Although the country faces several challenges in terms of economic development and industrial modernization, there is a growing recognition of the need to embrace sustainable practices.

This paper investigates the potential for integrating CE principles into North Macedonia's economy and examines the obstacles that must be overcome to make this transition successful.

2. THE CIRCULAR ECONOMY: AN OVERVIEW

The circular economy is focused on three key principles, which are crucial for transitioning towards a sustainable and regenerative economic system. These principles are: 1) designing out waste and pollution, 2) keeping products and materials in use, and 3) regenerating natural systems.

2.1. Designing out waste and pollution

The first principle of the circular economy aims to eliminate waste and pollution at the source. This involves rethinking the way products are designed, manufactured, and distributed to ensure that waste and pollution are not just minimized, but prevented altogether. Traditional production systems often generate significant waste as a by-product of extracting raw materials, producing goods, and disposal of used products. In contrast, circular economy approaches focus on creating products that are durable, reusable, repairable, and easy to disassemble at the end of their life.

Key aspects of this principle include:

Eco-design: Products are designed with a focus on sustainability from the start. This includes using fewer resources, reducing hazardous materials, and ensuring that products can be easily reused or recycled.

Minimizing pollution: Production processes are optimized in order to reduce emissions and waste by choosing cleaner production methods, using renewable energy, and implementing closed-loop systems that prevent harmful environmental outputs.

Extended product lifecycle: Products are designed to last longer, either by being more durable or by allowing for easy maintenance and repair, which reduces the need for frequent replacements.

By designing out waste and pollution, businesses can not only reduce their environmental footprint, but also create products that deliver greater value to consumers and the economy as a whole.

2.2. Keeping products and materials in use

The second basic principle of the circular economy focuses on maintaining the value of products, components, and materials for as long as possible. Rather than following the linear economy's practice of discarding items after use, CE emphasizes creating systems that keep materials in circulation through reuse, repair, refurbishment, remanufacturing, and recycling.

Key strategies to keep materials in use include:

Reuse and sharing models: Extending the lifespan of products by encouraging reuse. For instance, through sharing platforms (e.g., car-sharing, tool-sharing) and second-hand markets, consumers can access products without the need to produce new ones.

Repair and refurbishment: Encouraging consumers and businesses to repair products rather than replace them. This also supports the growth of repair industries and services.

Remanufacturing: Taking used products and restoring them to "like-new" condition, which preserves the value embedded in the original manufacturing process and reduces the need for new raw materials.

Recycling: When products can no longer be reused or repaired, materials can be recycled back into the production process, reducing the demand for virgin raw materials and minimizing waste.

This principle helps address resource scarcity by ensuring that valuable materials are continually cycled through the economy, reducing the need for new raw material extraction and decreasing environmental degradation.

2.3. Regenerating natural systems

The third principle of the circular economy is focused on minimizing negative impacts by seeking to actively restore and regenerate natural systems. This principle recognizes that economic activity does not have to be extractive; instead, it can play a role in replenishing the ecosystems that businesses and communities depend on. The goal is to shift from exploiting finite resources to creating regenerative cycles where materials are sourced and used in ways that benefit the environment.

Key elements of regenerating natural systems include:

Restorative agriculture and land use: Encouraging farming practices such as agro-ecology, regenerative agriculture, and organic farming, which enhance soil health, increase biodiversity, and improve water management. These practices contribute to the restoration of ecosystems while maintaining agricultural productivity.

Circular water management: Efficiently managing water resources by treating wastewater for reuse, reducing water consumption in production processes, and ensuring that water use supports ecosystem health.

Using renewable energy: Transitioning from fossil fuels to renewable energy sources, such as solar, wind, and hydroelectric power, reduces greenhouse gas emissions and lessens the environmental impact of energy consumption. This shift supports the restoration of the earth's climate and natural systems.

Biological cycles: Organic materials, such as food and agricultural waste, can be returned to the ecosystem through composting or anaerobic digestion, which replenishes soils and promotes natural regeneration. This forms a biological cycle where waste becomes a nutrient for new growth.

These three core principles of the circular economy form the foundation for transforming how economies operate. Together, they offer a holistic approach to sustainability that balances economic growth with ecological regeneration and long-term resource stewardship. By adopting these principles, countries like North Macedonia can enhance their resource efficiency, mitigate environmental impacts, and contribute to global efforts to minimize climate change and promote sustainable development.

In the context of North Macedonia, the implementation of these principles could significantly contribute to resource efficiency and economic resilience. This is particularly important given the country's reliance on imports for many raw materials and its need to meet the environmental standards set by the European Union (EU) as part of its accession process.

3. NORTH MACEDONIA'S CURRENT ECONOMIC LANDSCAPE

North Macedonia's economy is primarily driven by manufacturing, mining, agriculture, and services. These sectors have historically operated on a linear economic model, contributing to resource inefficiency and environmental degradation. Industrial pollution, waste generation, and inefficient use of energy and raw materials are significant issues that need to be addressed. Moreover, North Macedonia has a high dependency on imports for critical resources, making it exposed to global market fluctuations and resource scarcity.

In recent years, however, the country has taken initial steps toward adopting sustainable practices. These include the development of national strategies for waste management, energy efficiency, and climate action, as well as

initiatives aimed at promoting green industries and innovation. Nevertheless, the transition toward a CE model remains in its infancy, with limited policy integration and business engagement.

North Macedonia has recognized the importance of aligning its policies and practices with global sustainability trends, particularly in response to the European Union's environmental and climate action goals. As an EU candidate country, it has been integrating sustainable practices into its national strategies to reduce environmental degradation, improve resource efficiency, and transition toward a low-carbon and circular economy.

The key steps North Macedonia has taken to adopt sustainable practices are:

- National Waste Management Plan (2020-2030) - North Macedonia has developed a comprehensive *National Waste Management Plan (2020-2030)*, which is aligned with EU waste management directives. The plan sets ambitious targets to improve the country's waste management system, reduce waste generation, and increase recycling rates.
- National Energy Efficiency Strategy - Energy efficiency has been a significant area of focus as North Macedonia works to reduce its dependence on coal and fossil fuels. In line with EU energy directives, the country has adopted an updated *National Energy Efficiency Strategy*.
- Climate Action Plan and Alignment with the European Green Deal - North Macedonia is committed to reducing its greenhouse gas emissions in alignment with the European Union's *Green Deal* and the *Paris Agreement*.
- Agriculture and Water Management Reforms - Sustainable practices in agriculture and water management have become a growing priority for North Macedonia, as these sectors are critical for food security and rural livelihoods. The country has introduced several measures to reduce the environmental impact of agriculture and ensure efficient use of water resources.
- Development of Green Public Procurement (GPP) - Green public procurement (GPP) as a tool must be increasingly used by the government to promote sustainability. By prioritizing the procurement of goods and services that have a lower environmental impact, the government can lead by example and encourage sustainable production and consumption.
- Circular Economy Initiatives - Although North Macedonia is still at an early stage in implementing a full circular economy (CE), steps are being taken to introduce CE principles into its economic system. These efforts are in line with the European Commission's *Circular Economy Action Plan*.
- Collaboration with the EU and International Organizations - North Macedonia has benefited from collaborations with the European Union, international organizations, and development agencies that support its sustainability transition.

These steps demonstrate North Macedonia's commitment to aligning its economy with sustainability principles. Although the country still faces challenges, such as the need for greater investments in infrastructure, policy enforcement, and behavioral change, the groundwork is being laid for a more sustainable future. By continuing to integrate these practices into its national development strategy, North Macedonia can strengthen its position as a regional leader in environmental sustainability and contribute to the broader global effort to achieve a greener economy.

4. POLICY AND LEGISLATIVE FRAMEWORK

North Macedonia's alignment with EU regulations and directives, particularly in the context of environmental sustainability, provides a crucial framework for promoting circular economy principles. The EU's Circular Economy Action Plan, part of the broader European Green Deal, serves as a guideline for member states and accession countries like North Macedonia to transition towards circularity.

Key areas where the legislative framework could support CE in North Macedonia include:

- Waste management: Implementation of more stringent recycling and waste reduction targets.
- Sustainable production and consumption: Encouraging industries to adopt eco-design principles and sustainable production practices.
- Extended Producer Responsibility (EPR): Requiring producers to be responsible for the lifecycle of their products, including post-consumer waste.
- Public procurement: Promoting green public procurement policies that prioritize circular products and services.

The country's National Waste Management Plan (2020-2030) outlines several objectives aligned with the EU's waste directives, such as increasing recycling rates and reducing landfilling. However, further integration of CE principles into national policies is necessary for systemic change.

5. KEY SECTORS FOR CIRCULAR ECONOMY IN NORTH MACEDONIA

Agriculture and Food Systems

Agriculture plays a significant role in North Macedonia's economy, contributing around 10% of the country's GDP. The sector faces issues related to water management, soil degradation, and food waste. Circular practices, such as regenerative farming, organic waste composting, and water recycling, can help enhance resource efficiency and reduce the environmental impact of agriculture.

Manufacturing and Industrial Sectors

North Macedonia's manufacturing sector, especially in textiles, automotive components, and machinery, presents opportunities for circularity. Adoption of circular manufacturing processes such as the remanufacturing of parts, recycling of materials, and eco-design can improve resource efficiency. Industries can also explore closed-loop systems, where waste products from one process are reused as inputs for another.

Energy Sector

The energy sector is critical in the transition to a CE. North Macedonia's energy mix is heavily dependent on coal, with significant greenhouse gas emissions. Increasing the share of renewable energy sources, such as solar and wind, while promoting energy efficiency in industrial processes, can contribute to the circular economy. The development of decentralized energy systems, where local energy generation meets local needs, can also reduce energy loss and improve resilience.

6. CHALLENGES AND BARRIERS TO CIRCULAR ECONOMY IMPLEMENTATION

Despite the potential benefits, several challenges obstruct the transition to a circular economy in North Macedonia:

- Limited awareness and understanding: There is a general lack of knowledge about circular economy principles among policymakers, businesses, and consumers.
- Infrastructure gaps: The country lacks the necessary recycling and waste management infrastructure to support large-scale circular practices.
- Economic and financial constraints: Transitioning to circular practices may require significant upfront investment, which can be a barrier for small and medium-sized enterprises (SMEs).
- Regulatory challenges: Although some policies align with EU standards, enforcement and implementation remain weak. More comprehensive legislation that incentivizes circular innovation is needed.
- Cultural and behavioral factors: Consumers and businesses have been slow to adopt sustainable practices, partly due to a lack of incentives and clear benefits.

7. OPPORTUNITIES FOR GROWTH

Despite these barriers, there are several opportunities for North Macedonia to become a regional leader in circular economy initiatives:

- Innovation and entrepreneurship: Startups and innovators can drive circular solutions, particularly in digital technologies and sustainable design.
- Collaboration with the EU: As a candidate country, North Macedonia can benefit from EU funding and knowledge exchange to develop CE strategies.
- Green jobs and skills development: The circular economy can create new employment opportunities in recycling, repair, and remanufacturing sectors. Skills development programs should focus on equipping the workforce for these emerging industries.

8. FINDINGS AND RECOMMENDATIONS

Findings

North Macedonia has made significant developments in aligning its policies with the European Union's sustainability and environmental directives. The country's *National Waste Management Plan (2020-2030)*, *National Energy Efficiency Strategy*, and commitments to the EU's Circular Economy Action Plan and Green Deal indicate a clear intention to transition towards a more sustainable, circular economy. However, full implementation remains slow due to financial, technical, and infrastructural challenges.

North Macedonia's energy sector is heavily dependent on coal and fossil fuels, contributing significantly to the country's greenhouse gas emissions. While there is a growing emphasis on renewable energy sources, such as solar and wind, the transition to a cleaner energy mix is progressing at a relatively slow pace due to a lack of large-scale investments and outdated energy infrastructure.

The waste management sector in North Macedonia continues to face significant challenges, with high levels of waste going to landfills and limited recycling capabilities. While the government has outlined strategies to improve

recycling rates and promote waste reduction, much of the infrastructure necessary to support circular waste practices is still underdeveloped. The absence of advanced recycling facilities and organized collection systems hinders the effective implementation of CE principles in this sector.

There is a general lack of awareness about circular economy principles among businesses, policymakers, and consumers. Many companies are still operating under traditional linear economic models, and the adoption of circular practices such as reuse, remanufacturing, and industrial symbiosis is relatively limited. This is exacerbated by weak consumer demand for sustainable products and limited governmental incentives to drive business transformation.

Recommendations

There is an urgent need to build awareness of circular economy principles among businesses, policymakers, and consumers. Public awareness campaigns, educational programs, and workshops on sustainable business models can help change mindsets and behavior. Additionally, vocational training programs should be developed to equip the workforce with the necessary skills for jobs in green industries such as recycling, renewable energy, and sustainable agriculture.

North Macedonia needs to enhance its waste management infrastructure, particularly in terms of recycling and waste separation systems. The development of modern recycling facilities, along with better waste collection and sorting practices, will be essential for improving recycling rates. The government should also enforce Extended Producer Responsibility (EPR) schemes and support local businesses in adopting circular practices such as product remanufacturing and material reuse.

The government should prioritize investments in renewable energy infrastructure to diversify the energy mix and reduce the reliance on fossil fuels. Developing large-scale solar and wind projects, improving grid integration for renewables, and offering incentives for energy-efficient technologies in buildings and industries are critical. International partnerships, especially with the EU and IFIs, should be leveraged to secure funding and technical expertise for these transitions.

Small and medium-sized enterprises (SMEs) are the backbone of North Macedonia's economy, but many face financial barriers to adopting circular practices. The government should introduce financial incentives, such as grants, low-interest loans, and tax breaks, to encourage SMEs to invest in circular innovations and technologies. Green public procurement policies can also support the growth of businesses that prioritize circular economy principles by creating market demand for sustainable products and services.

By implementing these recommendations, North Macedonia can accelerate its transition toward a circular economy, fostering economic resilience, environmental sustainability, and alignment with the European Union's green agenda.

9. CONCLUSION

The transition to a circular economy presents both challenges and opportunities for North Macedonia, demanding a multi-faceted and strategic approach. Structural and financial barriers, including outdated infrastructure, limited access to financing, and gaps in policy implementation, remain significant obstacles. However, aligning with European Union directives provides a robust framework for systemic change, offering guidance, financial support, and access to best practices. Public-private partnerships will be pivotal in bridging resource gaps and fostering innovation, creating a collaborative ecosystem where the public sector provides regulatory support, and the private sector drives technological advancements and market adoption.

Focusing on transformative changes in key sectors—such as agriculture, manufacturing, and energy—offers a pathway to unlock substantial benefits. For instance, adopting circular practices in agriculture can reduce waste and enhance food security, while sustainable manufacturing can promote resource efficiency and competitiveness. Similarly, transitioning to renewable energy and circular energy models can mitigate environmental degradation and reduce dependence on non-renewable resources.

The adoption of a circular economy model will not only advance North Macedonia's environmental sustainability goals but also strengthen its economic resilience, fostering innovation and creating new employment opportunities. Furthermore, by taking proactive measures to embrace green policies and technologies, North Macedonia can position itself as a regional leader in the Balkans, setting an example for neighboring countries.

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