

**A COMPREHENSIVE ANALYSIS OF THE EUROPEAN CIRCULAR ECONOMY:
HOW CIRCULAR EUROPEAN COUNTRIES ARE?**

Dilara SÜLÜN¹

Abstract: As the pursuit of economic and commercial activities, production and consumption are fundamental and indispensable processes of the global economy, the total waste generated becomes an alarming issue worldwide. The European Union (EU), aware of the increasingly threatening consequences of the linear economy, tends to expand the Circular Economy (CE) model to reduce raw material extraction and increase the recycling of primary materials. This article explores the scope and evolution of the Circular Economy model in Europe. Our research questions are as follows: How circular are EU member states? What is the circularity rate in Europe and each EU member state? Which countries are more successful in implementing the circular economy model and what are the most important and suitable sectors for recycling and reuse? We examine the policy data through the EU, first by evaluating the policy analysis in the EU, presenting the relevant documents and regulatory framework in the EU. Then we use quantitative data to assess the circularity rate in Europe and each EU country between 2004 and 2022 and explore the achievements of CE in Europe by sectorial materials. Our findings indicate that despite the relatively high and rising circularity level in Europe, the current growth rate in the circular economy is not sufficient to reach the EU's 2030 objectives.

Keywords: *Circular Economy, European Union, European Environment Agency, Sustainable Development, Recycling.*

Article Category: Economics

Date of Submission: 31.01.2025

Date of Acceptance: 13.02.2025

¹ Associate Professor, Izmir Democracy University, İzmir, Türkiye.
Email: dilara.sulun@idu.edu.tr

AVRUPA DÖNGÜSEL EKONOMİSİNİN KAPSAMLI BİR ANALİZİ:**AVRUPA ÜLKELERİ NE KADAR DÖNGÜSEL?**

Öz: Ekonomik ve ticari faaliyetlerin sürdürülmesi, üretim ve tüketimin küresel ekonominin vazgeçilmez ve temel süreçleri olması nedeniyle, dünya çapında üretilen atıkların toplamı endişe verici bir sorun haline gelmektedir. Doğrusal ekonominin artan tehdit edici sonuçlarının farkında olan Avrupa Birliği (AB), hammadde çıkarımını azaltmak ve birincil malzemelerin geri dönüşümünü artırmak için Döngüsel Ekonomi (CE) modelini genişletme eğilimindedir. Bu makale, Döngüsel Ekonomi modelinin Avrupa'daki kapsamını ve gelişimini incelemektedir. Araştırma sorularımız şunlardır: AB ülkeleri ne kadar döngüseldir? Avrupa toplamında ve her AB üye ülkesinde döngüsellik oranı nedir? Döngüsel ekonomi modelini uygulamada hangi ülkeler daha başarılıdır ve geri dönüşüm ve yeniden kullanım için en önemli ve uygun sektörler hangileridir? Çalışmamızda öncelikle AB'deki politikaların analizi yapılmış olup, ilgili belge ve dokümanlar ile yasal çerçeve sunularak AB politika verileri incelenmiştir. Çalışmamızın nicel araştırma kısmında ise 2004 ile 2022 yılları arasında Avrupa genelindeki ve her AB ülkesindeki döngüsellik oranları değerlendirilmiş olup, döngüsel ekonominin Avrupa'daki başarıları sektörel bazda incelenmiştir. Neticede, Avrupa'da son yıllardaki nispeten yüksek ve yükselen döngüsellik seviyesine rağmen döngüsel ekonomideki büyüme oranının, AB'nin 2030 hedeflerine ulaşmak için yeterli olmadığı sonucuna varılmıştır.

Anahtar Kelimeler: *Döngüsel Ekonomi, Avrupa Birliği, Avrupa Çevre Ajansı, Sürdürülebilir Kalkınma, Geri Dönüşüm*

Introduction

The concept of sustainability is the most important element of the circular economy (CE). A circular economy model is shaped by the transition from the linear economy model to the circular model from raw materials to production, from consumption to waste generation, the use of renewable energy resources, the reduction of consumption levels, and the increase of recycling and reuse. In other words, a circular economy comprises processes aimed at creating economic, social, and environmental benefits by providing sustainable production, consumption, growth, and development models. In a circular economy, materials are not wasted, and nature is preserved. Within a circular economy model, materials and goods are in circulation through various processes. These processes can be in the form of maintenance, reuse, remanufacture, recycling, and recovery.² “Reducing, reusing, recycling, and recovering” materials in the system are well known in the academic literature and they are referred to as the ‘3R’ and ‘4R dimensions of CE’.³ Therefore, CE also fights climate change and other environmental issues.

In the current system, industries take materials from nature, make products from these materials and then throw them away as “waste” which is known as “*the linear process*”. However, in a CE, “waste” is no more produced, in other words, there is no more waste. In a CE, products are used as long as possible, which reduces the use of raw materials and reduces carbon emissions. However, according to the World Economic Forum, “*in the current way of our living, we are using 60 % more resources than the Earth can provide and creating too*

² Ellen MacArthur Foundation, “What is a Circular Economy”, Date of Accession: 07.09.2024 from <https://www.ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview>

³ Julian Kirchherr & Nan-Hua Najda Yang & Frederik Schulze-Spüntrup & Maarten J. Heerink & Kris Hartley (2023), “Conceptualizing the Circular Economy (Revisited): An Analysis of 221 Definitions”, *Resources, Conservation and Recycling*, Vol. 194, p. 3.

much waste".⁴ The EU produces more than 2.5 billion tons of waste per year, but with a CE, up to 4.5 trillion U.S. dollars could be saved by 2030.⁵

With the European Commission (EC) 2015 Action Plan of Circular Economy, the concept of CE has been used increasingly by both scholars and practitioners since then.⁶ The Action Plan was followed by substantive environmental and sustainable policies and regulations in the EU, including the European Green Deal.

Our study comprises first the literature review on CE and our research methodology, and it is followed by a policy analysis in the second part on the Circular Economy in Europe. This part forms the qualitative analysis of our research, based on the relevant regulatory documents and European policies. The third part of our study comprises quantitative research based on statistical data on circularity rates in Europe. An assessment is made for the EU-27, in general, to compare it with the global circularity rates. This part also includes an examination of the circularity rates in the EU by country as well as by sectorial materials.

1. Literature Review

Mhatre et al. explored the concept of circular economy and its implementation in the EU countries based on circular business models.⁷ They argued that the most densely used circular strategy has been recycling and that the pioneer sectors in the circular economy (CE) are construction, electronics, and waste management. Besides, governments and regional authorities' macro-level policies lead and facilitate the implementation of the circular economy.

⁴ World Economic Forum (2022), "What Is the Circular Economy, and Why Does It Matter That It Is Shrinking?", 14.06.2022, Date of Accession: 07.09.2024 from <https://www.weforum.org/agenda/2022/06/what-is-the-circular-economy/>.

⁵ *Ibid.*

⁶ European Commission (2015), "First Circular Economy Action Plan", Date of Accession: 07.09.2024 from https://environment.ec.europa.eu/topics/circular-economy/first-circular-economy-action-plan_en.

⁷ Purva Mhatre & Rohit Panchal & Anju Singh & Shyam Bibyan (2021), "A Systematic Literature Review on the Circular Economy Initiatives in the European Union", *Sustainable Production and Consumption*, Vol. 26, p. 187.

For Kirchherr et al., out of the 208 survey respondents and 47 expert interviews, the little achievement in CE in Europe is mainly due to cultural boundaries, low consumer awareness as well as low consumer interest along with doubtful company culture.⁸

Pardo and Schweitzer asserted that CE policies are built upon societal needs and are vital to reaching climate and social objectives.⁹ However, there are many obstacles such as market-related difficulties and a lack of financial or technical resources.

Calisto Friant et al. analyzed the CE discourse and policies of the former European Commission President Juncker, between 2014 and 2019.¹⁰ Their study revealed a difference between words and actions. They argued that the Commission's discourse was relatively holistic and that policies did not address many socio-ecological consequences.

Mazur Wierzbicka asserted that there is a “two-speed Europe” among the EU member states regarding advancement towards CE between 2010 and 2018.¹¹ Germany, Belgium, Spain, France, Italy, Netherlands, and the United Kingdom (UK) are the leading states in operating with CE principles. However, Central, Eastern, and Southern European countries are slower in the transformation towards CE where very few strategies were effective in meeting European standards to face the challenges of the circular economy.

⁸ Julian Kirchherr & Laure Piscicelli & Ruben Bour & Erica Kostense-Smit & Jennifer Muller & Anne Huibrechtse-Truijens & Marko Hekkert (2018), “Barriers to the circular economy: Evidence from the European Union (EU)”, *Ecological Economics*, Vol. 150, p. 264.

⁹ Romain Pardo & Jean-Pierre Schweitzer (2018), “A Long-term Strategy for a European Circular Economy – Setting the Course for Success”, Institute for European Environmental Policy, Date of Accession: 07.09.2024 from https://circulareconomy.europa.eu/platform/sites/default/files/think_2030_circular_economy.pdf.

¹⁰ M. Calisto Friant & W. J. V. Vermeulen & R. Salomone (2021), “Analysing European Union circular economy policies: words versus actions”, *Sustainable Production and Consumption*, Vol. 27, p. 337.

¹¹ Ewa Mazur-Wierzbicka (2021), “Circular economy: advancement of European Union countries”, *Environmental Sciences Europe*, Vol. 33, no: 111, p. 1.

Hagelüken et al. explored the CE in non-ferrous metals and their study found that an obligatory certification program for recyclers of electronic waste would encourage treatment processes with high quality and allow material recovery more efficiently.¹²

Hartley et al. focused their research on policy recommendations to accelerate CE, by interviewing government and private sector policy experts.¹³ Their findings indicated recommendations such as setting more rigid measures and norms starting from the production process, providing tax support toward circular products, facilitating waste trading through virtual purchase platforms and raising awareness campaigns.

Marino and Pariso evaluated the transition rate of EU states towards CE by comparing their performances between 2006 and 2016.¹⁴ They correlated the Gross Domestic Product (GDP) data with different “*Produced Municipal Waste*” data. They concluded that EU states have adopted different strategies and that only a few of them were effective in terms of European CE.

Fitch-Roy et al. stressed that only some parts of the European CE are innovative, the rest was added to the existing instruments. Given the ineffectiveness of past policies, they suggest more radical strategies to pursue policies of sustainable production and consumption.¹⁵

Camilleri analyzed the importance of CE in business and industry stakeholders.¹⁶ He argued that European strategies provided a reduction in waste in various EU contexts. However, the

¹² Christian Hagelüken & Ji Un Lee-Shin & Annick Carpentier & Chris Heron (2016), “The EU Circular Economy and Its Relevance to Metal Recycling”, *Recycling*, Vol. 1, no: 2, p. 242.

¹³ Kris Hartley & Ralf Van Santen & Julian Kirchherr (2020), “Policies for transitioning towards a Circular Economy: Expectations from the European Union (EU)”, *Resources, Conservation and Recycling*, Vol. 155, p. 1.

¹⁴ Alfonso Marino & Paolo Pariso (2020), “Comparing European countries' performances in the transition towards the Circular Economy”, *Science of The Total Environment*, Volume 729, p. 1.

¹⁵ Oscar Fitch-Roy & David Benson & David Monciardini (2020), “Going around in circles? Conceptual Recycling, Patching and Policy Layering in The EU Circular Economy Package”, *Environmental Politics*, Vol. 29, no: 6, p. 983.

¹⁶ Mark Anthony Camilleri (2020), “European Environment Policy for The Circular Economy: Implications for Business and Industry Stakeholders”, *Sustainable Development*, Vol. 28, no: 6, p. 1804.

European Commission still needs to speed up the transition to CE due to environmental conditions.

To Milios, policymakers can contribute to providing adequate infrastructures, as well as capabilities in logistics, supply and distribution or training to practitioners in the industries.¹⁷

For Kirchherr et al.¹⁸ and Camilleri¹⁹, the path to CE may still be hard for some industries. Some sectors are likely to have more difficulties in reducing their waste or re-using their materials, for example, mining or extraction industries, producers of textile components, and electronic or plastic industries.²⁰ In fact, many businesses choose to stay in their position and rely on their traditional linear model.²¹

There is a considerable increase in the share of renewable energy across the EU, mainly due to the CE policies. A significant increase is also spotted in Türkiye, where the share of renewable energy was multiplied by more than three from 2007 to 2015.²²

Along with many European countries, China also advanced significantly in applying CE policies. Because using renewable energy reduces traditional energy consumption, it also reduces carbon emissions. China has also adopted policies, regulations and strategic plans related to renewable energy.²³

¹⁷ Leonidas Milios (2018), “Advancing to a Circular Economy: Three Essential Ingredients for a Comprehensive Policy Mix”, *Sustainability Science*, Vol. 13, p. 861.

¹⁸ Julian Kirchherr et al. (2018), “Barriers to the Circular Economy: Evidence from the European Union (EU)”.

¹⁹ Mark Anthony Camilleri (2019), “The Circular Economy’s Closed Loop and Product Service Systems for Sustainable Development: A Review and Appraisal”, *Sustainable Development*, Vol. 27, no: 3, p. 530.

²⁰ *Ibid.*

²¹ Nancy M. P. Bocken & Ingrid De Pauw & Conny Bakker & Bram Van Der Grinten (2016), “Product Design and Business Model Strategies for a Circular Economy”, *Journal of Industrial and Production Engineering*, Vol. 33, no: 5, pp. 308-320; Gustavo Michelini & Renato N. Moraes & Renata N. Cunha & Janaina M.H. Costa & Aldo R. Ometto (2017), “From Linear to Circular Economy: PSS Conducting the Transition”, *Procedia CIRP*, Vol. 64, p. 2.

²² Mihaela Mihai & Daniela Manca Todose & Emilia Titan & Valentina Vasile (2018), “Correlations in the European Circular Economy”, *Economic Computation and Economic Cybernetics Studies and Research*, Vol. 52, no: 4, p. 61.

²³ Xueliang Yuan & Xujiang Wang & Jian Zuo (2013), “Renewable Energy in Buildings in China— A Review”, *Renewable and Sustainable Energy Reviews*, Vol. 24, p. 18.

There are many definitions and interpretations of CE in academic literature. Kirchherr et al analyzed the 221 definitions of CE and presented their findings.²⁴ First, the concept of CE went through consolidation and differentiation in the last five years. Second, a shift in the supply chains is increasingly recommended to promote CE worldwide. Third, despite sustainable development appears as the main objective of CE, it is not clear whether CE can support environmental sustainability and economic development at the same time. Finally, the CE transition relies on a collaboration between producers, consumers, policymakers, and scholars.²⁵

1.1. Research Methodology

After having presented the relevant academic literature review on the Circular Economy, our research comprises both qualitative and quantitative analysis in the evaluation of the CE across the EU. The qualitative analysis comprises the documents regulating the Circular Economy in the European Union. This research exposes the regulatory framework of the Union and sheds light on the EU's short-term and long-term objectives. This qualitative part explores and evaluates the European 2015 Circular Economy Action Plan, The European Commission 2018 Circular Economy Monitoring Framework (CEMF), the 2019 European Green Deal; zero pollution and neutral climate objectives, the 2020 New Circular Economy Action Plan and the 2023 revised CEMF.

The second part of our research comprises the quantitative analysis of circular economy with relevant data and indicators, in the European Union countries. The most important indicator in measuring circular economy is the “*Circularity Rate*” (CR), also called the “*Circular Material Use Rate*” (CMUR). It shows the share of total materials used in an economy that is put to recycling or recovery and returned to the economy as secondary materials. Therefore, we have

²⁴ Julian Kirchherr et al. (2023), “Conceptualizing the Circular Economy (Revisited): An Analysis of 221 Definitions”.

²⁵ *Ibid.*

evaluated the circular material use rate in EU-27, from 2004 to 2022. Our statistical assessment is three-fold:

- Circular material use rate across the EU,
- Circular Material Use Rate in the EU by country, and
- the circular material use rate in the EU by material group.

Based on these statistics, the current state of play in EU countries is compared with CMUR in the world and EU's indicators are also evaluated within the EU's 2030 objectives.

2. The Policy Framework of the European Circular Economy

2.1. European Commission 2015 and 2020 Circular Economy Action Plans

The first CE action plan at the European level was adopted by the European Commission in 2015. The objective of the plan was to facilitate the European transition toward a circular economy, by setting several actions and measures for it. The plan also aimed to strengthen sustainable economic development by boosting competitiveness and creating new employment opportunities. The totality of a product's life cycle is included in the relevant measures, in order to ensure beneficial and environmental practice for businesses and governments. The plan even engaged in the early stages of production, such as the design process, and covered the phases from production to consumption and to waste management. In total, 54 actions have been delivered in various policy areas such as chemicals, industry, plastics, sustainable development, waste management and recycling.²⁶

The European Green Deal (EGD), a closely connected strategy with the CE, was also adopted by the European Commission in 2019, and in the following year, the new CE Action Plan was

²⁶ European Commission (2015), "First Circular Economy Action Plan", Date of Accession: 07.09.2024 from https://environment.ec.europa.eu/topics/circular-economy/first-circular-economy-action-plan_en.

adopted by the European Commission in 2020.²⁷ In this new CE Action Plan sets a new agenda for sustainable growth and for the EU's 2050 climate neutrality target. The new plan focuses “especially on the sectors that use most resources and where the potential for circularity is high such as: electronics and ICT, batteries and vehicles, packaging, plastics, textiles, construction and buildings, food, water and nutrients”.²⁸ **Figure 1** below reflects the functioning of the circular economy.

Figure 1. Circular Economy Model



Source: European Parliament²⁹

2.2. The Bellagio Declaration

A cooperation was initiated between the Italian Institute for Environmental Protection and Research (ISPRA) and the European Environment Agency (EEA) in December 2020 and was

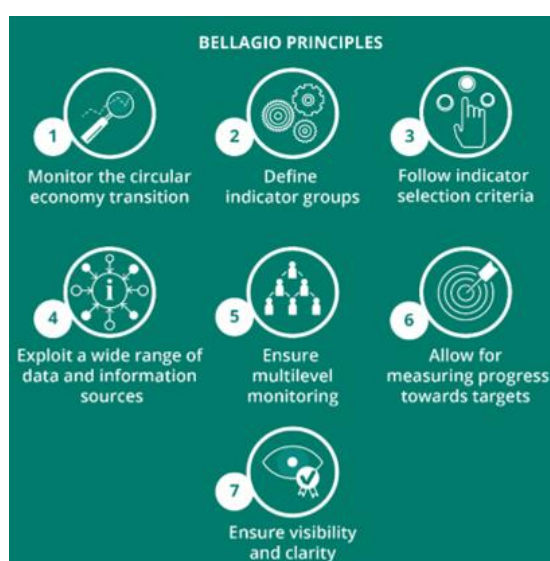
²⁷ European Commission (2020), “Circular Economy Action Plan”, Date of Accession: 07.09.2024 from https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en

²⁸ *Ibid.*

²⁹ European Parliament Research Service (2023), “Circular Economy: Definition, Importance and Benefits”, Date of Accession: 15.10.2024 from https://www.europarl.europa.eu/resources/library/images/20230927PHT05951/20230927PHT05951_original.png.

published in March 2021, under the name of Bellagio Declaration.³⁰ It laid down the principles concerning monitoring CE, including each relevant party.³¹ It is a guide for national and European authorities for monitoring frameworks and indicators. It was carefully elaborated in close consultancy with relevant institutions to ensure alignment with the European Green Deal and with the European Circular Economy Action Plan. The Bellagio Declaration defined seven principles as essential for monitoring the transition to a CE.³²

Figure 2. Bellagio Principles for Monitoring the Transition to Circular Economy



Source: European Environment Agency³³

2.3. European Union 2018 and 2023 Circular Economy Monitoring Frameworks (CEMF)

The European Commission adopted its first Circular Economy Monitoring Framework (CEMF) in January 2018, which comprised four levels of CE, presented in **Table 1**. The EC,

³⁰ European Environment Agency (2020), “The Bellagio Declaration Circular Economy Monitoring Principles”, Date of Accession: 07.09.2024 from <https://www.eea.europa.eu/themes/waste/measuring-europes-circular-economy/BellagioDeclaration.pdf>.

³¹ World Resources Forum (2024), “Where Next for Circular Economy Monitoring? An Overview of European Developments”, 23.01.2024, Date of Accession: 07.09.2024 from <https://www.wrforum.org/wrf23/where-next-for-circular-economy-monitoring-an-overview-of-european-developments/>.

³² European Environment Agency (2020), “The Bellagio Declaration Circular Economy Monitoring Principles”, Date of Accession: 07.09.2024 from <https://www.eea.europa.eu/themes/waste/measuring-europes-circular-economy/BellagioDeclaration.pdf>.

³³ *Ibid.*

in line with the EGD and its objectives of zero pollution and a neutral climate, called for a revision of the CEMF in its 2020 Circular Economy Action Plan. The revised CEMF was published in 2023, and comprised 5 levels, the newly added level is “*global sustainability and resilience*”. Within this new framework, there are also newly added indicators such as “*material footprint, resource productivity, consumption footprint, greenhouse gas emissions from production activities and material dependency*”.³⁴

Table 1. Levels of Circular Economy in the 2018 and 2023 CEMF

Levels of Circular Economy	2018 CEMF	2023 CEMF
Production and consumption	x	x
Waste management	x	x
Secondary raw materials	x	x
Competitiveness and innovation	x	x
Global sustainability and resilience		x

Source: Compiled by the author

3. Quantitative Analysis of the CE in the EU Member States

3.1. Circular Material Use Rates in Europe

In this part, we will explore and analyze the most important indicator in measuring circular economy across the EU. The Circularity Rate (CR), also called Circular Material Use Rate (CMUR), shows the share of total materials used in an economy that are put to recycling or recovery and returned into the economy as secondary materials. The recycled materials avoid further extraction of primary raw materials. According to the latest Eurostat and EEA data released in 2023, the EU’s circularity rate was 11.5 % in 2022, making Europe the biggest

³⁴ European Commission (2023), “Improved circular economy monitoring framework now live”, Date of Accession: 07.09.2024 from <https://ec.europa.eu/eurostat/web/products-eurostat-news/w/wdn-20230515-1>.

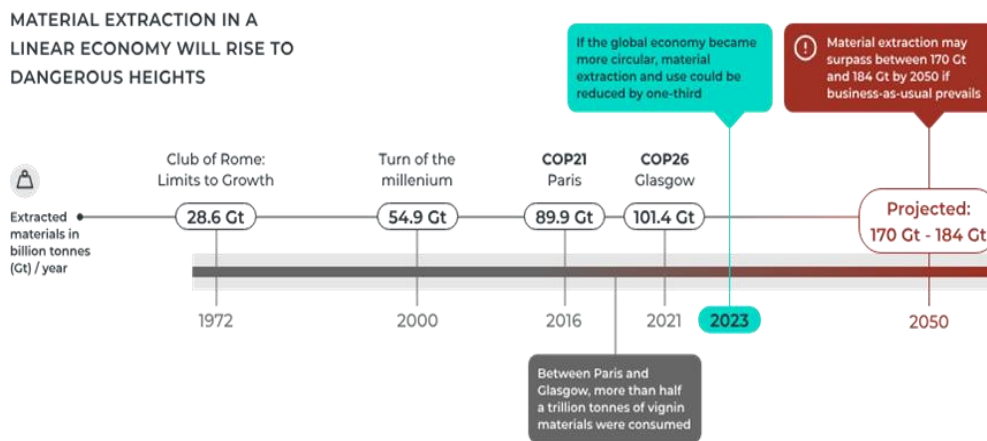
consumer of recycled materials. To compare it with the world rate, the global circularity rate was 9.1 % in 2018, 8.6 % in 2020 and 7.2 % in 2023 according to the 2024 Circularity Gap Report.³⁵ The numbers reflect unfortunately the worsening of the global situation and indicate that the world relies almost exclusively on new materials, as the extraction of new materials is rising each year. In other words, the numbers indicate that more than 90 % of materials are either wasted, lost or unavailable for reuse.

Circular economic strategies, by increasing products' life cycle, can decrease consumption and therefore harm less the globe and climate. The EU's objective of doubling the CMUR by 2030 would necessitate multiplying 2020's rate (11.5 %) by two, which would make 23.2 %. In other words, Europe needs to increase the CMUR average annual growth rate by 20 in the next years, when compared to the periods between 2012 and 2022. However, this scenario is unrealistic, based on the 2010 and 2022 annual growth rate and several reports predicting a rise in the demand for materials in Europe. Therefore, the EU cannot reach its 2030 and 2050 objectives by only increasing recycling but would also need to reduce the material use, especially in heavy material groups such as non-metallic minerals and metals. On the other hand, because extracting materials harms the environment, Europe also needs its consumption of fossil energy materials.³⁶ **Figure 3** below reflects the rise of material extraction across the globe, surpassing the environmental limits. However, CE measures can reduce the world's material extraction and its use by one-third.

³⁵ Circle Economy Foundation Report (2024), *The Circularity Gap Report 2023*, Date of Accession: 07.09.2024 from <https://www.circularity-gap.world/2023>.

³⁶ Interreg Central Europe (2024), "Circular Material Use Rate in Europe", 11.06.2024, Date of Accession: 07.09.2024 from <https://www.interreg-central.eu/news/circular-material-use-rate-in-europe/#:~:text=Although%20the%20EU's%20CMUR%20has,consumption%20has%20remained%20rather%20stable.>

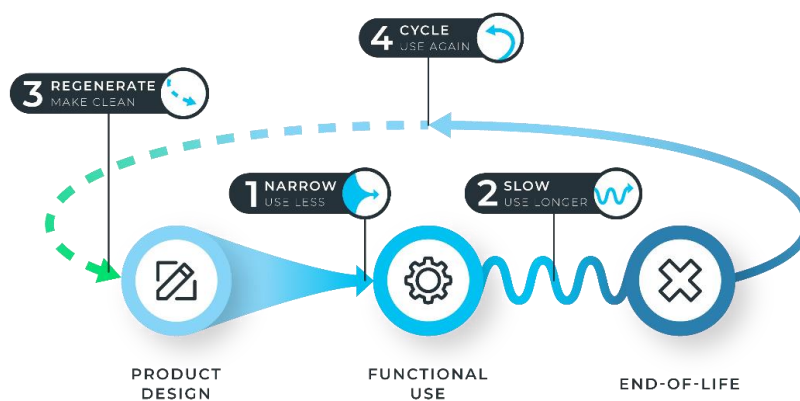
Figure 3. Increase of Material Extraction in Billion Tons



Source: Circularity Gap World Report³⁷

Figure 4 below represents the four flows needed for a circular economy, based on the four objectives of Bocken et al (2016).

Figure 4. The Four Flows of Circular Objectives



Source: Circularity Gap World Report³⁸

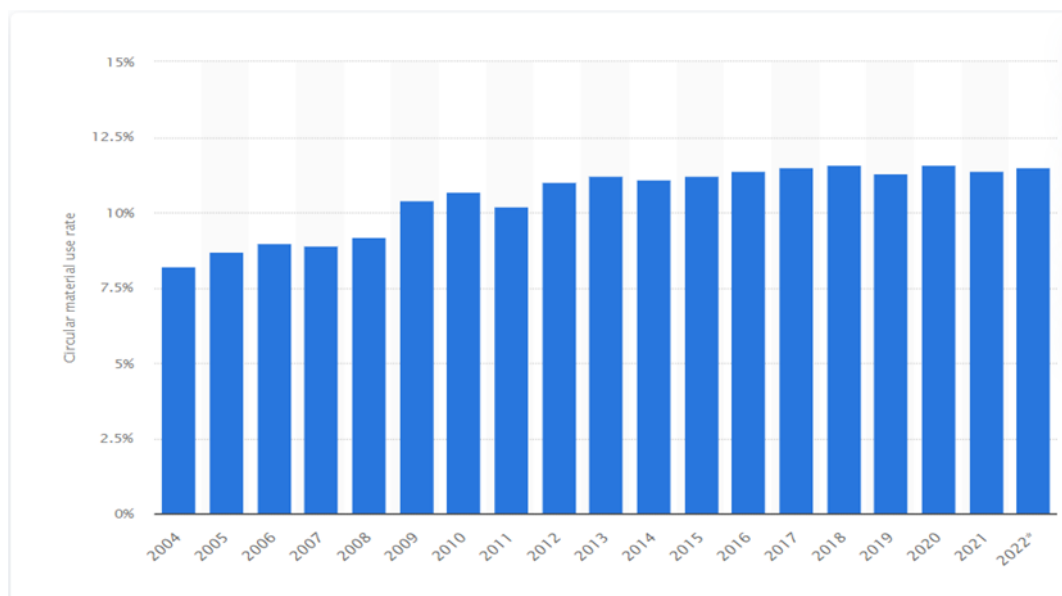
As defined earlier, the circularity rate is the share of material resources used that come from recycled waste materials. In 2022, 11.5 % of material resources came from recycled materials in the EU. Despite the upward trend in the CMUR in the EU and the EU’s higher rates

³⁷ Circle Economy Foundation Report (2024), *The Circularity Gap Report 2023*, Date of Accession: 07.09.2024 from <https://www.circularity-gap.world/2023>.

³⁸ *Ibid.*

compared to the rest of the world, European current objectives in CE are likely not to be reached by the EU.

Figure 5. Circular Material Use Rate in the European Union (EU-27) from 2004 to 2022



Source: Statista³⁹

As set in the European CE Action Plan, the EU aims to double its use of recycled material, between 2020 and 2030. However, the increase between 2020 and 2022 was only less than 1 % in the EU, this slow progress and new projections of material demand in Europe indicate that the EU is not likely to meet its 2030 objective.

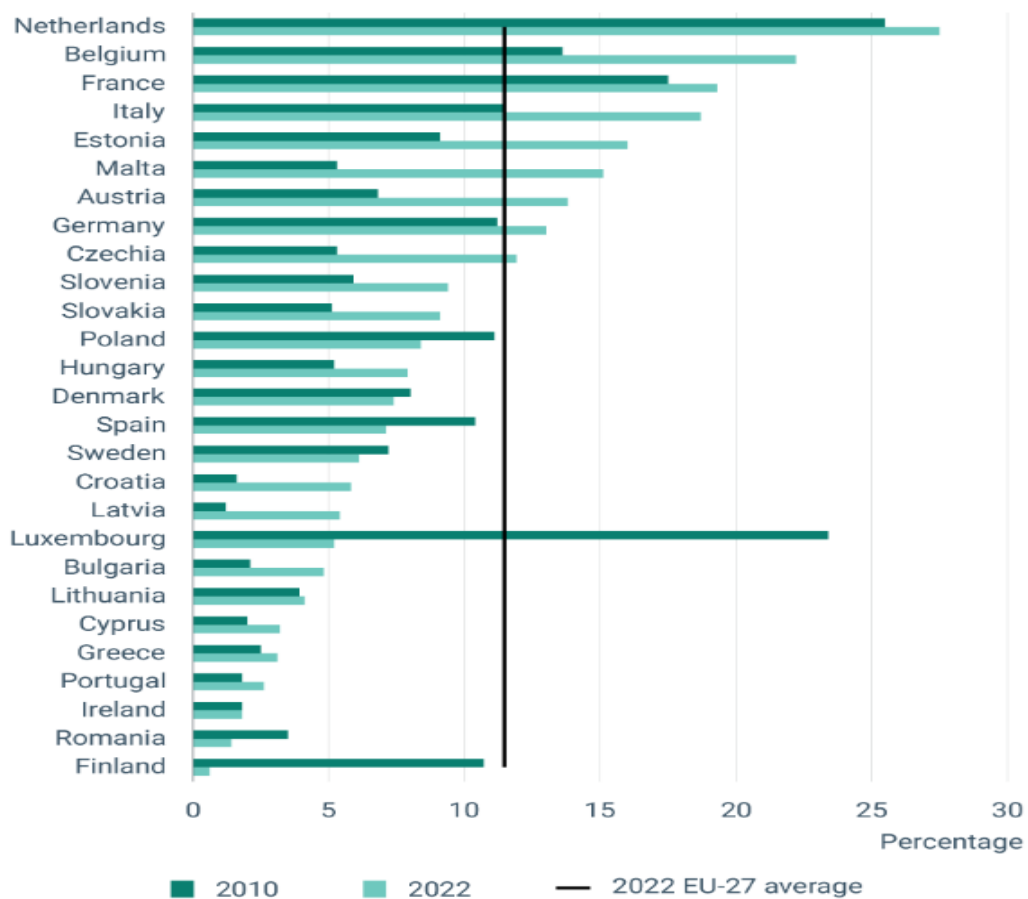
3.2. Circular Material Use Rate in the EU By Country

We can observe important differences in the MCURs across the EU. For example, whereas the Netherlands made 27.5 % in 2022, Finland made only 0.6 %. Recycling capacities and material consumption levels differ from country to other. While CMUR was higher than 20 % only in Belgium, Netherlands, and Belgium, six other countries had rates over 10 % in 2022. These countries are:

³⁹ Statista, “Circular Material Use Rate In The European Union 2010-2022”, Date of Accession: 07.09.2024 from <https://www.statista.com/statistics/1316475/circular-material-use-rate-in-european-union-by-country/>

- France,
- Italy,
- Estonia,
- Malta,
- Austria, and
- Germany.

Figure 6. Circular Material Use Rate in the EU By Country



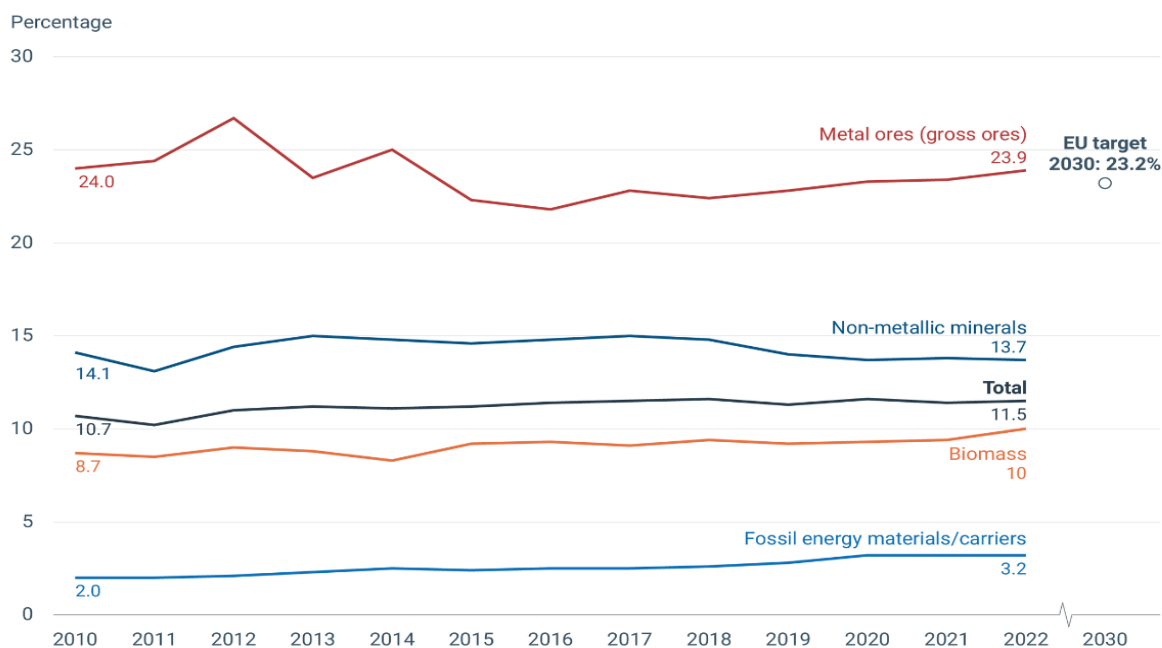
Source: European Environment Agency⁴⁰

20 EU member states’ CMURs have increased in the last decade, the biggest rises (above 5 %) were seen in Malta, Belgium, Italy, Austria, Estonia, and Czechia. Latvia, Croatia, Malta,

⁴⁰ European Environment Agency (2024), “Circular material use rate in Europe”, Date of Accession: 10.15.2024, from <https://www.eea.europa.eu/en/analysis/indicators/circular-material-use-rate-in-europe>.

Bulgaria, Czechia, and Austria also marked a good increase by doubling or even more their CMURs between 2010 and 2022. However, three countries had significant decreases in their CMURs; these are Finland, Luxembourg, and Romania.

Figure 7. Circular Material Use Rate in the EU By Material Group Between 2010-2022



Source: European Environment Agency⁴¹

Almost half of the total material consumption was comprised of non-metallic minerals and their CMUR decreased since 2010, while biomass and fossil-based materials' CMURs increased between 2010 and 2022. There are different CMURs for various material groups, for example, while metal ores CMUR was 24 % in 202, fossil materials CMURs were slightly above 3 %. Obviously, the use of the materials differs of course depending on the nature of these materials. While metals can easily be recycled and reused, fossil fuels cannot be recycled.

⁴¹ European Environment Agency (2023), "Circular Material Use Rate in Europe", Date of Accession: 10.15.2024 from <https://www.eea.europa.eu/en/analysis/indicators/circular-material-use-rate-in-europe>.

Conclusion

We have presented the policy framework of Circular Economy in the EU. As sustainable growth and sustainable development gain more and more importance across the globe, the EU has put considerable and measurable objectives for 2030 and 2050, in a large policy area covering most environmental issues. The European Commission has played an important role in setting these measures; however, the EU member states, and the European Environment Agency have also contributed to the development of these strategies.

We have seen that a large policy and regulatory framework has been introduced in the EU, including European Commission Action Plans and Monitoring Frameworks. However, despite the ambitious political and regulatory environmental measures and Circular economy objectives by 2030, the quantitative data regarding CE in Europe reveals two important points.

The first point is that the EU has achieved better CE rates in comparison with other regions in the world. EU's circularity rate was 11.5 % in 2022, making Europe the biggest consumer of recycled materials. To compare it with the world rate, the global circularity rate was 9.1 % in 2018, 8.6 % in 2020 and 7.2 % in 2023. Therefore, we can assess that while the EU has a positive and increasing circularity rate, the global circularity rate has decreased since 2018. The EU had more successful circular results and achievements while the worsening of the global situation indicates that the world relies almost exclusively on new materials.

The second point that is important in our findings is that despite the upward trend in the CMUR in the EU and the EU's higher rates compared to the rest of the world, European current objectives in CE are likely not to be reached by the EU. As set in the European CE Action Plan, the EU aims to double its use of recycled material, between 2020 and 2030. However, the increase between 2020 and 2022 was only less than 1 % in the EU, this slow

progress and new projections of material demand in Europe indicate that the EU is not likely to meet its 2030 objective.

When we assess the CMUR in the EU by country, we observe important differences across the EU. For example, whereas the Netherlands made 27.5 % in 2022, Finland made only 0.6 %. Recycling capacities and material consumption levels differ from one country to another. While CMUR was higher than 20 % only in Belgium, Netherlands, and six other countries had rates over 10 % in 2022. These countries are France, Italy, Estonia, Malta, Austria, and Germany.

When we assessed the CMUR in the EU by the material group between 2010 and 2022, we observed that almost half of the total material consumption was comprised of non-metallic minerals and their CMUR decreased since 2010, while biomass and fossil-based materials' CMURs increased between 2010 and 2022. There are different CMURs for various material groups while metal ores CMUR was 24 % in 202, the fossil materials CMURs were only around 3 %.

In conclusion, the EU overall needs to increase its annual growth rate in circularity levels, in order to reach its 2030 objectives. Our findings indicate that the current growth rates are insufficient, and the EU needs to become more circular, especially Finland, France, Italy, Estonia, Malta, Austria and Germany, the EU countries that are lagging in CMUR.

Besides, addition to EU regulations and policies, more circularities can be facilitated by national governments' policies in the EU, and advanced infrastructure and technological capacities, including collaboration between public and private entities and also by increasing awareness and providing financial assistance through incentives. Recycling and reuse of secondary raw materials are not enough to reach significant levels of circularity. Our policy recommendations for the EU would be to enhance environmental tax reforms and incentives, to include CE targets and criteria in the pre-production processes and to control the

implementation of CE in national laws and objectives. Additionally, the EU should encourage public and private partnerships in CE and focus on the most harmful sectors such as the food industry, construction and manufacturing industries including textile and automotive. Finally, the EU should increase awareness of environmental issues and their impact.

BIBLIOGRAPHY

- Bocken, Nancy M. P. & De Pauw, Ingrid & Bakker, Conny & Van Der Grinten, Bram (2016), “Product design and business model strategies for a circular economy”, *Journal of Industrial and Production Engineering*, Vol. 33, no: 5, pp. 308-320.
- Calisto Friant, M. & Vermeulen, W. J. V. & Salomone, R. (2021), “Analysing European Union circular economy policies: words versus actions”, *Sustainable Production and Consumption*, Vol. 27, pp. 337-353.
- Camilleri, Mark Anthony (2019), “The Circular Economy’s Closed Loop and Product Service Systems for Sustainable Development: A Review and Appraisal”, *Sustainable Development*, Vol. 27, no: 3, pp. 530-536.
- Camilleri, Mark Anthony (2020), “European Environment Policy for The Circular Economy: Implications for Business and Industry Stakeholders”, *Sustainable Development*, Vol. 28, no: 6, pp. 1804-1812.
- Circle Economy Foundation Report (2024), *The Circularity Gap Report 2023*, Date of Accession: 07.09.2024 from <https://www.circularity-gap.world/2023>
- Ellen MacArthur Foundation, “What is a Circular Economy”, Date of Accession: 07.09.2024 from <https://www.ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview>
- European Commission (2015), “First Circular Economy Action Plan”, Date of Accession: 07.09.2024 from https://environment.ec.europa.eu/topics/circular-economy/first-circular-economy-action-plan_en
- European Commission (2020), “Circular Economy Action Plan”, Date of Accession: 07.09.2024 from https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en

- European Commission (2023), “Improved circular economy monitoring framework now live”, Date of Accession: 07.09.2024 from <https://ec.europa.eu/eurostat/web/products-eurostat-news/w/wdn-20230515-1>
- European Environment Agency (2020), “The Bellagio Declaration Circular Economy Monitoring Principles”, Date of Accession: 07.09.2024 from <https://www.eea.europa.eu/themes/waste/measuring-europes-circular-economy/BellagioDeclaration.pdf>
- European Environment Agency (2023), “Accelerating the Circular Economy in Europe: State and Outlook 2024”, 21.03.2024, Date of Accession: 07.09.2024 from <https://www.eea.europa.eu/publications/accelerating-the-circular-economy>
- European Parliament Research Service (2023), “Circular Economy: Definition, Importance and Benefits”, Date of Accession: 15.10.2024 from https://www.europarl.europa.eu/resources/library/images/20230927PHT05951/20230927PHT05951_original.png.
- Fitch-Roy, Oscar & Benson, David & Monciardini, David (2020), “Going around in circles? Conceptual Recycling, Patching and Policy Layering in The EU Circular Economy Package”, *Environmental Politics*, Vol. 29, no: 6, pp. 983-1003.
- Hagelüken, Christian & Lee-Shin, Ji Un & Carpentier, Annick & Heron, Chris (2016), “The EU Circular Economy and Its Relevance to Metal Recycling”, *Recycling*, Vol. 1, no: 2, pp. 242-253.
- Hartley, Kris & Van Santen, Ralf & Kirchherr, Julian (2020), “Policies for transitioning towards a circular economy: Expectations from the European Union (EU)”, *Resources, Conservation and Recycling*, Vol. 155, pp. 1-10.
- Interreg Central Europe (2024), “Circular Material Use Rate in Europe”, 11.06.2024, Date of Accession: 07.09.2024 from <https://www.interreg-central.eu/news/circular->

material-use-rate-in-europe/#:~:text=Although%20the%20EU's%20CMUR%20has,consumption%20has%20remained%20rather%20stable

- Kirchherr, Julian & Piscicelli, Laure & Bour, Ruben & Kostense-Smit, Erica & Muller, Jennifer & Huibrechtse-Truijens, Anne & Hekkert, Marko (2018), “Barriers to the circular economy: Evidence from the European Union (EU)”, *Ecological Economics*, Vol. 150, pp. 264-272.
- Kirchherr, Julian & Yang, Nan-Hua Najda & Schulze-Spüntrup, Frederik & Heerink, Maarten J. & Hartley, Kris (2023), “Conceptualizing the Circular Economy (Revisited): An Analysis of 221 Definitions”, *Resources, Conservation and Recycling*, Vol. 194, pp. 1-32.
- Marino, Alfonso & Pariso, Paolo (2020), “Comparing European Countries' Performances in the Transition Towards the Circular Economy”, *Science of The Total Environment*, Volume 729, pp. 1-12.
- Mazur-Wierzbicka, Ewa (2021), “Circular economy: advancement of European Union countries”, *Environmental Sciences Europe*, Vol. 33, no: 111, pp. 1-15.
- Mhatre, Purva & Panchal, Rohit & Singh, Anju & Bibyan, Shyam (2021), “A Systematic Literature Review on the Circular Economy Initiatives in the European Union”, *Sustainable Production and Consumption*, Vol. 26, pp. 187-202.
- Michelini, Gustavo & Moraes, Renato N. & Cunha, Renata N. & Costa, Janaina M.H. & Ometto, Aldo R. (2017), “From Linear to Circular Economy: PSS Conducting the Transition”, *Procedia CIRP*, Vol. 64, pp. 2-6.
- Mihai, Mihaela & Todose, Daniela Manea & Titan, Emilia & Vasile, Valentina (2018), “Correlations in the European Circular Economy”, *Economic Computation and Economic Cybernetics Studies and Research*, Vol. 52, no: 4, pp. 61-78.

- Milios, Leonidas (2018), “Advancing to a Circular Economy: Three Essential Ingredients for a Comprehensive Policy Mix”, *Sustainability Science*, Vol. 13, pp. 861-878.
- Pardo, Romain & Schweitzer, Jean-Pierre “A Long-term Strategy for a European Circular Economy – Setting the Course for Success”, Institute for European Environmental Policy, Date of Accession: 07.09.2024 from https://circulareconomy.europa.eu/platform/sites/default/files/think_2030_circular_economy.pdf
- Statista, “Circular Material Use Rate In The European Union 2010-2022”, Date of Accession: 07.09.2024 from <https://www.statista.com/statistics/1316475/circular-material-use-rate-in-european-union-by-country/>
- World Economic Forum (2022), “What Is the Circular Economy, and Why Does It Matter That It Is Shrinking?”, 14.06.2022, Date of Accession: 07.09.2024 from <https://www.weforum.org/agenda/2022/06/what-is-the-circular-economy/>
- World Resources Forum (2024), “Where Next for Circular Economy Monitoring? An Overview of European Developments”, 23.01.2024, Date of Accession: 07.09.2024 from <https://www.wrforum.org/wrf23/where-next-for-circular-economy-monitoring-an-overview-of-european-developments/>
- Yuan, Xueliang & Wang, Xujiang & Zuo, Jian (2013), “Renewable Energy in Buildings in China— A review”, *Renewable and Sustainable Energy Reviews*, Vol. 24, pp. 1-8.