



CIRCULAR ECONOMY AND EUROPEAN UNION PUBLIC GOVERNANCE: REGULATORY BARRIERS SINCE 2014

[amnd]

MARIA LUÍSA VASCONCELOS
Universidade Fernando Pessoa (Portugal)
lvasc@ufp.edu.pt

SANDRA BERNARDO
Universidade Fernando Pessoa (Portugal)
sbern@ufp.edu.pt

Abstract: Successful integration of Circular Economy (CE) within economic systems can significantly contribute to sustainable development by promoting economic growth through closed-loop systems. Nonetheless, despite CE principles aligning closely with the United Nations' Sustainable Development Goals (SDGs), their integration into public policy faces limitations. This study adopts a qualitative research approach, drawing insights from academic literature and European legislation, so as to shed light on the challenges and barriers obstructing the effective implementation of CE principles within the framework of the EU. Focusing on regulatory obstacles, this research analyzes the intersection of Sustainability Economics (SE) with CE, identifies major CE principles and observes the challenges involved in incorporating them into public policy. It then reviews European Union (EU) milestones in adopting CE, under both the Juncker Commission and the von der Leyen Commission, and assesses the obstacles in integrating CE within EU public policy. The study found that major challenges highlighted in the literature include insufficient awareness, limited infrastructure for recycling and reusing materials, and ensuring collaboration between governments, industries, and consumers. Continuing to implement comprehensive policy frameworks is essential for promoting CE practices in the EU.

Keywords: sustainability economics, circular economy, environmental policies, regulatory barriers, European Union.

ISSN 2283-7949
GLOCALISM: JOURNAL OF CULTURE, POLITICS AND INNOVATION
DOI: 10.54103/gjcp.2024.23508



Some rights reserved

INTRODUCTION

The far-reaching impacts of human activities have made planet Earth vulnerable to significant biophysical consequences, to such an extent that it has led to the widespread use of the term “Anthropocene” (United Nations Development Programme 2020) among researchers across natural sciences, engineering, humanities, and social sciences. Even though the formal recognition of this epoch remains a subject of ongoing debate within the scientific community (Nature 2024), there is a consensus regarding the undeniable influence of human activities on Earth’s ecosystems and climate patterns, and the need for urgent and comprehensive measures to mitigate impacts.

There is a critical need for decision-making guided by Sustainability Economics (SE) to shape a more sustainable future, and consequently, a growing imperative to understand Circular Economy (CE) beyond the perspective of immediate costs, but rather in terms of its societal and environmental objectives (Andersen 2007). The principles of CE closely align with the objectives outlined in the United Nations’ Agenda 2030 Sustainable Development Goals (SDGs) (United Nations 2015), especially those directly related to responsible consumption and production (SDG 12), climate action (SDG 13), and life below water and on land (SDG 14). Within this framework, it is recognized that integrating CE principles into public policy is significant for achieving long-term sustainability. Nonetheless, despite the growing interest in CE, largely due to support from NGOs, consultancies, and think tanks, tensions and limitations related to its implementation suggest that challenges arise when integrating CE into both businesses and public governance.

Within the framework of sustainable economic, this study examines the challenges (obstacles) and opportunities (prospects) associated with integrating CE principles into public policy frameworks. Despite the relevance of different type of barriers – cultural, legal, market-related, technological –, the article centers on regulatory obstacles, with a specific focus on the European Commission legislation post-2014.

The research is based on three main assumptions. Firstly, it accepts that successful integration of CE principles into public policy can significantly contribute to sustainability by directly framing the reduction of resource consumption, minimizing waste, and fostering economic growth through innovative, closed-loop systems. Secondly, it acknowledges that strategic public policy initiatives can create synergies, ultimately aiding in the implementation of CE and facilitating the dismantling of various barriers. Thirdly, it recognizes that challenges related to policy alignment, stakeholder engagement, and the need for robust regulatory frameworks must be effectively addressed to achieve the full potential of CE strategies.

The study employs a qualitative research approach, drawing from academic literature and examining European Commission legislative milestones under the Juncker (2014-19) and von der Leyen (2019-present) Commissions, to investigate the primary regulatory barriers that hinder the effective implementation of CE principles into European legal framework. The relevance of the study lies in informing policymakers, scholars, and practitioners about European Union (EU) barriers in achieving a more effective integration of CE, while highlighting critical regulatory challenges that need to be addressed to fulfill the objectives outlined in Agenda 2030.

The paper is structured as follows: in the first and second sections we examine the intersection of SE with CE and examine major principles of CE; we then review the key milestones taken by the EU towards the implementation of CE into governmental policies post 2014 and highlight the major obstacles, with special focus on regulatory barriers; we conclude with an assessment of the progress and obstacles in integrating CE within the EU policies.

THE INTERSECTION OF SUSTAINABILITY ECONOMICS AND CIRCULAR ECONOMY

Despite the absence of a precise definition and variations in perspectives, methodology, and institutional background, SE has become a center for many scholars studying the Anthro-

cene, and the prevailing view endorses a comprehensive approach that considers ecological, social, and economic dimensions for more effective solutions to contemporary sustainability challenges. This research specifically refers to the definition provided by Baumgärtner and Quaas (2010) and again by Drupp et al. (2020), employing a four-dimensional characterization: *a*) a subject matter focus on the human-nature relationship; *b*) an orientation to the long-term and uncertain future; *c*) a normative orientation of sustainability; and *d*) a genuine concern for economic efficiency. Accordingly, for the purpose of this analysis, SE is to be understood as a multidimensional and interdisciplinary field with a genuine economic focus that encompasses the intricate relationship between humans and nature, adopts a long-term perspective, and prioritizes economic efficiency while establishing a normative foundation for addressing sustainability challenges.

Within this conceptual framework, SE brings sustainability considerations into the contemporary growth dynamics, aiming to reconcile economic activity with the well-being of the planet. CE, defined as “an economic model wherein planning, resourcing, procurement, production and reprocessing are designed and managed, as both process and output, to maximize ecosystem functioning and human well-being” (Murray et al. 2017), aligns effortlessly with the core focus of SE, as both share a fundamental commitment to economically sustainable practices.

Similarly, Kirchherr et al. (2017: 224-225) present a meta-definition of CE based on an analysis of 114 definitions and describe it as

an economic system that is based on business models which replace the ‘end-of-life’ concept with reducing, alternatively reusing, [and] recycling [...] materials in production/distribution and consumption processes [...], with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations.

For the purpose of this paper, we adopt such a comprehensive approach, which recognizes the necessity of incorporating the social dimension inherent in sustainable development into

CE, emphasizing a balanced attention to the interplay between economic, environmental, and social factors. Such a perspective is deemed essential, as emphasized by Mies and Gold (2021: 11), “to obtain a truly sustainable alternative to the current economic system”.

CIRCULAR ECONOMY PRINCIPLES AND MARKET BARRIERS

CE principles call for significant change in what, how and how much we produce and consume within modern economies, going beyond minor adjustments to the existing system as if “a bit of twisting the *status quo*”, as expressed by Kirchherr et al. (2017: 229). This change stands in direct contrast to the conventional linear model of “take-make-[consume]-dispose” (Ellen MacArthur Foundation 2013: 14) as it promotes a closed-loop system where products, materials, and resources are continuously cycled back into the production process.

From a microsystem perspective (individual companies, products, or consumers), the transition from a linear to a circular economy is facilitated by the 3 Rs Principles – Reduction, Reuse and Recycle (Ghisellini et al. 2016) –, further extended to the 9 Rs Framework, where the R 9 is the beginning of the linear output and the R 0 is the closest to circularity. The concern begins with the practical application of materials through Recovering (R 9) and Recycling (R 8) processes. It then moves towards extending the lifespan of products and their parts, achieved through Repurposing (R 7) and Remanufacturing (R 6) of discarded products, along with Refurbishing their use (R 5), Repairing defective functions (R 4), and Reusing (R 3). Finally, the circularity ends with smarter product use and manufacture, accomplished by Reducing the use of natural resources (R 2), Rethinking alternatives (R 1), and Refusing unnecessary products or services (R 0) (de Melo et al. 2022).

Nonetheless, our focus is on optimizing entire systems rather than individual components. This involves system-wide optimization, restorative practices, and the decoupling of economic growth from environmental degradation, and calls for



concepts such as product life extension, recycling, remanufacturing, waste reduction through resource efficiency, “cradle-to-cradle,” biomimetics, and industrial ecology.

Accordingly, although other principles can additionally be identified (Ghisellini et al. 2016), tab. 1 aligns key principles and strategies of CE (Ellen MacArthur Foundation 2023; Suárez-Eiroa et al. 2019; Velenturf, Purnell 2021) and explains how each contributes to the broader goals of sustainability. These CE principles aim not only to conserve resources but also reduce environmental degradation, decrease waste generation, and promote economic resilience. A few words of caution, however.

Firstly, CE also raises concerns about unintended consequences and oversimplified goals. Murray et al. (2017) exemplify this by highlighting potential environmental costs of green technologies and challenging the notion that durability always aligns with ecological efficiency. These critiques emphasize the need for a comprehensive evaluation of the CE approach, raising concerns about the potential prioritization of technological solutions over natural processes in sustainable practices. Secondly, CE aims to retain product value, minimize waste, and keep resources within the economy for repeated use, but CE does not endorse endless recycling. While the initial stages of recycling yield noticeable benefits, as the process continues, additional advantages become increasingly challenging to attain. There is a cut-off point where recycling becomes too burdensome, leading to diminishing returns and, ultimately, a situation where the effort expended outweighs the benefits gained (Andersen 2007). Thirdly, further research is crucial to understand the intricate dynamics among climate change, biodiversity, and resource scarcity within CE’s framework, and its impacts on economic growth, social justice, and global sustainability, particularly in light of entropy and the rebound effect (Calisto Friant et al. 2021).

Tab. 1. *Major principles for Circular Economy (CE)*

Three principles driven by design (Ellen MacArthur Foundation 2023)	Ten “manifesto” Principles (Velenturf, Purnell 2021)	Seven operational principles (Suárez-Eiroa et al. 2019)
<p><i>Closed-looped approach</i></p> <p><i>P#1. Eliminate waste and pollution</i> [Design out waste and pollution]</p> <p>Material flows are categorized into biological nutrients and technical nutrients. Biological nutrients are designed to re-enter the biosphere safely, while technical nutrients are designed to circulate at high quality without entering the biosphere. This closed-loop approach aims to minimize waste and ensure that materials are reused and recycled within the system.</p>	<p>3. <i>Design for circularity</i>: Focused on minimizing waste and optimizing resource use.</p> <p>4. <i>Circular business models</i>: Encourages practices that reduce waste and pollution.</p> <p>10. <i>Whole system assessment</i>: Aims to optimize material use and reduce waste.</p>	<p>iii) Closing the system.</p> <p>iv) Maintaining the value of resources within the system.</p> <p>vi) Designing for CE.</p>
<p><i>Design to Re-design</i></p> <p><i>P#2. Circulate products and materials (at their highest value)</i> [Keep products and materials in use]</p> <p>Products and systems are designed so as to facilitate easy disassembly, reuse, and recycling. The objective is to prevent waste and prevent environmental damage through better system design.</p>	<p>2. <i>Reduce and decouple resource use</i>: Encourages efficient use and circulation of resources.</p> <p>5. <i>Transform consumption</i>: Shifts towards demand-driven resource use, promoting circulation.</p> <p>6. <i>Citizen participation</i>: Involves citizens in resource circulation.</p> <p>7. <i>Coordinated participatory and multi-level change</i>: Involves multiple stakeholders in circulating resources.</p>	<p>i) Adjusting inputs to the system to regeneration rates.</p> <p>ii) Adjusting outputs from the system to absorption rates.</p> <p>iv) Maintaining the value of resources within the system.</p> <p>v) Reducing the system’s size.</p> <p>vi) Designing for CE.</p>
<p><i>Restorative Approach</i></p> <p><i>P#3. Regenerate nature</i> [Regenerate natural systems]</p> <p>The aim is not only to prevent damage but also to actively repair and restore the environment by designing systems within industries that contribute positively to environmental restoration.</p>	<p>1. <i>Beneficial reciprocal flows of resources</i>: Emphasizes the co-existence and mutual benefit between nature and society.</p> <p>8. <i>Mobilize diversity</i>: Supports diverse solutions for regenerating nature.</p> <p>9. <i>Political economy for multidimensional prosperity</i>: Focuses on long-term environmental health and prosperity.</p>	<p>i) Adjusting inputs to the system to regeneration rates.</p> <p>ii) Adjusting outputs from the system to absorption rates.</p> <p>vi) Designing for CE.</p> <p>vii) Educating for CE.</p>
<p><i>Decoupling Economic Growth from Resource Depletion</i>: the ultimate aim is to achieve sustainable development.</p>		

Note: The principles in the table are numbered according to the sequence used by the respective authors.

Regardless of the challenges and necessary cautions, the transition to CE within the contemporary market system is relevant and long overdue. CE asks for changes in product design, business models, waste-to-resource processes, and consumer behavior, demanding systemic innovation in technology, organization, society, finance, and policies. Although estimates indicate that enhancing resource efficiency across value chains could lead to a 17% to 24% reduction in material input needs by 2030 (Meyer 2011: 11), market barriers to effective and efficient management of resources persist, hindering progress in resource productivity within the industry. Back in 2012, one of the frameworks for the innovation of the European Commission, Europe Innova (cited in European Commission 2014), had already projected that optimizing resource utilization through CE could yield a substantial annual savings potential of €630 billion for the European industry. What, then, is hindering this transition? Within the EU, Kirchherr et al. (2018) found that cultural barriers, such as a “lack of consumer interest and awareness”, along with a “hesitant company culture”, were the primary obstacles to the CE for businesses and policy-makers. Interestingly enough, no technological barriers ranked among the most pressing CE challenges, but the study revealed that those market barriers were induced from a lack of synergies from governmental interventions aimed at accelerating change. Without addressing these barriers, the realization of sustainability benefits in the context of CE will not materialize.

De Jesus, Mendonça (2018: 81) emphasize regulatory barriers as the second most significant obstacle highlighted in the relevant literature, cited in 23% of their reviewed articles. Kirchherr et al. (2018: 269) present a different viewpoint, indicating that businesses and policy-makers don't rank regulatory barriers among the top five most pressing obstacles. Nonetheless, among the surveyed regulatory barriers, “Obstructing laws and regulations” emerges as a core concern, as expert-interviewees perceived the need for changes in existing laws and regulations as crucial. Note that Kirchherr et al. (2018) acknowledge that their findings may have been influenced by their focus on the EU and find it reasonable to anticipate that the European Commission's designation of CE

as a policy priority since 2015 might have already led to the addressing of the most critical CE regulatory barriers.

Nonetheless, the role of public policy, both directly and indirectly, particularly in dismantling market and technological barriers and, subsequently, creating synergies for the effective implementation of CE, is still far from materializing. Persistently low prices of virgin materials and substantial upfront costs associated with circular investments, for example, present ongoing challenges, and it is crucial to address these issues for a successful transition to CE. Moreover, overcoming deeply entrenched cultural barriers seems improbable without such interventions. As far as public governance is concerned, we would say the true challenge for policymakers is to look beyond the short-term costs of CE and prioritize social and environmental objectives, all while securing public and voter support and contending with macroeconomic constraints.

The following section will focus on reviewing the key milestones of the path taken by the EU towards the adoption of the CE, with the aim of providing an overview of the progress of this approach and identifying the key obstacles of incorporating CE approaches into governmental policies within the EU context. This effort seeks to highlight the challenges for improving public policy to advance CE, fostering synergies across cultural, technological, and market dimensions.

INTEGRATING CIRCULAR ECONOMY INTO EUROPEAN UNION PUBLIC POLICY

The integration of CE principles and strategies into public policy aligns closely with the shared 17 SDGs outlined in Agenda 2030, which seek to harmonize economic growth, environmental protection, and social well-being. Indeed, public policy plays a central role in achieving these objectives by creating regulatory frameworks and incentives that promote sustainable practices (United Nations 2015).

Accordingly, countries have introduced specific legislation aimed at transitioning from a linear economy to a circular approach, with significant examples originating in Germany,

through the avoidance, reduction, disposal (Centre international de référence sur l'analyse du cycle de la vie et la transition durable [Ciraig] 2015: 40), the Netherlands, with the circular economy and waste law (Bastein et al. 2013; van Buren et al. 2016: 40; Centre international de référence sur l'analyse du cycle de la vie et la transition durable [Ciraig] 2015), Japan, in the early 2000s, with excess waste and resources scarcity policies and a law for the promotion of efficient utilization of resources (Ellen MacArthur Foundation 2014: 34), and China, which was the first country to adopt a CE law and “as large-scale industrial ecology” focused on 3 Rs (Centre international de référence sur l'analyse du cycle de la vie et la transition durable [Ciraig] 2015; de Melo et al. 2022: 259). In the EU, it is clear that CE has been embraced in the last two decades, emerging as an essential strategy under both the Juncker Commission (2014-2019) and the von der Leyen Commission (2019-present).

In December 2014, the European Parliament successfully adopted the European Commission's communication, “Towards a Circular Economy: a Zero-Waste Programme for Europe”, overcoming opposition from certain business lobbies. The initiative aimed to enhance recycling, prevent material loss, stimulate job creation and economic growth, demonstrate the effectiveness of new business models, eco-design, and industrial symbiosis in achieving zero-waste goals, while also reducing greenhouse emissions and environmental impacts (European Commission 2014). In 2015, the European Commission adopted its initial CE package (European Commission 2015) aiming to facilitate the transition to a circular economy, boost competitiveness, and promote sustainable growth. The action plan included 54 specific measures across production, consumption, waste management, and the secondary raw materials market, along with a revised legislative proposal on waste. Completed by 2019, ongoing efforts continued for some actions beyond that year (European Commission 2019b). In the same year, several regulations were adopted to establish ecodesign requirements for various products. Additionally, the European Green Deal was adopted in December 2019 (European Commission 2019a) and in March 2020, a new Circular Economy Action Plan was

also adopted (European Commission 2020a), integrating 35 initiatives that cover the product life cycle and focusing on design, circular processes, sustainable consumption, and waste prevention, while also incorporating strategic legislative and non-legislative measures. The new action plan is aligned within the European Green Deal and aims to further transition to a CE, alleviating resource pressure, promoting sustainable growth, and contributing to the EU's 2050 climate neutrality goal.

By examining the timeline of events leading to the implementation of the first CE action plan in March 2020 (European Commission 2020b), we discern a consistent dedication from the EU towards advancing the CE objectives under both the Juncker (2014-19) and von der Leyen Commissions (2019-present), with comprehensive measures and initiatives that cover the whole life cycle of products and promote circular economy processes. The Juncker Commission (2014-19) laid the groundwork for the circular economy by adopting the first action plan in 2015. The von der Leyen Commission (2019-present) built upon this foundation and has shown a high level of ambition in advancing the circular economy objectives, with the new action plan and the European Green Deal reflecting a more comprehensive and integrated approach to sustainability.

Despite EU's prior accomplishments, integrating CE principles as fundamental behaviors poses significant challenges, including regulatory barriers and resistance from established industries and consumer behavior. In their examination of EU's CE policies under the Juncker Commission, Calisto Friant et al. (2021) found that policies primarily targeted resource efficiency and technological change, specifically focusing at improving the Recycling of various waste types (R 7) and Repairing (R 3) through eco-design regulations, albeit with limited impact on electronic products. These findings led them to concur with Fitch-Roy, Benson and Monciardini (2019; cited in Calisto Friant et al., 2021), asserting that the CE policies of the EU fundamentally reshape existing measures, emphasizing the revision of waste directives and recycling targets rather than actively pursuing transformative change.

Calisto Friant et al. (2021) argue that EU policies prioritize growth and competitiveness over human well-being and ecosystem health. They maintain that there are disparities between the EU's discourse and implemented targets and policies, with the former being comprehensive and the latter neglecting the broader socio-ecological implications of a transition to circularity, refraining from addressing rebound effects, entropy, overshoot, overconsumption, and downscaling. Furthermore, the EU's perspective that reducing inequality is dependent on GDP growth presupposes that the biosphere has the capacity to sustain further economic expansion.

But what are indeed the major obstacles to the implementation of public policy on CE, specifically in the EU? To address this question, a comprehensive analysis of various sources, including journal articles, book chapters, official reports, and NGO reports, was conducted. The period of study began with the Juncker Commission, and the search was guided by the relevance of the source and focus on the EU context. To identify references, specific keywords were combined such as: "Circular Economy" AND ("European Union" OR "EU" OR "Europe" OR "European countries" OR "European regions") AND ("Barriers" OR Impediments" OR "Challenges" OR "Constraints" OR "Resistance" OR "Obstacles"). The findings from this literature review are summarized in tab. 2, which is specifically dedicated to examining regulatory barriers, although it also considers other types of barriers insofar as they have a connection to public policy, e.g., difficulties in addressing market failures or in promoting a conducive environment for innovation and entrepreneurship. Overcoming these barriers in the EU requires an integrated and multifaceted approach that takes into account the specific characteristics of each member state, promotes cooperation, strategic investments, and a long-term vision for transitioning to a more CE. Additionally, a collaborative approach involving governments, the private sector, and civil society is required, aiming for a gradual yet determined and swift transition to a more CE in the EU.

Tab. 2. EU public policy challenges to the implementation of Circular Economy (CE) practices

Challenges	Description
Jurisdiction and regulations differences	<p><i>The EU comprises countries with different legal frameworks and economies, making it difficult to align CE policies across member states.</i></p> <p>Regulatory barriers: “Obstructing laws and regulations”, “Lack of global consensus” (Kirchherr et al. 2018), and “Lack of harmonisation in EU legislation” (Stumpf et al. 2021).</p> <p>Non-conducive legal systems and misaligned incentives make traditional practices more resistant to change (de Jesus, Mendonça 2018).</p> <p>Lack of EU harmonisation impacts more severely existing businesses transition to circularity as opposed to new born businesses (Briguglio et al. 2021).</p>
Lack of harmonized standards	<p><i>The wide range of industries and products within the EU make it difficult to create unified standards for sustainability and eco-efficiency.</i></p> <p>Lack of harmonized definitions and/or standards in several sectors (Briguglio et al. 2021; Kirchherr et al. 2018; Stumpf et al. 2021) E.g.: existing environmental policies influence the definition as to what is waste, and what is not; often, materials are labelled as waste prematurely; this categorization can hinder the growth of industrial eco-parks and the development of symbiotic relationships (de Jesus, Mendonça 2018).</p>
Differing levels of CE adoption	<p><i>Economic and infrastructure inequalities among EU regions determine different stages of CE implementation.</i></p> <p>The National Circularity Index¹ presented by Momete (2020) reveals a varied picture across Europe.</p> <p>There are different uses of CE practices across the EU (Bassi and Dias 2019; Mazur-Wierzbicka 2021; Re et al. 2023; Robaina et al. 2020).</p> <p>There are different needs across various sectors (Bilal et al. 2020; Korhonen et al. 2018).</p>
Supply chain challenges	<p><i>Need for Investment, Traceability, Harmonized Standards, and Global Policy Coordination.</i></p> <p>Need for substantial investment in infrastructure, e.g.: recycling facilities and waste management systems.</p> <p>Difficulties in ensuring product traceability along complex global supply chains, and ensuring that the entire supply chain, including international suppliers and partners, adopts sustainable practices.</p> <p>The lack of harmonized standards makes it difficult to implement effective CE strategies (Bressanelli et al. 2019; Govindan, Hasanagic 2018).</p> <p>Integrating CE can be hindered by the need to coordinate policies with countries outside the EU, especially in a globalized economy. E.g.: international trade agreements may have a negative impact on secondary (e.g., recycled) raw material sourcing, as those agreements might impose restrictions, tariffs, or regulations that make it more difficult, expensive, or less efficient to source these secondary materials across borders (Briguglio et al. 2021).</p>

Challenges	Description
Financial constraints	<p><i>Difficulties in finding and allocating funding.</i></p> <p>Finding funding for circular business models is challenging (Kirchherr et al. 2018; Sarja et al. 2021), especially in an environment where budgetary priorities may be contested and in an area that often relies on innovative technologies, which require large investment in research and development (Aloini et al. 2020).</p> <p>The lack of fiscal tools for internalising environmental costs constitute a policy barrier (Briguglio et al. 2021; Milios 2021).</p>
Cultural and behavioural resistance	<p><i>Resistance to changing consumption and disposal behaviours.</i></p> <p>Changing behaviours towards consumption and disposal face cultural resistance and require robust educational campaigns. Promoting understanding and acceptance of the CE among citizens, require substantial efforts in educational programs and specialized training.</p> <p>“Lacking consumer interest and awareness” is the primary cultural barrier identified by Kirchherr et al. (2018). To address it, adequate education and training is crucial, both to enhance general awareness and to establish the required skill base (de Jesus, Mendonça 2018).</p>
Monitoring and evaluation capacity	<p><i>Difficulties in tracking the progress of circular practices.</i></p> <p>The assessment of Return on Investment is a complex and uncertain process (Aloini et al. 2020)².</p> <p>Difficulties in assessing and quantifying the environmental benefits of CE, especially in demonstrating tangible impacts, e.g.: emissions reduction and resource conservation.</p> <p>Uncertainty regarding the long-term financial return on these investments makes companies hesitant to adopt CE.</p>

Notes: ¹ The National Circularity Index aims to identify the best and worst performers within the EU in terms of their readiness to transition to a sustainable circular economy. It serves to pinpoint the systemic interventions required by EU member countries on their journey towards embracing circularity. | ² Note that most studies that have been carried out to evaluate the adoption and implementation of CE have predominantly utilized single-dimensional indicators (e.g.: waste management). However, Silvestri et al. (2020) build two composite indicators – the Circular Economy Static Index (CESI) and the Circular Economy Dynamic Index (CEDI) – that permit both a static and a dynamic evaluation of the CE performance of European regions.

Pragmatically, to strengthen its role as a proactive advocate for sustainability policies, the EU must advance CE regulations that promote environmental well-being, social equity and economic resilience, without giving priority to economic growth. This becomes especially challenging during periods of

economic stagnation and uncertainty, as competing demands for economic recovery can lead to potential conflicts between environmental goals and short-term economic interests. Striking a balance between sustainability and economic resilience becomes particularly difficult during these periods.

However, this is not just a choice; it is an urgent imperative. If the EU and the world fail to act promptly and decisively today to address environmental challenges, the consequences will extend far beyond environmental concerns and will become more and more evident in the degradation of ecosystems, threats to biodiversity, and the exacerbation of climate-related issues, jeopardizing the overall well-being of present and future generations. The very structure of our economies, businesses, employment opportunities, and societal well-being will be at stake, leaving an unsustainable and compromised foundation for future generations to address.

Table 2 outlines various challenges related to the adoption of CE practices in the EU. Overall, addressing these challenges requires a multi-faceted approach which involves: *a)* harmonizing regulations and legal frameworks is crucial for promoting consistent CE practices across the EU; *b)* establishing harmonized definitions and standards is essential for facilitating the transition to circularity and promoting eco-efficient practices; *c)* addressing regional inequalities and sector-specific needs is necessary for promoting widespread adoption of CE practices; *d)* overcoming supply chain obstacles requires substantial investment, standardized processes, and international policy alignment; *e)* developing fiscal tools and incentivizing investment in CE initiatives are essential for overcoming financial constraints; *f)* education, awareness campaigns, and training programs are necessary for changing consumer behaviour and promoting acceptance of CE principles; *g)* developing robust assessment methodologies and quantifying the environmental impacts of CE initiatives are essential for assessing their effectiveness.

CONCLUSION

This study highlighted the significance of adopting circularity to address sustainability challenges while simultaneously promoting, though not prioritizing, economic growth. The path to a CE is not without challenges. Obstacles such as resistance from established linear economic models, the requirement for substantial infrastructural changes, and the necessity for cross-sectoral collaboration present significant barriers. These challenges should not discourage the pursuit of circularity. Quite the contrary, they further highlight the argument for incorporating CE principles into public policy, emphasizing that this transition is not an isolated effort but a shared responsibility.

This path faces significant challenges, including diverse legal frameworks, regulatory barriers, and a lack of harmonization across member states which further complicate the transition. Infrastructure investment difficulties, global coordination issues, and the difficulty in allocating funding for circular business models constitute additional challenges. Moreover, cultural resistance to changing consumption behaviors and the need for extensive educational campaigns, along with the complexity of monitoring and evaluating environmental benefits, add to this substantial undertaking. Addressing these challenges requires coordinated efforts to harmonize regulations, promote standardization, bridge regional disparities, and promote innovation and education for a successful transition to CE. Whatever the challenges, the path to sustainability remains urgent, requiring a collaborative approach and coordinated efforts to implement effective policies that drive more sustainable practices.

REFERENCES

- D. Aloini, et al. (2020), *Driving the transition to a circular economic model: a systematic review on drivers and critical success factors in circular economy*, in “Sustainability”, 12, 24.
- M.S. Andersen (2007), *An introductory note on the environmental economics of the circular economy*, in “Sustainability science”, 2, 1, pp. 133-140.
- F. Bassi, J.G. Dias (2019), *The use of circular economy practices in SMEs across the EU*, in “Resources, Conservation and Recycling”, 146, pp. 523-533.

- T. Bastein et al. (2013), *Opportunities for a circular economy in the Netherlands* (Delft: TNO), <https://www.tno.nl/media/8551/tno-circular-economy-for-ienm.pdf>.
- S. Baumgärtner, M. Quaas (2010), *What is sustainability economics?*, in "Ecological Economics", 69, 3, pp. 445-450.
- M. Bilal et al. (2020), *Current state and barriers to the circular economy in the building sector: towards a mitigation framework*, in "Journal of Cleaner Production", 276.
- G. Bressanelli et al. (2019), *Challenges in supply chain redesign for the circular economy: a literature review and a multiple case study*, in "International Journal of Production Research", 57, 23, pp. 7395-7422.
- M. Briguglio et al. (2021), *Born or grown: enablers and barriers to circular business in Europe*, in "Sustainability", 13, 24.
- N. van Buren et al. (2016), *Towards a circular economy: the role of Dutch logistics industries and governments*, in "Sustainability", 8, 7.
- M. Calisto Friant et al. (2021), *Analysing European Union circular economy policies: words versus actions*, in "Sustainable Production and Consumption", 27, pp. 337-353.
- Centre international de référence sur l'analyse du cycle de la vie et la transition durable [Ciraig] (2015), *Circular economy: a critical review of concepts*, <https://ciraig.org/index.php/project/circular-economy-a-critical-literature-review-of-concepts/>.
- M.A. Drupp et al. (2020), *Between Ostrom and Nordhaus: the research landscape of sustainability economics*, in "Ecological Economics", 172.
- Ellen MacArthur Foundation (2013), *Towards the circular economy Vol. 1: Economic and business rationale for an accelerated transition*, <https://www.ellenmacarthurfoundation.org/towards-the-circular-economy-vol-1-an-economic-and-business-rationale-for-an>.
- Ellen MacArthur Foundation (2014), *Towards the circular economy Vol. 3: accelerating the scale-up across global supply chains*, <https://www.ellenmacarthurfoundation.org/towards-the-circular-economy-vol-3-accelerating-the-scale-up-across-global>.
- Ellen MacArthur Foundation (2023), *Circular economy principles*, <https://www.ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview>.
- European Commission (2014), *Towards a circular economy: a zero waste programme for Europe* (Brussels: European Commission), COM(2014) 398.
- European Commission (2015), *Closing the loop – an EU action plan for the circular economy* (Brussels: European Commission), COM(2015) 614.
- European Commission (2019a), *The European green deal* (Brussels: European Commission), COM(2019) 640.
- European Commission (2019b), *Report on the implementation of the circular economy action plan* (Brussels: European Commission), COM(2019) 190.
- European Commission (2020a), *A new circular economy action plan. For a cleaner and more competitive Europe* (Brussels: European Commission), COM(2020) 98.
- European Commission (2020b), *Timeline: First circular economy action plan*, https://environment.ec.europa.eu/topics/circular-economy/first-circular-economy-action-plan_en#timeline.
- P. Ghisellini et al. (2016), *A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems*, in "Journal of Cleaner Production", 114, pp. 11-32.
- K. Govindan, M. Hasanagic (2018), *A systematic review on drivers, barriers, and practices towards circular economy: a supply chain perspective*, in "International Journal of Production Research", 56, 1-2, pp. 278-311.
- A. de Jesus, S. Mendonça (2018), *Lost in transition? Drivers and barriers in the innovation road to the circular economy*, in "Ecological Economics", 145, pp. 75-89.
- J. Kirchherr et al. (2017), *Conceptualizing the circular economy: an analysis of 114 definitions*, in "Resources, Conservation and Recycling", 127, pp. 221-232.
- J. Kirchherr et al. (2018), *Barriers to the circular economy: evidence from the European Union (EU)*, in "Ecological Economics", 150, pp. 264-272.



- J. Korhonen et al. (2018), *Circular economy: the concept and its limitations*, in “Ecological Economics”, 143, pp. 37-46.
- E. Mazur-Wierzbicka (2021), *Circular economy: advancement of European Union countries*, in “Environmental Sciences Europe”, 33, 111.
- T.A.C. de Melo et al. (2022), *Circular economy public policies: a systematic literature review*, in “Procedia Computer Science”, 204, pp. 652-662.
- B. Meyer (2011), *Macroeconomic modelling of sustainable development and the links between the economy and the environment*, in “Publications Office of the European Union”, <https://op.europa.eu/s/y9dB>.
- A. Mies, S. Gold (2021), *Mapping the social dimension of the circular economy*, in “Journal of Cleaner Production”, 321.
- L. Milios (2021), *Towards a circular economy taxation framework: expectations and challenges of implementation*, in “Circular Economy and Sustainability”, 1, 2, pp. 477-498.
- D. C. Momete (2020), *A unified framework for assessing the readiness of European Union economies to migrate to a circular modelling*, in “Science of the Total Environment”, 718.
- A. Murray et al. (2017), *The circular economy: an interdisciplinary exploration of the concept and application in a global context*, in “Journal of Business Ethics”, 140, 3, pp. 369-380.
- Nature (2024), *Editorial: are we in the Anthropocene yet?*, in “Nature”, 627, pp. 466.
- B. Re et al. (2023), *The role of institutional environment in catalysing circular entrepreneurship: a cross-country comparison of Finland and Italy*. In H. Lehtimäki et al. (eds.) *The Routledge handbook of catalysts for a sustainable circular economy* (London: Routledge) pp. 143-166.
- M. Robaina et al. (2020), *The determinants for a circular economy in Europe*, in “Environmental Science and Pollution Research”, 27, 11, pp. 12566-12578.
- M. Sarja et al. (2021), *A systematic literature review of the transition to the circular economy in business organizations: obstacles, catalysts and ambivalences*, in “Journal of Cleaner Production”, 286.
- F. Silvestri et al. (2020), *Regional development of circular economy in the European Union: a multidimensional analysis*, in “Journal of Cleaner Production”, 255.
- L. Stumpf et al. (2021), *Climbing up the circularity ladder? – A mixed-methods analysis of circular economy in business practice*, in “Journal of Cleaner Production”, 316.
- B. Suárez-Eiroa, et al. (2019), *Operational principles of circular economy for sustainable development: linking theory and practice*, in “Journal of Cleaner Production”, 214, pp. 952-961.
- United Nations (2015), *Transforming our world: the 2030 agenda for sustainable development* (New York: United Nations), <https://sustainabledevelopment.un.org/post2015/transformingourworld/publication>.
- United Nations Development Programme (2020), *Human development report 2020: the next frontier: human development and the Anthropocene* (New York: United Nations Development Programme), <https://hdr.undp.org/content/human-development-report-2020>
- A. P. M. Velenturf, P. Purnell (2021), *Principles for a sustainable circular economy*, in “Sustainable Production and Consumption”, 27, pp. 1437-1457.

