JUST2CE

A Just Transition to Circular Economy

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CHAPTER 1

Circular economy model, principles and just transition perspectives

PART I. BASICS OF THE CIRCULAR ECONONOMY AND STATE OF THE ART

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Chapter 1. Circular economy model, principles and just transition perspectives

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Abstract

This chapter introduces the CE concept and the socio-economic system that it proposes. The concept of CE was born more than fifty years ago by the early contribution of Kenneth Boulding, who conceived the economic system and the Earth as closed systems due to the acquired awareness that natural resources are limited. Therefore, resources should be used with care, eliminating the concept of waste to ensure the continuous reproduction of the resources needed in the economic system.
Over time, the CE concept has much evolved thanks to the contribution of Pearce and Turner in the nineties and further scholars of different research areas (such as System Thinking, Industrial Ecology, Ecological Economics, Environmental Economics). Currently, the Ellen Mac Arthur Foundation, since one of its first reports (2012), is one of the most involved organizations promoting CE dissemination and application. Besides the genesis of CE and its evolution, this chapter also offers an analysis of the current level of circularity worldwide, showing that more effort should be made to favour the transition from the linear and recycling economy to CE. Moreover, the concept of just transition is addressed in association with that of CE to provide an overview of its consideration in the international literature and academic research. The latter analysis shows several cases of social injustices worldwide in some sectors (e.g. fashion, e-waste, plastic waste and recycling). Solutions are provided by the selected literature to improve the current state and orient the transition to a more comprehensive and socially aware model of CE.

Keywords: Circular Economy, Circular Economy Principles, Linear Economy, Recycling Economy, Just transition.

This chapter presents the basic concepts of existing CE models useful to give a preliminary and essential knowledge to the reader to appreciate the evolution of CE and its potential of tackling the current environmental and social challenges.

1.1 Introduction

The CE has become one of the most adopted buzzwords in current academic research, industries practice and policy discourse (Clube and Tennant, 2023; Ashton et al., 2022; De Lima, 2022; Nikolaou et al. 2021; Johansson and Henriksson, 2020) due to its potential of contributing to a better sustainable development (Evans, 2023; Lamba et al., 2022) and tackle the global environmental challenges such as climate change (Rödl et al., 2022) and the high

consumption of natural resources (Remme and Jackson, 2023; Circular economy gap, 2023). In the last decade, many studies have investigated the origin of the concept of CE, how the CE model works in practice, its limits/challenges and future directions (De Lima, 2022; Nikolau et al., 2021; Antikainen et al., 2018; Murray et al., 2017). Scholars underlined that the concept of CE is not new since it has origins in theories elaborated in the 60'-70' of the last century, such as Industrial ecology, Environmental economics and Ecological economics (Lamba et al., 2022; Antikainen et al., 2018), but undoubtedly can be considered new its premises of radically rethink the linear model of economy and society (Valencia et al., 2023; Antikainen et al., 2018) dominating since the second industrial revolution (Ellen Mac Arthur Foundation, 2023). In this regard, the CE model is much focused on redesigning production and consumption processes and a better valorisation and cycling of products, materials and components (Remme and Jackson, 2023; Antikainen et al., 2018; Murray et al., 2017). Some aspects are still less explored in CE discourse, such as the social impacts of CE implementation (Clube and Tennant, 2023; Lamba et al., 2022; Rask, 2022; Schöggl et al., 2020; Johansson and Henriksson, 2020; Murray et al., 2017). However, on one side, transitions towards CE (Bosman and Rotmans, 2016) and sustainability (Geels, 2011) are complex and long processes (Geels, 2011) since the path and the changes towards a new societal state and structure require time (Loorbach, 2007). On the other hand, it is important to identify barriers and challenges in the transition to avoid lock-in mechanisms preventing the transition from proceeding in the desired direction (Korhonen et al., 2018). In that, among the CE's current challenges, there is a lack of a clear policy vision (Upadhyay et al., 2022) as well as a restricted vision of CE centred on waste or recycling practice (D'Urzo and Campagnaro, 2023; Remme and Jackson, 2023; Van Langen et al., 2020) or specific social themes (e.g. employment) whenever the social impacts are considered in CE applications (Vanhuyse et al., 2021). The academic literature emphasizes that there is a so-called mainstream vision and development of CE (Calisto Friant et al., 2023; Villalba-Eguiluz et al., 2023; Genovese and Pansera, 2021; Clube and Tennant, 2020) as well as an "integral CE" model (Villalba-Eguiluz et al., 2023) more comprehensive and socially aware (Clube and Tennant, 2023) emerging from grassroots initiatives where the economic actors apply more radically the CE model and take care of the aspects of social inclusion, community development and just transition. This framework contains economic models that focus on the "Social & Solidarity Economy" (SSE) (D'Urzo e Campagnaro, 2023; Costanza, 2023; Villalba-Eguiluz et al., 2023; Mureau et al., 2017), "Care-centred economy" and "civil economy" paradigms (D'Urzo e Campagnaro, 2023; Nogueira et al., 2023; Bruni and Zamagni, 2015; Bruni, 2013).

Therefore, this chapter aims to provide an overview of the CE concept and models and their current development to enhance a more comprehensive understanding by all stakeholders, particularly policymakers.

1.2 Genesis and evolution of CE concept and model

The first contributions to the elaboration of the concept of CE and the associated model of economy and society date back to the sixties of the last century with the ecological economist Kennet Boulding (1966) who conceptualized the economy as a closed system similar to a spaceship with a limited amount of natural resources. Therefore, he suggested the economy as circular in order to assure a continuous regeneration of the materials. At that time, many scientists were increasingly afraid of the environmental limits of the natural environment in terms of the provision of the natural resources required to support the economy (Meadows et al., 1972) as well as its capacity to assimilate the different forms of pollution released to the environment (Bresso, 1993). In such years,

the neoclassical and linear model of the economic system centred on the goal of quantitative economic growth was criticized by the nascent Environmental economics and Ecological Economics school of thoughts (Bresso, 1993).

Pearce and Turner (1989) further elaborated the idea of a circular economic system, suggested by Kennet Boulding, on the basis of the contribution by Georgescu-Roegen (1971) to the laws of thermodynamics that suggest matter and energy conservation (1st law of the thermodynamics) and degradation (2nd law of thermodynamics and entropy principle). In their model, Pearce and Turner (1989) propose a better management of natural resources and environmental goods on the basis of the recognition of an economic value to the environmental services provided to the economic system. Three relevant functions of the environment are pointed out: the environment is a provider of direct utility as well as of natural resources for the production of goods and services and is a receiver of waste from the production of goods and services (Panella, 2002). In the absence of this recognition, the economic system is considered linear in agreement with the neoclassical thinking that does not account for the relations of the economic system with the natural environment (Buonaiuti, 2014). Moreover, the attribution of an economic value is aimed to favour a better management of natural resources, environmental goods and services provided by the environment. These latter are finite, but in economic thinking, many scholars since Adam Smith (1776) considered environmental goods such as water or air as unlimited and freely available without paying a price (Smith, 1776) and because of this, "they play no part for economics" (Say, 1821).

Scholars of different fields contributed over the years to enrich the understanding of the closed-loop systems concept at the industrial level as well as to the further development of the concept of CE. In this framework, the "cradle to cradle" design philosophy by Michael Braungart and Bill McDonough (2010) provided inspiration to CE with the following three principles:

1. "Cradle to cradle" concept that emphasizes that the economic system should eliminate the concept of waste as the latter are nutrients and circulate in the biological or technical cycles;

2. "Renewable energy use" due to their lower environmental impacts than conventional energy sources;

3. "Diversity" to promote resilience in human systems.

A further relevant contribution has been provided by Walter Stahel, who dedicated much work to the development and application of the "closed loop" idea to production processes (Stahel, 1981), founding the Product Life Institute in Geneva more than 25 years ago focused in the promotion of the concepts of: "product-life extension, long-life goods, reconditioning activities, and waste prevention". Stahel is also much concerned about the development of the "performance economy" and the importance of selling services rather than products. Finally, he also considers the CE to be an umbrella term grouping several specific ideas that are based on a set of principles. Janine Benyus created the Biomimicry approach (2002), defined as: "a new discipline that studies nature's best ideas and then imitates these designs and processes to solve human problems". She believes that Nature can provide human society with the solutions to the great challenges of our time since Nature has solved many issues that humans are experiencing. For example, birds are able to fly without using fossil fuels.

Industrial Ecology is focused on the investigation of the flows of material and energy throughout the industrial systems. It deserves attention on the creation of connections between operators within the industrial ecosystem and closed-loop processes where waste generated by an operator or process becomes input for others, in so

eliminating undesirable by-products (Graedel and Allenby, 1995; Frosch, 1992). "Industrial ecology adopts a systemic point of view, designing production processes so they perform as close to living systems as possible. This is achieved by considering local ecological constraints and looking at the global impact of processes from the outset". Finally, Industrial ecology also aims to perceive higher social well-being due to its focus on natural capital restoration, which is key for promoting sustainability.

Important contributions also came from the "regenerative design" approach by John T. Lyle (2010) which is applicable to all systems that become on that basis more resilient because they are designed as closed-loop systems (Ikerd, 2021) as well as from the blue economy movement and philosophy of the Zero emissions research and initiatives promoted by Gunter Pauli. The Blue Economy is a movement that encompasses a wide range of actors (such as companies, consumers, and scientists) and proposes an economy that generates the least impact to the environment and relies for the satisfaction of its needs on local systems of production and consumption.

Finally, all these schools of thought converged to the current CE concept promoted since the year 2010 by the Ellen MacArthur Foundation. The latter has been at the forefront in the dissemination of the CE concept and applications by means of a series of reports setting the fundamental aspects of a CE and its functioning. The Foundation was created by the British sailor Ellen MacArthur, who acquired the awareness that natural resources on Planet Earth are finite, perceiving the need for the transition to an economic model (namely, CE) for better use of natural resources compared to the linear economy model. The CE model by the Ellen Mac Arthur Foundation is currently considered the mainstream vision of the CE (D'Urzo and Campagnaro, 2023). However, after an initial general consensus, several scholars started to criticize this vision underlying several limits, including its capacity to put under discussion the capitalist paradigm dominant in the governance of the global economy and suggest its reform (Genovese and Pansera, 2021; Giampietro and Funtowicz, 2020; Reike et al., 2018). Moreover, this CE model considers mainly the environmental and economic dimensions of sustainability and, to a limited extent, the social one and its balance (D'Urzo and Campagnaro, 2023).

The bulk of CE research is still concentrated on studies dealing with management and corporate business models as well as waste management and recycling, while the other principles (e.g., reuse, repair and reduce) are less investigated (Schöggl et al., 2020). Similarly, until now, the analysis of the different dimensions of sustainability in the academic literature privileged the environmental and economic ones, while the social received less attention (Johansson and Herikksson, 2020; Schöggl et al., 2020).

It is important to mention that more comprehensive and socially aware CE models are emerging from case studies applying the CE at the local scale in particular in cities (Bozeman et al., 2023; Ghisellini et al., 2022; Rask, 2022; Petoskey et al., 2021; Ghisellini and Ulgiati, 2020; Prendeville et al., 2018) and are showing the ecological transformation as well as a reorganization of the economy and social life more in line with the well-living of people and environment (Clube and Tennant, 2023). These cases are based on the integration of ethical values disruptive of the economic logic of efficiency and profit maximization, which depict the neoliberalism thought and model (SPES Annual Conference, 2022) and widen CE mainstream vision as well as the meaning itself of an economy and its position within the environmental and social systems (Moreau et al., 2017; James, 2022). These latter authors intend the economy as a subsystem of society (Parsons and Smelser, 1956). The economy is not neutral to social relations and the impacts of their activities, such as related to: "justice, inequality, poverty and exploitation" (Ashton et al., 2022; James, 2022) since it has a social purpose and recognizes the potent role of social norms and institutions (Polany, 1944) in explaining economic development and the well-being and happiness of people. Institutions (e.g. Governments and the laws) were considered promoters of equity and oriented to public happiness

since the early contributions of some of the founders of the ancient school of civil economy of Naples, such as Antonio Genovesi (1768) and Gaetano Filangeri (1783). In that, the economic activity, for those scholars, was strictly influenced by social norms such as trust, reciprocity and equity. On the other hand, in such years, the physiocratic school of thought (Quesnay, 1758) conceived both the economy and society as open systems to the environment (**Figure 1.1**), thereby taking into account its biophysical limits.

After these two schools of thought, the biophysical/environmental and societal dimensions were progressively excluded from the economic analysis while returned to be integrated to some extent in the last century thanks to the contributions of Ecological Economics (Boulding, 1966; Georgescu-Roegen, 1971), Environmental Economics (Pearce and Turner, 1989) and Institutional Economics (Polany, 1944; North, 1994) respectively.

Moreau et al. (2017) explore the SSE as a model embedding the theoretical framework of Institutional Economics to show "how institutional conditions can contribute to the development of a CE by taking into account social institutions, societal norms, and political considerations". They investigate labour conditions in the city of Geneva and show the advantages of an SSE in reducing e.g. the inequalities in terms of salaries among employees. In the SSE, people are placed above profits rendering clear the value system "towards more equitable labour conditions and participative decision making, but also toward social wellbeing and the democratization of the economy overall" (Moreau et al., 2017). Untangling the economy from the main logic of efficiency and profitability could lead to decisions also with regard which CE strategies (which materials should be reused or reduced or which should be recycled) are more positive for the environment because the main goal is identifying the CE model that fits better the limits of the natural environment (Moreau et al., 2017).

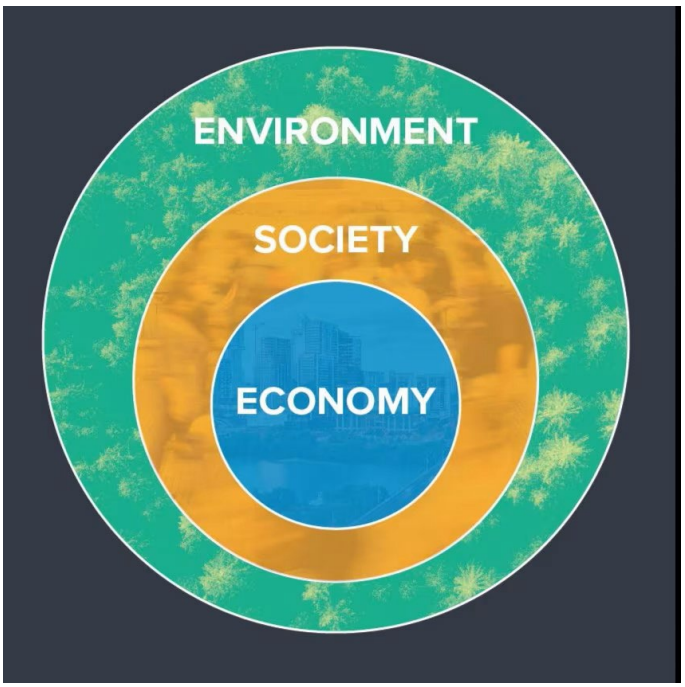

Figure 1.1 The relations between the natural environment, the economy and society in the socially aware CE. Source: https://www.ellenmacarthurfoundation.org/systems-and-the-circular-economy-deep-dive

1.3 Linear economy, recycling economy and circular economy

The advent of the CE model can be conceived in light of the huge environmental effects of the linear production and consumption model that still dominate worldwide (Moreau et al., 2017). The current global economy is only 7.2% circular (Circular Gap Report, 2023), meaning that only 7.2% of all input consists of secondary materials, while more than 90% of the materials are wasted, lost or are not available for reuse since they are stocked temporarily in products such as buildings and machinery (Circular Gap Report, 2023).

One of the characterizing aspects of the current worldwide linear economy is the massive consumption of natural resources. United Nations data[2] underline that the consumption of natural resources continues to rise while the efficiency in their use does not improve at the same pace, mainly regarding energy consumption. The amount of waste generated is also increasing (Kalmykova et al., 2016). Therefore, the so-called "decoupling" is far from being reached, and urgent actions and policies are required in order to ensure an equitable distribution of resources within and across generations and avoid the continuous overextraction of resources and environmental degradation (Warlenius, 2023). It is significant to highlight in this regard that, despite the great attention on reducing pollution due to the dispersion of plastic in the environment, in the G20 countries it is estimated that plastic consumption will more than double by 2050. (Back to Blue, 2023)

The indicator of material footprint gives an idea of the consumption of natural resources that supports the production of wealth in the global economies and the material needs of the population. The evolution of the material footprint worldwide shows that the indicator has grown from 28.6 billion tonnes (Gt) in 1972 to 101.4 billion tonnes (Gt) in 2021 (**Figure 1.2**). It is expected that by 2050, the global material footprint will rise to 170-184 billion tonnes (Gt) in the absence of effective political actions able to reverse the trend and achieve a reduction of the material footprint3 in particular in high-income countries (Circular economy gap, 2023; UN, 2017).

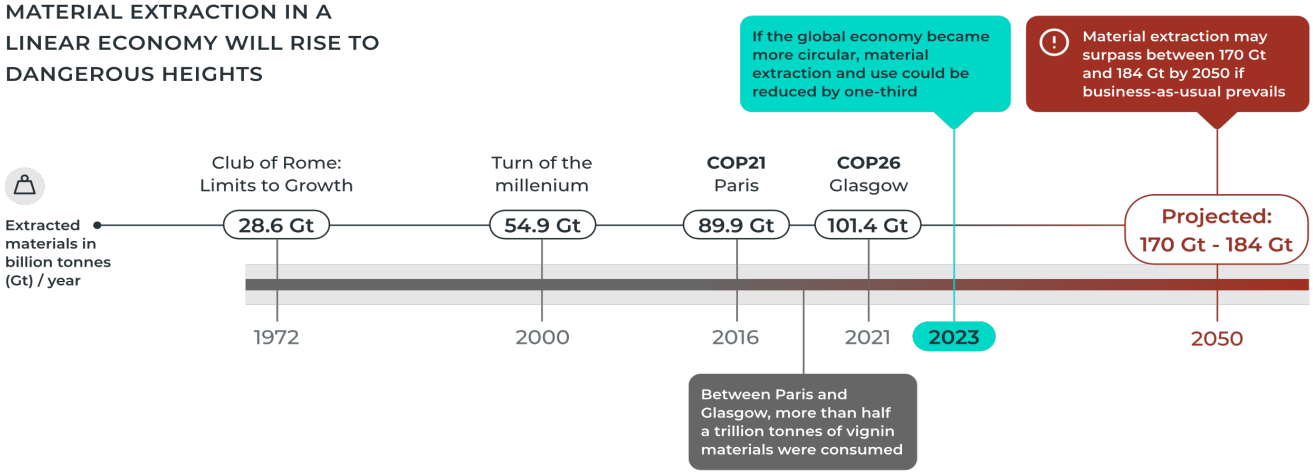

Figure 1.2 Global material footprint in the global economy from 1972 to 2050. Source: Circular economy gap, 2023.

The United Nations statistics (2017) also provide data about the material footprint per capita, which show that in the year 2017, high-income countries had the highest material footprint (26.3 metric tonnes per person) compared

[2] https://unstats.un.org/sdgs/report/2019/goal-12/
[3] https://unstats.un.org/sdgs/report/2019/goal-12/

to the world average (12.2 metric tonnes), while the other countries recorded the following levels of consumption: upper-middle-income (16.9), lower-middle-income (4.7), low-income (2.0). The UN also remarks on the dependence of Global North countries on materials extracted elsewhere, particularly in the Global South, since the material footprint indicator is higher by 9.8 (metric tonne per capita) than domestic material consumption per capita (17.9 metric tonnes). Therefore, improvements in resource use and more sufficiency lifestyles are needed (Villalba-Eguiluz et al., 2023) that strongly reduce the consumption of natural resources (Bocken and Short, 2021). Policies are fundamental to stimulate this shift in consumption (Remme and Jackson, 2023; Rask, 2022) since it is claimed that the application of CE alone will not be able to reduce the material footprint (Bocken and Short, 2021).

Figure 1.3 summarizes these aspects, highlighting the main differences between linear, recycling economy and CE, evidencing that the latter, by design, should incorporate more sustainable production and consumption models in order to ensure that the economy feeds itself while minimizing the use of natural resources by "keeping material in use without degrading their quality or downcycling into lower valued products" (Ellen Mac Arthur Foundation, 2023). It is also worth pointing out that in the recycling economy, products are designed to keep the value of materials and products in a shorter time than the CE. As a result, in a recycling economy, resources should still be extracted, and the production of waste is inevitable. Moreover, while recycling is a practice that is more environmentally sound than landfilling or incineration, on the other hand, it requires energy (Mah, 2022). Only a few elements in the periodic table have recycling rates above 75%, while most of them can be recycled once, and others cannot be recycled at all (Graedel, 2021). Finally, recycling as an economic activity is often performed far from the point of generation of the waste to be recycled and is mainly oriented to the pursuit of economic efficiency (Stahel, 2016), disregarding the environmental and social impacts (Ghisellini et al., 2023).

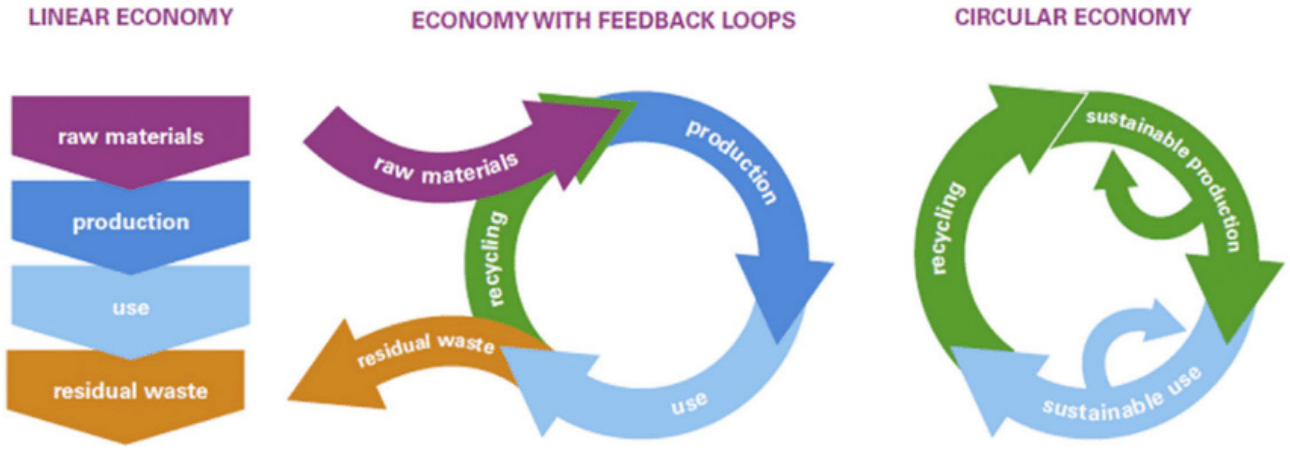

Figure 1.3. The life cycle of products in the linear, recycling and circular economy. Source: Van Bueren et al., 2016.

1.4 The circular economy model and its principles: the mainstream vision of CE

After the surge of the concept of CE in the last decade, many scholars have provided a definition of CE (Kirchherr et al., 2017). The most recent by the Ellen Mac Arthur Foundation (2023) indicates that CE is: *a system where materials never become waste and nature is regenerated. In a circular economy, products and materials are kept in circulation through processes like maintenance, reuse, refurbishment, remanufacture, recycling, and composting. The circular economy tackles climate change and other global challenges, like biodiversity loss, waste, and pollution, by decoupling economic activity from the consumption of finite resources* [4].
This definition is entirely focused on the environmental dimension of the CE that, until now, is the sustainability dimension mainly emphasised by the literature (Dzhengiz et al., 2023 [5] ; Mies and Gold, 2021). Three important aspects (and principles) emerge in this definition: the elimination of the concept of waste, the circularity of products, materials, and components, and the positive contribution of the economy and society to the environment in the regeneration of natural resources. At the basis of these aspects/principles, there is the concept of design by which products and materials are thought to last longer than conventional products of the linear economy by a series of strategies aimed to circulate products and materials to retain most of their values (maintenance, reuse, refurbishment, remanufacturing, recycling and composting).

Finally, circulation means that products at the end of their life can still be useful as materials or components, avoiding the production of additional waste and further prolonging their intrinsic value. This model of CE is depicted in **Figure 1.4** in the so-called Butterfly diagram, where each of the two wings represents the biological and technical cycles of the model of CE. In the technical cycle (marked in blue), products circulate by means of the application of different strategies such as reuse, repair, remanufacturing, and recycling, while in the biological cycle, organic products and materials can safely return to the soil through processes like composting and anaerobic digestion and be valuable nutrients for the regeneration of the soils.
The Ellen Mac Arthur Foundation (2023) proposes to handle products and materials in the technical cycle at cascade[6]. Given that the goal is "*keeping products whole to retain the maximum possible value*", the best option is based, e.g. on sharing by which the products could be used over time by users who do not own the product. Further options could be the reuse of the product by means of the resale and later cycles of maintenance, repair, and refurbishment. "*When the product can no longer be used, its components can be remanufactured. Parts that cannot be remanufactured can be broken down into their constituent materials and recycled. While recycling is the option of last resort because it means the embedded value in products and components are lost, it is vitally important as the final step that allows materials to stay in the economy and not end up as waste*" (Ellen Mac Arthur Foundation, 2023).

[4] https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview
[5] https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview
[6] Cascade is about a succession of processes by which an intermediate product is used as a feedstock for a succession of processes. In this way, the value of raw materials is optimized because it is possible to obtain multiple products rather than only one product. Available online: https://www.borregaard.com/sustainability/planet/circular-economy-and-cascading-use-of-biomass/ (last accessed: 23/10/2023).

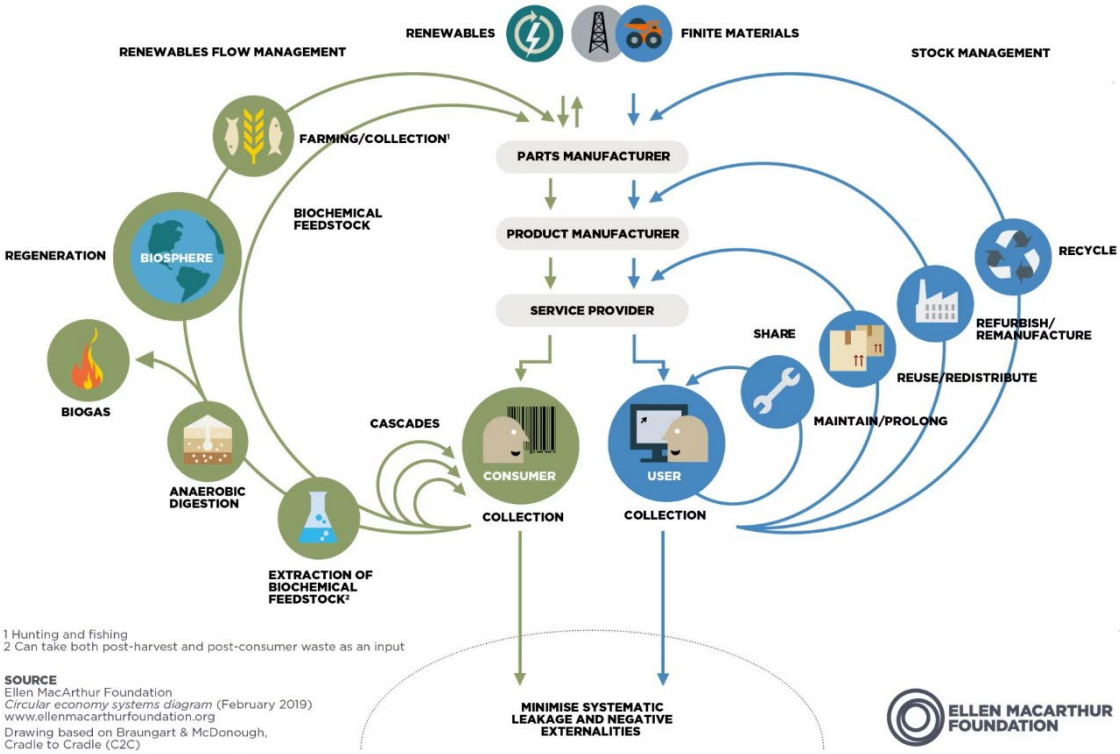

Figure 1.4 CE strategies in the technical and biological cycles. Source: Ellen Mac Arthur Foundation, 2023.

1.5 The circular economy and the "just transition" discourse

It would be a deep mistake to ignore how the existing literature is linking and elaborating the concept of "just transition" to that of CE and its model. For this purpose, we performed a search on Web of Science using the keywords "circular economy" and "just transition" and selected the literature including these two concepts. In that, the literature review of this study can be considered integrative of the one performed in other chapters contained in this e-book that reviewed the literature using as keywords "circular economy" and "environmental justice" (chapter 17), "circular economy" and "gender" (chapter 18), "circular economy" and "labour" (chapter 19).

On the basis of our analysis, the relation between CE and just transition started to be mainly investigated by the academic literature from the year 2020 onwards. Within this stream of the literature, some of the proposed theoretical frameworks comprise that of Responsible Research and Innovation (RRI) (Purvis et al., 2023; Pansera et al., 2021) and frameworks that are focused on the dynamics of incumbency in energy transition and the power that incumbents play in "blocking" the adoption of alternatives more socially and economically sounds and scientifically realistic (Remme and Jackson, 2023; Stirling, 2019). In this view, RRI is particularly useful to put under discussion the current mainstream model of CE and analyse its implementation in the light of social justice concerns, suggesting a way to take the latter into account in CE practices (Purvis et al., 2023)

The selected literature also underpins cases of great challenges to overcome (e.g., the trade of textile waste or e-waste from the GN to the GS), providing possible responses to improve state of the art and profoundly embedded injustices.

Therefore, in this study, the theme of "just transition" within CE is regarded not only as the "energy transition" to renewable energies (Mutezo and Mulopo, 2021) and challenges of the revitalization of coal post-mining sites (Cala et al., 2021), but also as energy poverty issues (Streimikiene et al., 2021) and environmental and social impacts of

metals extraction (e.g., cobalt) for the transition to electric vehicles (Rachidi et al., 2021; Remme and Jackson, 2023). In this regard, Remme and Jackson (2023) evaluate the CE policies in Norway, including the ambitions for the electric vehicle transition, highlighting the injustices that such transition could imply throughout the life cycle and the environmental costs for the countries where the metals are extracted. Therefore, the authors warn that CE and electric vehicles development, rather than favouring a just transition, could perpetuate colonial injustices and become a profitable industry that accumulates wealth for a small number of elites in the GN at the expense of the GS (Chapter 6 of this e-book written by Liu and Ulgiati will deal with global electric vehicle transition in more details analysing the environmental and social costs of the transition).

Other researches have focused on waste trade from the GN to the GS. For instance, Thapa et al., 2022 have analysed the movements of waste electrical and electronic equipment trade towards African countries (Nigeria), while Nagarajan et al. (2022) investigated plastic recycling as a production activity in India and the rights of workers and small-scale enterprises. Valencia et al. (2023) explored waste picking in two countries of Latin America, finding that the creation of social provisioning communities with female waste picking contributed to giving dignity to labour recycling as well as care and political representation. Lima et al. (2022) evaluated the bioeconomy transition in Brazil, India and Indonesia and the different types of injustices that are created, while Suarez-Visbal et al., (2022) addressed the social impacts on workers regarding the quality of jobs and livelihood, gender equality and social inclusion in the apparel value chain. Leclerc and Badami (2023) analysed the formal and informal e-waste flows, the actors involved in these latter, and the associated environmental and social impacts in Montreal, finding that these flows are not as distinct as those found in previous research. Persson and Hinton (2023) investigated the changes in the second-hand clothing market in Sweden following the presence of different forms of non-profit and for-profit businesses to evaluate how they influenced the transition to a socially just CE. These Authors underscore the importance of strengthening the extended producer responsibility to enhance the reuse and repair activities and its integration with other tools to discourage the exports of clothing waste as well as their destruction. From this perspective, it is important to highlight that the problem of fast fashion is a very serious global issue, and GS countries where most garments are exported from the GN are organizing activities such as repair and upcycling to increase the durability of exported garments to avoid their landfilling (Vanacker et al., 2023). These authors have analysed these issues to assess the relationship between circularity, garment durability and just transition. On the basis of the results, the authors stress that people should be placed at the centre of this relation to ensure a just circular economy in this sector. Further, Papamicheal et al., (2023) argue that it is key to combine different business models of circular fashion (based on the concept of slow fashion) to facilitate the adoption of a holistic approach for achieving a just transition to the CE in the fashion industry. Moreover, the use of textile fibres produced from crop residues would be an important result towards a more circular fashion sector. Small farmers in India are crucial actors in providing the needed biomass, but their institutional power is still limited. As a result, their power should be strengthened in order to assure a just and circular transition in the sector (Harry et al., 2020).

Moving beyond fashion, Otlhogile and Shirley (2023) have analysed the history and evolution of the just transition movement, showing that it has become a framework for specific groups and communities since it gathers movements belonging to just urban, rural, circular economy and energy transitions. They analysed case studies about these movements in local and regional contexts to improve the understanding of their activities and their progress in Africa and create consensus around them for local and national stakeholders.

The participation of all the relevant stakeholders and the relations between them are important in a just transition to CE (Vanhuyse et al., 2023) since e.g. small-scale institutions struggle in the transition due to the poor organization of their waste services for the local communities requiring support from the national institutions (Ghisellini et al., 2023b). Therefore, methods such as life cycle assessment, social life cycle assessment and social impact assessment (Vanhuyse et al. 2022) are relevant in a just transition perspective to analyse the environmental impacts and the social relations and impacts of CE implementation (Ghisellini et al., 2023c). These methods and related indicators can be expanded to better fit the CE purposes (Luthin et al., 2023) and integrated into other methodological approaches to provide a wider understanding at hand for policymakers and their need for monitoring and evaluation of the progress and impacts of a just transition (Purvis and Genovese, 2023). However, measuring social impacts still faces many challenges due to the qualitative aspects to be measured as well as the conventional data sources that are not appropriate for measuring circularity (Pitkänen et al., 2023).

1.6 Conclusions

This work aimed to give preliminary and essential knowledge about the evolution of the CE concept, model, and principles and link it with the just transition concept to evaluate its potential to contribute to the current socio-ecological challenges. The CE originated in the last century from different schools of thought and mainly in response to the increasing environmental challenges of the linear economic model. The mainstream vision of the CE model continues to represent an important reference model for CE development since it is based on the elimination of the concept of waste by design, on the key role of renewable energies, the circulation of materials, products and components based on the optimization of their value, on the regenerative capacity of circular practices producing biological nutrients for the soils and the improvement of biodiversity. However, several scholars also underline the importance of adopting a CE model that considers the social impacts of CE implementation to provide a more meaningful and transformative response to the social challenges ahead of the linear economy and recycling economy. The analysis of literature dealing with the themes of Just Transition and CE shows that many case studies contribute by signalling injustices and suggesting solutions to overcome them, as well as best practices and innovative frameworks. Therefore, it is important to disseminate this knowledge and raise awareness among all the stakeholders, and policymakers in particular, that a more comprehensive and socially aware model of CE should complement the mainstream one to help overcome its current challenges and design a social justice-oriented, model to overcome the present focus on economic activities and environmental protection.

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