

CIRCULAR ECONOMY IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT: THE EUROPEAN UNION EXPERIENCE

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ABSTRACT

Recently, the countries across the world have started orienting their attentions towards Circular Economy which is highly responsive to environmental, social and economic goals that are known as sustainable development. This paper aims to identify the contribution of Circular Economy in leading to sustainable development goals by presenting experience of European Union. The papers discuss certain key elements with their implications.

Keywords: Circular Economy (CE), Recycling, Sustainable Development Goals (SDG).

INTRODUCTION

Historically, waste resulting from manufacturing and consumption was seen as an inevitable evil. Many concepts have emerged in the last decades attempting to achieve a world that is fundamentally waste-free with responsible attitude in terms of resources, products, materials, and the overall environment. This includes zero waste, circular economy, closed-cycle, reuses, resource efficiency, recycling and waste avoidance.

However, a comprehensive holistic approach is needed to ensure that event such as recycling, avoidance and reuse, are taken in account at all stages of the environmental product design in their implementation from the outset. Such mechanism will permit recycling across the product life cycle, and at the level of material and energy. This is indeed the core principle of the circular economy.

Although Expectations related to environmental concerns and economic gains proliferate in the transition to a circular economy, the benefits are commonly centered on four levels: the usage of resource, the economy, the environment, and the subsequent social benefits.

Given its potential in terms of economic expansion and advancement, the circular economy, as a tool to promote the sustainable development idea, is gaining considerable attention. In fact, experts and proponents of the circular economy claim that the transformation of economies from the linear model to the circular one allows some economies to be realized. In the linear models, waste takes place after resources are exploited and consumed, whereas in the alternative circular model, which is described as more resource efficient tries to keep manufactured products, alongside their components and materials within the underpinning system for longer possible periods while safeguarding the quality of their usage,

Using European Union experience, this article analyzes how effective Circular Economy (CE) ideas are in attainment of the Sustainable Development Goals (SDGs).

The Circular Economy Concept

Definition

The idea of “*circular economy*” can be found in specialized literature in regard to its occurrence and viability, which coincide with efforts to discover and understand the economy’s biophysical foundation. The physiocrats believed that an economy had to provide the essential conditions to sustain “*cyclical production processes,*” but the neoclassicists were focused with capital reproduction, such as amortization and investments, without being able to solve the problem of natural resources (Negrei, 2008).

The definition, development, and benefits of Circular Economy (CE) application have recently been widely described in scientific literature. The CE model is presented as a technique for ensuring future economic growth while being environmentally sensitive (Rashid, 2016).

CE, according to the Ellen MacArthur Foundation, is “*an industrial economy that is restorative or regenerative by intention and design*” (The Ellen Mac Arthur Foundation, 2019 a). Murray et al. (2017) define CE as “*an economic model in which planning, resourcing, procurement, production, and reprocessing are structured and controlled, as both process and output, to maximize environmental functioning and human well-being*” (Geissdoerfer et al., 2017).

Furthermore, Geissdoerfer et al. (2017) analyzed many contributions and claimed that CE is a “*regenerative system in which resource input and waste, emission, and energy leakage are minimized by delaying, closing, and narrowing material and energy loops*” (Geissdoerfer et al., 2017).

Waste is minimized to the maximum extent possible in a completely circular economy by carefully researching and creating products and industrial processes in order to keep resources in constant use, in addition to ensuring that any inevitable trash or leftovers are recycled or reclaimed. The circular economy, as it appears in the definition of the Ellen MacArthur Foundation, involves two material cycles: a biological cycle in which trash is returned to nature after use and a technical cycle in which goods, components, or materials are manufactured and sold to reduce waste. A circular system prioritizes the use of pure, non-toxic materials and goods that can be easily maintained, reused, mended, or refurbished to extend their useful life before being disassembled and recycled into new items, thereby reducing waste throughout the extraction-production-consumption cycle Figure 1.

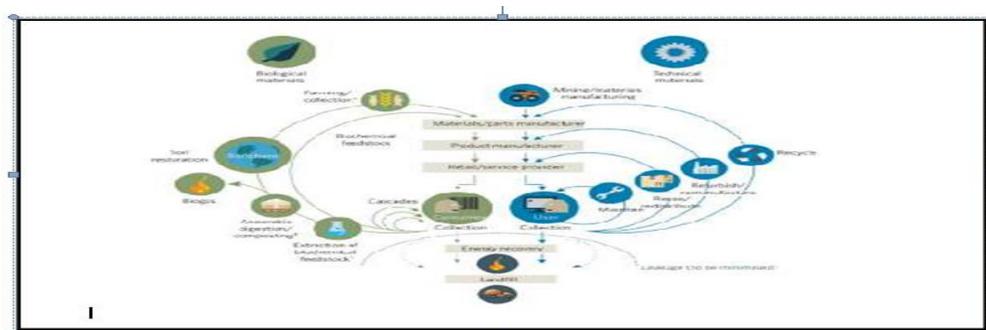


FIGURE 1
CIRCULAR ECONOMY SYSTEM DIAGRAM

Source: The Ellen MacArthur Foundation (2013) Report

This cyclical method of creating and consuming decouples economic growth from material consumption and extraction. As a result, firms can hedge future resource and material supply risks with a circular economy. While also enhancing their resilience in the face of declining supply and increased pricing uncertainty and volatility This will minimize resource reliance while enhancing competitiveness, notably through innovation. The circular economy is also said to provide a potential for economic and industrial regeneration, with related investment requirements (European Investment Bank, 2020).

In Summary (Service, 2016), the Circular Economy Can Be Defined as Follows

A circular economy concept involves the design and manufacture of new products and assets with emphasis on the reduction of virgin materials consumption and the generation of waste; the implementation of new business models and strategies to optimize capacity utilization and the useful life of products and assets; and the closing of resource and material loops through the recycling of end-of-life products and materials (Service, 2016).

Fundamental Uses

There are numerous fundamental applications of the circular economy, including (European Investment Bank, 2020):

The industrial symbiosis: It is an industrial organizational method used by different economic operators on the same territory that is characterized by an optimized resource allocation through flux exchanges or mutualization of goods and services.

- **The second use:** It allows you to extend the use of a product by giving it a new life through a gift or a secondhand sale.
- **Repair:** It consists of restoring the use of a product, allowing it to be extended before or after the user disposes of it.
- The second purpose of components is to extract from products certain working (or repairable) things or pieces in order to sort them, resell them, and give them new life.
- **Recycling:** It refers to a variety of ways for transforming waste after recovery in order to reintroduce all or a portion of it into a production cycle.
- **Eco-conception:** It is the conception of a product, good, or service that takes into account, with the goal of reducing, its negative environmental consequences during its lifecycle, without compromising its qualities or performances. Its purpose is thus to promote reuse, repair, and recycling, among other things.
- **The Economy of Functionality:** It promotes usage over possession and sells services related to the product rather than the thing itself.

Circular Economy Opportunities

The circular economy provides organizations with the following chances to limit their exposure to so-called "*linear hazards*," cut expenses, and capitalize on new market and business opportunities (Assembly, 1987):

Reduce/hedge: Future commodity supply uncertainty and price volatility: In the face of uncertain future commodity supply and price volatility, the circular economy provides better resilience and risk-hedging. For example, transitioning from selling things to selling services enables businesses to retain ownership of and reuse or recycle components and raw materials used to manufacture commodities as corporate assets.

Manufacturing cost reduction: Designing with reuse, disassembly, and recycling the goal of easing remanufacturing and reintroduction is frequently less expensive than making new parts from raw resources. Remanufacturing vehicle parts, for example, is 30-50% less expensive than producing new parts and produces 70% less waste.

Cost savings and new revenue streams: Companies understand the importance of auditing their supply chains in order to identify byproducts and waste streams that can be avoided, repurposed, or recycled. As a result, instead of using waste management agencies, businesses are turning to resource management or reverse logistics partners to uncover possible applications for their byproducts and garbage, a technique that lowers costs and boosts efficiency while reducing resource consumption and environmental impact. Companies who are unable to reuse or recycle their own items, byproducts, or garbage can offer them to other businesses, resulting in symbiotic circular partnerships.

New business opportunities and new markets: The potential to extend the life and revenue of an asset through repair and refurbishment schemes allows for new service-based companies and strengthens customer relationships. Companies in such models create items to facilitate repair and component reuse, and they may also give consumers with information, tools, and replacement parts to repair their products.

Context of Sustainable Development

Sustainable development definition: The World Commission on Environment and Development defined sustainable progress in its 1987 report, 'Our Common Future,' as "*development that meets the demands of the present without jeopardizing future generations' ability to satisfy their own needs.*" This conventional definition incorporates two crucial concepts: 'needs,' notably the vital requirements Priority should be given to the world's poor; and 'limitations,' which challenge the environment's ability to meet current and future needs with regards to the level of technology and social structure.

The World Summit on Sustainable Development held in 2002 expanded the common definition by including the three frequently utilized pillars of sustainable development that is economic, social, and environmental dimensions. The Johannesburg Declaration laid the groundwork "*a collective obligation to advance and reinforce the interconnected and mutually reinforcing pillars of sustainable development, economic development, social development, and environmental protection at the local, national, regional, and global levels*" (Harris, 2000).

Sustainable Development aspects: In the wide discussion and application of the notion since then, three components of sustainable development have usually been recognized (Schroeder, 2019):

A- Economic: A financially A sustainable system must be capable of continuously producing commodities and services, keeping government and foreign debt levels adequate, and preventing extreme sectoral imbalances that harm agricultural or industrial production.

B- Environmental: A reliable sustainable system must have a stable resource base, avoid overuse of renewable resource capacity or environmental sink functions, and use only non-renewable resources when viable alternatives are available in This includes a robust maintenance of biodiversity, atmospheric stability, and other ecological services that are not typically classified as commercial resources.

C-Social: A system must bring about distributional justice, adequate social service provision, inclusive of education and, equity of gender, and political transparency and accountability as well as involvement in order to be socially sustainable.

Circular Economy in the framework of SDGs

What are SDGs?

The SDGs have been labeled "*the path for building a better and more sustainable future for everybody by 2030.*" The seventeen objectives and 169 targets that go with them are increasingly being recognized as a framework for planning and carrying out sustainable operations by organizations in both the public and private sectors around the world.

As a new approach for economic prosperity and development, the circular economy has the power to bring considerable environmental, economic, and social gains on a global scale. The circular economy focuses on the idea of replacing products and resources through reduction, reuse, and recycling them during the manufacturing process and also along distribution, and consumption 'end-of-life' items and materials in current production and consumption patterns. Long-term development is the goal of circularity promotion.

Some of the key stress the fact that shifting to the circular economy, as a new paradigm for economic development, provides significant environmental, economic, and social advantages on a global scale. The circular economy focuses on the idea of reducing, reusing, and recycling resources, products and materials in manufacturing, distribution, and consumption processes to replace 'end-of-life' items and materials in current production and consumption patterns. Long-term development is the goal of circularity promotion economic transition will not occur unless existing regulatory structures are significantly altered.

CE & SDGs

Circular Economy (CE) as an alternative economic paradigm has gained traction support in recent years, and it is also thought to provide a "*method for achieving local, national, and global sustainability*" (al P.S., 2018). This growing interest in circular economy activities is mirrored in a number of institutions, encompassing governments, municipalities, and, not least, many huge multinational corporations looking for strategies to shift to circular economy practices (Lieder & Rashid, 2016).

While the basic goal of CE and SDGs appears to be comparable (economic and social prosperity within the ecological and resource limits of our planet), the links between these two goals are not immediately evident. The term "*circular economy*" appears only once in the 2030 Agenda for Sustainable Development, which comprises the SDGs and their associated targets.

A study appearing in the Journal of Industrial Ecology sheds light on possible connections between the CE and the SDGs. Based on a thorough literature assessment, the study investigates the extent to which CE implementations are important for reaching the SDGs in a developing country environment. The report defines '*CE practices*' as a diverse set of practices and business models including reuse, repair, recycling, refurbishing, remanufacturing, industrial symbiosis, product sharing, biomimicry, and supporting design methods and practices. The study states that "*CE practices can be implemented as a 'toolbox' and particular implementation methodologies for reaching a sizable number of SDG targets,*" emphasizing the significance of the CE transition in accomplishing the SDGs (The Ellen Mac Arthur Foundation, 2019a).

CE & SDGs Serves for Directive, 2019:

- Zero Waste Certification
- Greenhouse Gas Accounting & Management (Carbon Footprint)
- SDG Mapping
- Annual Sustainability Reporting for Corporations & Multinational Corporations
- Policy Research and Analysis
- Capacity Building, Training, and Stakeholder Consultation
- Design Thinking for Green Product Development; Projects on Resource Efficiency and the Circular Economy

CE Explicit Mentions in SDGs

The section that follows examines and evaluates the link between the practices related to CE and the SDGs, the most recent worldwide agenda for collaboration in international sustainable development. Although CE is linked to SDG 12 (Sustainable Consumption and Production), the SDGs do not directly address it. We believe that CE practices and principles are intimately intertwined, and that putting CE practices in place will be critical to reaching many SDG targets, not only SDG 12 (The Ellen Mac Arthur Foundation, 2019b).

Relationship category	Explanation of category	Example SDG target for this category
1. Direct/significant impact of CE practices to goal achievement.	Goal attainment in this category is intrinsically connected to the adoption of CE practices. Without CE practices, meeting targets would be difficult, if not impossible.	11.6 Reduce cities' negative per capita environmental effect by 2030, including special emphasis to the Municipal and other trash management, as well as air quality.
		CE waste management standards, like as the 3Rs, which prohibit municipal garbage incineration and open burning, are critical to attaining this goal.
2. Contribution made indirectly (via other SDG targets).	This category includes aims that CE practices contribute to indirectly through other targets. It refers to the synergies that can be formed between various aims via the use of CE techniques.	1.1 By 2030, all people worldwide will be free of severe poverty, which is currently defined as having a daily income of less than \$1.25 CE activities do not immediately contribute to the abolition of severe poverty in the case of objective 1.1; nevertheless, CE practices that directly contribute to targets 8.2 and 9.2 will indirectly help to progress on goal 1.1.
3. Meeting targets encourages the adoption of CE practices.	This category specifies a target with a causal link to CE in the opposite direction. Instead of contributing to the achievement of the target, accomplishment on a specific aim of this category will aid in the wider adoption of CE practices.	4.4 By 2030, double youth and adults' number with the required skills, comprising of technical and vocational abilities, essential to employment, productive jobs, and business creations. Increased technical capabilities of workers and entrepreneurs will be required for widespread adoption and dispersal of CE practical approaches as well as associated business models.
4. A weak or non-existent relationship	This category contains targets for which no or only a weak connection was observed during the evaluation.	5.2 Put an end to all public and private violence against women and girls. There is no evidence of a relationship between CE and practice in the literature or practice.

Source: Schroeder et al. (2019)

Global Transformation towards Circular Economy for Sustainable development III-1- The European Union Circular Economy

The classic production and consumption model is distinguished by a linear approach that comprises the steps listed below Figures 2A & 2B.

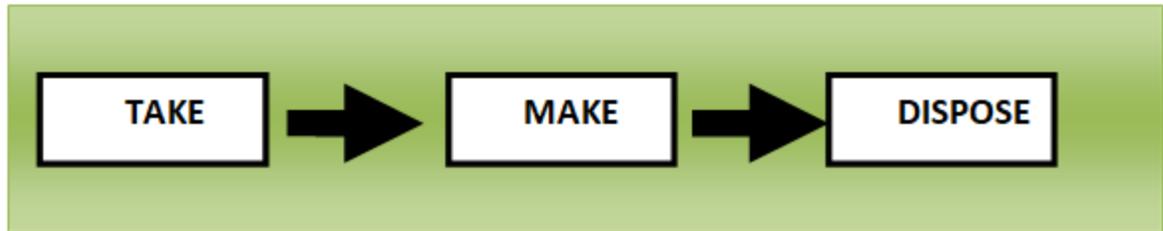


FIGURE 2A
LINEAR ECONOMICS

Source: The Ellen MacArthur Foundation's (2013), Circular Economy.

CE waste management standards, like as the 3Rs, which prohibit municipal garbage incineration and open burning, are critical to attaining this goal. Jeopardized is referred to as sustainable production and consumption. This might be translated as "*doing more with fewer resources.*"

Improving product durability, reparability, and recyclability is a top goal for the European Commission. This will be accomplished through the Eco-design guidelines as well as incentives that differentiate manufacturers' financial contributions under extended responsibility schemes of producer which should be based on products' end-of-life costs (Dodick, 2017). Furthermore, The Commission will review measures intended at developing a more uniform policy framework for EU product policy engagement in the CE's several strands (Table 1).

Furthermore, the Commission is collaborating with stakeholders to strengthen the credibility of green claims, and it will improve enforcement of current regulations, This includes updated instructions on deceptive commercial tactics It is putting Product Environmental Footprint "*COM/2013/0196 final*" on the market to that end. Methodology to the test, as well as establishing the (optional) EU Ecolabel, which acknowledges low-impact products.

Simultaneously, the Commission recommended an enhanced labeling system for energy-related items to assist consumers in selecting the most efficient, long-lasting products (The Ellen Mac Arthur Foundation, 2019b).

The challenge is to improve products' whole environmental performance over their life cycle, increase product demand and improve production processes, and assist consumers in making educated decisions.

In terms of consumption, which is expected to reach 82 billion tons by 2020, In recent years, the trend of usage and exploitation has been dependent on decreased resource costs, particularly in developed countries (Dobbs et al. (2011), with growth and development processes resulting from conjecture on current conditions.

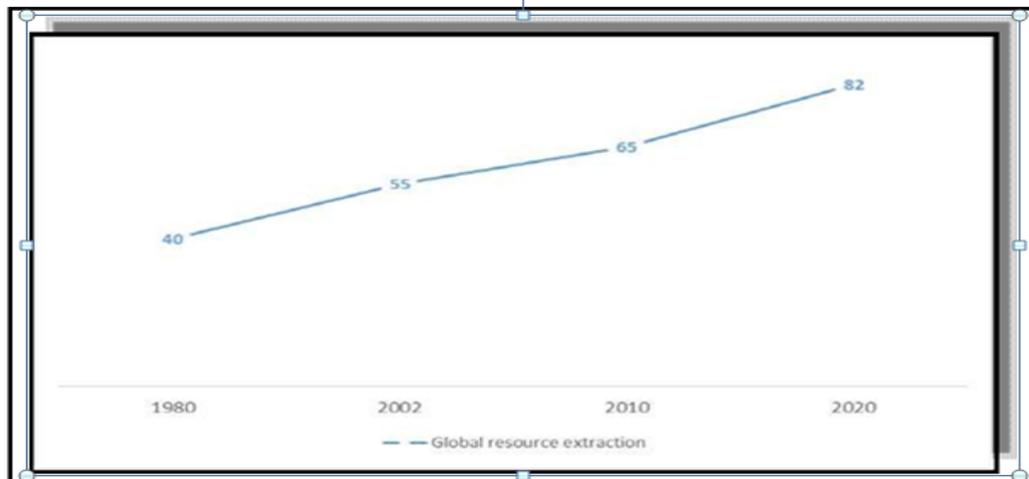


FIGURE 2B
GLOBAL RESOURCE EXTRACTION

Source: The Ellen MacArthur Foundation's (2013)

These settings, which offered an appealing climate and were advantageous in the near term, eventually led to overexploitation and waste creation.

This same type of economy produces things with short lifespans, imprinting an unsustainable nature on buyers. Each year, around 15 million tons of materials are used per person in Europe, whereas 4.5 tons of rubbish are generated annually, with half of this waste being disposed of in landfills (European Commission).

Another aspect to consider is that the shift to a circular economy may deliver value for as long as feasible while minimizing waste, assuring sustainability, lower emissions, resource efficiency, and greater competitiveness.

One of the key goals of this sort of economy is to extend the life of things by making them more durable, reusable, and repairable so that they can meet current needs.

Rethinking the paradigm of cost-focused supply chains and embracing value-oriented ones is another way to bring to the forefront of public consciousness innovative methods to sustainable development backed by a circular economy.

Furthermore, The CE's waste management policy is critical because It specifies How to apply the EU waste hierarchy (prevention, reuse, and landfill) to achieve the best overall environmental result. Long-term signals must be sent to the public and commercial sectors, while the EU must also create the enabling conditions, such as consistent application of present legislation, to achieve high levels of material recovery for all trash (a fundamental CE goal). Currently, just 40% of EU household garbage gets recycled. The Commission is proposing new waste regulations to provide requirements for more recycling and less landfilling while accounting for regional differences (Doran, 2002).

In order to stimulate secondary raw material markets Recycling resources are looped back as "*Secondary Raw Resources*" (SRMs) in a CE, giving supply security and allowing them to be exchanged like primary materials. These substances are now commonly available.

Constitute a minor part of the raw minerals utilized in the EU Quality is one of the challenges impeding the (increasing) use of these materials. In the lack of EU criteria, determining impurity levels or eligibility for high-grade recycling might be problematic. As a

result, In collaboration with diverse industry stakeholders, the Commission will begin work on EU-wide quality criteria for SRMs (Dodick, 2017).

Furthermore, for the CE to grow, innovation and investment are key components because they have a direct impact on the competitiveness and modernization of EU industry. Industry 2020 under the Circular Economy was a Horizon 2020 work program for 2016–2017 that allocated over €650 million in funding for cutting-edge demonstration projects that support CE initiatives and new business models. Additionally, it explores a potential strategy for assisting innovators who confront regulatory obstacles by forging connections with private and public stakeholders. The former Horizon 2020 budget, which covered the years 2014 and 2015 (2019, http://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/main/h2020-wp1415), has been replaced. These efforts will benefit from the Eco-innovation Action Plan, which between 2014 and 2020 has allocated over €80 billion for a range of environmental programs, including innovation and research. <https://ec.europa.eu/environment/ecoap/about-action-plan/union-funding-programmes> accessed 2019.

Estimated benefits of CE to the EU

In fact, different stakeholders and EU countries perceive the CE differently; this highlights the necessity need a shared understanding of the CE and the policies that must accompany it Furthermore, we shall attempt to evaluate the benefits of CE to the EU (Dodick, 2017).

Resource advantages: A CE will decrease demand for primary raw materials by reusing materials found in high-value products or reintroducing waste -as high-quality secondary raw materials- into the economy, reducing Europe's reliance on imports and making procurement chains in many industrial sectors less vulnerable to price volatility in international market of commodities markets and supply uncertainty caused by scarcity in resources and/or a myriad of geopolitical factors (European Investment Bank, 2020).

Environmental advantages: The major goal of the EU's policy related to resource-efficiency is to completely decouple economic production and social well-being as a result of resource and energy use, as well as the environmental consequences 2013 (European Union). While existing waste policies are beneficial, according to the European Commission, various combinations of more ambitious municipal and packaging waste recycling targets and lowering disposal might result in a 424-617 million tonnes of CO₂ equivalent reduction in greenhouse gas emissions between 2015 and 2035, on top of reductions achieved through full implementation of ongoing targets.

Economic advantages. A circular economy has the potential to significantly reduce costs in a variety of industries. Implementing Circular economy concepts, for example, are expected to net material cost savings in the EU alone of USD 340-630 billion per year, corresponding to 12-23% of the prices of current material input in these industries (Ellen MacArthur, 2012). Food, beverages, textiles, and packaging, for example, offer a worldwide material savings potential of USD 700 billion per year or roughly 20% of these industries' material input costs.

Social advantages: Sharing, eco-design, reuse, and recycling are examples of social innovations that are expected to lead to more sustainable consumer behavior while also enhancing human health.

Constraints of the EU's CE action plan

Despite efforts aimed at such a cyclical economy, and so on. According to the European Commission's study "The circular economy: connecting, generating, and protecting value," European policies and activities are implemented through action plans, which are strategic directions that must be followed. However, in order to succeed, several technical, social, political, and economic obstacles must be overcome (Costea-Dunarintu, 2016).

Companies are frequently unaware of, or lack the competence or knowledge to choose circular economy solutions.

Today's systems, business models, infrastructure, and technology have the potential to lock the economy into a linear model.

Investment in creative business models or efficiency measures is minimal, and is regarded as dangerous and complex.

CONCLUSION

The World Circular Economy Forums (WCEFs) have grown into significant global gathering places for CE experts and practitioners across the world. The WCEFs look into how firms may take advantage of new opportunities by implementing circular economy solutions, as well as how the circular economy can assist accomplish the SDGs (SDGs).

The circular economy and, more broadly, the SDGs must be implemented in tandem. Contradictions may develop, however, if, for example, material reuse is pushed without enough consideration for dangerous substances and the potential risks they provide to employees, consumers, and users.

As a result, one intriguing global topic is whether or not CE promotion would benefit from a particular international approach, or whether the goals outlined by, say, the SDGs are sufficient. Maintaining sustainable production and consumption patterns, for example, spurs sustainable management and efficient use of natural resources, as well as reducing worldwide per capita waste of food and significantly reducing overall waste flows, while also justifying costly fossil-fuel subsidies. These goals are equally important for the circular economy.

Furthermore, "*The EU's CE strategy has the high goal of changing Europe's economy to alleviate the effects of a host of environmental crises*". Much of European environmental policy, as previously demonstrated, bears no similarity to the CE's "*restorative*" qualities. Instead, it emphasized solid waste reduction, particularly through recycling, as well as greenhouse gas emissions reduction. Indeed, CE essentially meant better waste management for the vast majority of EU member states. Furthermore, climatic change and resource scarcity.

In practice, efficiency initiatives appeared to be mostly isolated, whereas integration with a bio-economy strategy required further effort.

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