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# Circular economy at the company level: An empirical study based on sustainability reports

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## Abstract

Circular economy (CE) has attracted both media and academic interest. However, there is a lack of empirical work that clarifies the specific activities involved in CE at the firm level. To fill this gap, this article offers an analysis of how firms disclose information about their activities associated with CE, based on an extensive worldwide dataset of sustainability reports from 1367 companies. The findings point to a rather limited, superficial and reductionist use of the concept of CE by firms. The concept of CE is only mentioned in around 16% of cases, and, when it is mentioned, it is mostly associated with conventional practices such as waste management and recycling. Conversely, core practices associated with CE, such as reduction, reuse, and remanufacture, are rarely considered. Further avenues for research and implications for managers, public policy makers and other stakeholders are discussed.

KEYWORDS

circular economy, empirical study, GRI, sustainability reporting

## 1 | INTRODUCTION

The concept of circular economy (CE) has become very widely used by a broad range of stakeholders, including policy makers, business organizations, and researchers (Arena et al., 2021). Public and private institutions all over the world are increasingly raising awareness of the CE paradigm (Camilleri, 2020; Hao et al., 2020). Academic and practitioner interest in CE is also increasing (Barreiro-Gen & Lozano, 2020).

Because it is a practitioner-dominated topic, the scholarly literature on CE remains unorganized (Korhonen, Honkasalo, & Seppälä, 2018), lacking a minimum level of theoretical foundation and there is no consensus on the interdisciplinary research agenda or the terminology (Bruel et al., 2019; Desing et al., 2020; Friant et al., 2020; Kirchherr et al., 2017). As underlined by Friant et al. (2020, p. 161), "the actual definition, objectives and forms of implementation of the CE are still unclear, inconsistent, and contested." Scholarly research about CE requires structured development to consolidate the definition, boundaries, principles, and associated practices (Merli et al., 2018). To that end, the evolution of the concept of CE must be considered, as well as what distinguishes it from related notions such as industrial ecology, industrial symbiosis, the performance economy, R-framework, the blue economy, biomimicry, and cradle to cradle (Schroeder et al., 2019).

In one of the few areas of agreement on the topic, academic research on CE tends to be subdivided into macro-, meso-, and micro-levels, the latter sometimes being referred to as firm-level (e.g., Barreiro-Gen & Lozano, 2020; dos Santos Gonçalves & Campos, 2022; Ghisellini et al., 2016; Kristensen & Mosgaard, 2020; Schroeder et al., 2019; Zhu et al., 2022). The macro-level refers to either the global, national, regional, or city level. The meso-level refers to either the sectoral, industrial symbiosis, or eco-industrial parks level. And the microlevel refers to the firm, consumer, or product level. As emphasized in the literature (Barreiro-Gen & Lozano, 2020; Gunarathne et al., 2021; Stewart & Niero, 2018), the majority of CE research has focused on the macro- and meso-levels, while the micro- or firm level has been under-researched. As Sinha

(2022) noted, "the existing literature is diffused and fragmented, and mostly it is based on a single case or is led by policy makers/consultants, thus, leaving a room for comprehensive research" (Sinha, 2022, p. 771). However, the importance of firms in the transition to a nonlinear economic model is underlined in the practitioner/gray literature (e.g., European Commission, 2020) and the scholarly literature (e.g., Kirchherr et al., 2017). Notwithstanding these contributions, there are few empirical works about the way firms deal with the concept of the CE in practice.

At the microlevel, as has been the case for studies focused on consumers (e.g., Testa et al., 2020; Testa et al., 2022) studies of CE at the firm level have only recently begun to be published (e.g., Gunarathne et al., 2021; Janik et al., 2020; Stewart & Niero, 2018). These studies were heterogeneous in terms of their methodological criteria and they produced inconclusive findings, and such findings as there were need to be structured and complemented (Opferkuch et al., 2022). Therefore, trying to contribute to this topic, this article aims to shed light on the way organizations from different countries use the concept of CE in practice, based on an analysis of their sustainability reports. Although the critical literature casts doubts about the reliability of this type of reporting (e.g., Cho et al., 2012; Diouf & Boiral, 2017; Moneva et al., 2006; Silva, 2021), sustainability reporting has recently been identified as a source of information that can be used to gain knowledge about the application of the concept of CE at the firm level (see the literature review below).

The rest of this article is structured as follows. First, a literature review about the theoretical implications of CE at the firm level and the empirical works published on this topic is presented. A description of the method of analysis follows. The results obtained from the analysis of an extensive dataset of close to 1400 organizations are summarized in the following section. Finally, the discussion and conclusions of the research are developed.

## 2 | LITERATURE REVIEW

From a theoretical perspective, the scholarly literature tends to associate the concept of CE at the firm level with a specific set of consolidated activities within the field of corporate environmental management. For example, from their analysis of 114 definitions from the literature, Kirchherr et al. (2017) associated the concept of CE with a combination of reduce, reuse, and recycle activities. More specifically, these authors found recycling to be the most common component of the definitions (approximately 80% of the definitions), followed by reuse (approximately 75%) and reduce (approximately 55%). Similarly, Prieto-Sandoval et al. (2018), with the aim of drawing a knowledge map of CE, found the most common and frequently mentioned group of principles were the same 3Rs (reduce, reuse, and recycle). Nevertheless, as pointed out by Dagiliene et al. (2020), the most commonly referenced activities are those summarized in the 4R framework (Kirchherr et al., 2017; Reike et al., 2018), which included the following "Rs" (Dagiliene et al., 2020, p. 5): (a) reduce: impact, emissions, waste, pollution, and so forth; (b) reuse: refurbish, repair, remanufacture; (c) recycle: waste, waste management; and (d) recover. Barreiro-Gen and Lozano (2020) also referred to a 4R scheme associated with four loops of recovery: reduction, repairing, remanufacturing, and recycling. Similarly, Merli et al. (2018) identified the following concepts most frequently associated with CE: reuse, closing loop, sustainability, and waste reduction. A more developed complementary framework was proposed by Van Buren et al. (2016) with the 9R framework that refers to the following activities: refuse (preventing the use of raw materials), reduce (reducing the use of raw materials), reuse (second-hand, sharing of products), repair (maintenance and repair), refurbish (refurbishing a product), remanufacture (creating new products from parts of old products); repurpose (product reuse for a different purpose), recycle (processing and reuse of materials), and recover energy (incineration of residual flows).

From an empirical perspective, the few studies that shed light on the way organizations deal with CE might be classified in two groups. First, a minority group of works are based on empirical studies that seek the opinion of business representatives on the subject. Based on a survey of 256 firms from more than 40 countries (mostly in Europe), Barreiro-Gen and Lozano (2020) found low levels of engagement with the 4Rs, and that organizations focus more on reducing and recycling than on repairing and remanufacturing. Similarly, in their survey of 49 organizations from the public sector in Portugal, Klein et al. (2022) also identified a low level of CE implementation, with waste collection and dematerialization practices found to have the highest levels of implementation. Aranda-Usón et al. (2020) researched the main activities related to the CE concept implemented by a sample of 52 Spanish firms with multiple sources of data collection (interviews and surveys). These authors found that the most frequently implemented activities were waste recycling and treatment, energy efficiency, reduction of the company's environmental impact, and eco-innovation. Mura et al. (2020) obtained information from 254 Italian SMEs, also using multiple sources (interviews, surveys, and focus groups), and found that CE practices were focused on waste management, packaging and supply chain, and design. Recently, based on 59 interviews with Swiss managers from three industries Takacs et al. (2022) explored the adoption of CE in SMEs. These authors identified a set of internal barriers (i.e., risk aversion, shortage of resources and knowledge) and four levels of more general external barriers. As for other topics analyzed on the basis of primary information obtained from the agents involved in the implementation of practical corporate environmental management activities (Boiral et al., 2018), possible biases, such as the social desirability bias, associated with self-reported data, must be considered for this type of study, as pointed out by Kuah and Wang (2020).

The larger, and growing, corpus of empirical literature on CE collects data about the activities associated with CE carried out by companies from their sustainability reports. For example, Stewart and Niero (2018) analyzed 46 sustainability reports published in 2016 in the fast-moving consumer goods sector, to explore how companies incorporated the CE concept into their agenda. These authors found that most reported activities were oriented toward the main product and packaging, focusing on end-of-life management and sourcing strategies, and to a lesser extent on circular product design and business model strategies.

Similarly, Janik et al. (2020) analyzed 61 reports from energy sector companies in Europe and found they rarely point to actions related

to CE. Similarly, Tiscini et al. (2022) analyzed the disclosure of practices associated with CE in a sample of 26 sustainability reports published in 2019 by 13 Italian companies from the cosmetic sector. These authors found practices involving packaging, recycling, GHG emissions, and $CO_2$ emissions to be associated with CE. Dagiliene et al. (2020) analyzed the disclosure of information about CE by 226 large European manufacturing companies and found firms did not report about the issue. The most commonly mentioned "R" was "reduce," as most companies focused on reducing materials, as well as the emission of air and water pollutants.

Conversely, the disclosure of reuse, recycle and recover practices was rare, as was the provision of information about resource efficiency practices associated with CE, such as minimizing the use of raw materials and the creation of shorter and closed loops. Gunarathne et al. (2021) analyzed the presence of CE within 20 sustainability reports published by Sri Lankan companies and found low levels of disclosures of direct and explicit keywords pertaining to CE principles at the firm level. Recently, Opferkuch et al. (2022) analyzed 138 reports published in 2020 by 94 European companies from various sectors. The results showed that nearly all companies are explicitly referencing CE, but only 7% of them integrate CE in a relevant way, and fewer than one third of companies were found to include both targets and indicators for CE, suggesting that overall, CE content within sustainability reports was largely superficial and inconsistent.

The reviewed growing literature based on sustainability report analysis generally used two different methodological approaches. On the one hand, Dagiliene et al. (2020), Janik et al. (2020), Gunarathne et al. (2021), and Tiscini et al. (2022) conducted qualitative content analyses, focusing on selected general and topic-specific disclosures identified by the authors as potentially associated with CE issues. In other words, a specific set of practices associated by the researchers with the concept of CE was analyzed. On the other hand, using an analytical perspective analogous to the one adopted in this work, but with a much more specific and limited focus, Stewart and Niero (2018) and Opferkuch et al. (2022) analyzed the information explicitly related to the concept of CE disclosed by companies. Considering the elasticity and vagueness of the term underlined in the literature, the latter approach seems more appropriate for the purpose of the present article.

Beyond the methodological issue, the results obtained in the reviewed works are inconclusive, if not contradictory. There is a gap in the literature, as identified by Opferkuch et al. (2022), who suggest that more cross-sectoral studies are required.

## 3 | MATERIALS AND METHODS

An exploratory empirical study was planned based on a qualitative in-depth analysis of sustainability reports. The descriptive information included in the sustainability reports was analyzed using a process of systematic categorization that groups information around recurring concepts and issues (Aké & Boiral, 2022; Schreier, 2012), following these general steps (see Figure 1): (1) data extraction phase; (2) organizing phase; (3) reporting results phase.

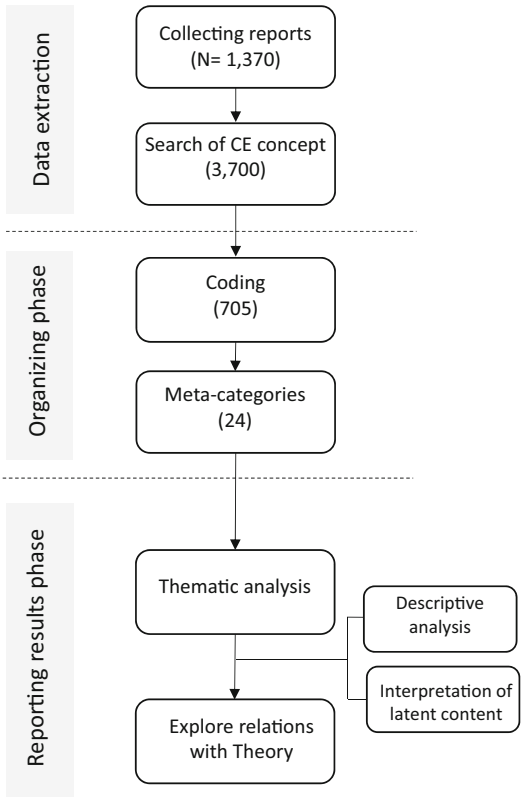


**FIGURE 1** Flowchart of the data analysis process.
*Source*: Prepared by the authors.

Reports disclosed following the global reporting initiative (GRI) scheme were used, as this framework is considered to be demanding and efficient in the mainstream scholarly literature (e.g., Alonso-Almeida et al., 2014; Jadoon et al., 2021). The sample of reporting organizations was limited to those with an explicit reference to sustainable development goals (SDGs) in their verified reports disclosed under the more recent standards, namely the GRI G4 Guidelines or the GRI Standards Reporting Framework. These inclusion criteria were designed to support the study of companies allegedly more committed to the disclosure of the concept of CE. As underlined by Schroeder et al. (2019) and Opferkuch et al. (2022), the CE concept has a strong connection with SDGs. For example, based on a literature review and a qualitative heuristic approach, Schroeder et al. (2019) found that the strongest relationships exist between CE and SDG 6 (Clean water and sanitation), SDG 7 (Affordable and clean energy), SDG 8 (Decent work and economic growth), SDG 12 (Responsible consumption and production), and SDG 15 (Life on land).

In December 2020 the GRI database was accessed to select and download the sustainability reports. 4575 reports published by 4446 organizations were obtained in the first search. All the reports were verified reports, either through the GRI Standards Report Registration System or the Registration Form by a representative of the reporting organization or by a third-party authorized by the reporting organization. Among the analyzed reports only 31.4% (1437) indicated that they included an explicit reference to the SDGs, as shown by a mark

in this field in the GRI database. 1370 reports from 1367 companies from 97 countries published either in English, Spanish, French, Portuguese, Italian, or German were finally considered (i.e., 67 reports were discarded for reasons of language). 64% of the 1370 reports were published in 2020, 29% in 2019 and a 7% in 2018.

The search methodology used in this study differs from that used by Dagiliene et al. (2020), Janik et al. (2020), Gunarathne et al. (2021), and Tiscini et al. (2022) as it does not analyze the specific use of the concept of CE in practice by firms by analyzing the disclosure of various practices previously associated with CE by the researchers. For example, Gunarathne et al. (2021) used that approach and included keywords such as "circular economy", together with explicit keywords such as "recycle*", implicit keywords (e.g., "energy efficiency") and other keywords (e.g., "Zero waste"). Since the term CE has been considered to be vague and elastic in the academic literature, it is argued that the methodology based on the explicit use of the term "CE" in the sustainability reports is better adapted to the proposed objective. Thus, following Stewart and Niero (2018) and Opferkuch et al. (2022), only the direct use of the CE concept was scrutinized. As a result, the information disclosed by the firms in indicators based on GRI G4 Guidelines that may possibly be associated with CE was not analyzed.

Searches were performed using a very diverse set of keywords in different languages (such as "circular economy", "economía circular", "économie circulaire", "circulari*" and so forth). Then, all extracts in which firms explicitly referred to CE were systematically identified and categorized using an inductive approach (i.e., appropriate codes were systematically assigned to meaning units) as suggested in the literature (Patton, 2002). Only the uses of the term "CE" that directly related to an activity, objective or purpose of the company were analyzed. For example, allusions made to CE that implied no connection to the company were omitted, such as in the following sentence taken from one of the sustainability reports: "It has been estimated that the transition to the circular economy could unlock USD $4.5 trillion of GDP growth worldwide by 2030."

The information obtained from the reports was extracted, collected, and analyzed using QDA Miner 2.0.8 software. As suggested by Mayring (2019) the qualitative step of assigning categories to the extracts of the environmental reports was considered central while the quantitative analyses (category frequencies) was seen as complementary to the analysis, considering the focus on explicit references of the concept of CE. The software facilitated the development and merging of categories into meta-categories reflecting the main findings. To reduce potential biases in the development and interpretation of categories, coding was carried out independently by two researchers with expertise in qualitative data analysis and the categorization framework was discussed following the suggestions set out in the specialized literature (Miles & Huberman, 2002). Grounded analyses (i.e., the number of quotations assigned to each meta-code) were carried out with QDA Miner software.

References to the CE concept were found in only 30.6% of the 1370 sustainability reports analyzed. In those reports close to 3700 references of the term of CE, its translation (e.g., *economía circular*, *économie circulaire*) or a strictly equivalent term—e.g., [economic] circularity—were identified in the content analysis of 419 reports. In the former cases (i.e., the term CE or a direct translation), the outcomes were analyzed individually by two researchers to discard findings not related to the subject of the study. Among the 3700 explicit mentions of the concept of CE, 705 references found in 218 reports were coded (20% of the explicit mentions found in 15.9% of the reports). These 705 references linked directly to specific activities of the firm publishing the sustainability report. Thus, most of the references to the term CE were not coded as no connection to the firm was found, as set out in the methodological approach adopted. By the systematized coding of the 705 extracts from the sustainability reports analyzed, a list of 24 meta-categories was agreed by the two researchers. Table 1 summarizes the main eight meta-categories that surfaced from the grounded analyses—i.e., the most frequently mentioned aspects related to the concept of CE categorized in the inductive process of analysis.

## 4 | RESULTS

Table 2 shows the main characteristics of the organizations that mentioned CE compared with the characteristics of the sample. The major discrepancies in the compared profiles point to a greater tendency to refer to the CE concept by firms belonging to industrial sectors of activity (e.g., chemicals, automotive, energy, equipment) than companies belonging to the service sector (e.g., financial services, real estate, tourism/leisure). Medium-sized and large companies seem to have a higher tendency to refer to the CE concept. Finally, regarding the location by continent, there seems to be a much higher propensity to mention the CE concept among European companies.

Regarding the results of the categorization, as shown in Table 1, the most frequent meta-category—with a frequency of 22%—was defined as "Institutional relation," and encompassed the relation or participation in a diverse set of initiatives with sectoral lobbies, associations, research centers, or specific institutions that aimed to foster

**TABLE 1** Main meta-categories encompassing the references made by organizations to the CE concept

| Category | Frequency (% of cases) |
|---|---|
| Institutional relation | 22% |
| General concept | 20% |
| Recycling | 15% |
| Waste management | 12% |
| Packaging | 6% |
| Resource efficiency and environmental impact reduction | 6% |
| New business models and/or business opportunities | 4% |
| Life cycle assessment (LCA) | 3% |
| Total of other categories with frequencies ≤1% | 12% |

*Source*: Prepared by the authors.

**TABLE 2** Characteristics of the organizations referring to CE

| Size | Sample | CE | Continent | Sample | CE |
|---|---|---|---|---|---|
| SME | 16% | 9% | Africa | 4% | 2% |
| Large | 50% | 54% | America | 25% | 17% |
| MNE | 35% | 37% | Asia | 19% | 21% |
| Total | 100% | 100% | Europe | 50% | 58% |
| | | | Total | 100% | 100% |
| Sectoral breakdown[a] | | | | | |
| Agriculture | 4% | 2% | Metal products | 2% | 3% |
| Automotive | 2% | 4% | Mining | 4% | 2% |
| Aviation | 3% | 5% | Nonprofit/Services | 2% | 1% |
| Chemicals | 1% | 6% | Other | 3% | 4% |
| Commercial services | 7% | 7% | Power grids and indust. autom. | 1% | 2% |
| Construction materials | 1% | 2% | Public | 6% | 4% |
| Energy | 10% | 16% | Real estate | 1% | 0% |
| Equipment | 4% | 9% | Technology hardware | 4% | 3% |
| Financial services | 14% | 3% | Telecommunications | 1% | 0% |
| Food and beverage products | 9% | 7% | Textiles and apparel | 1% | 0% |
| Food, water, and energy | 1% | 1% | Tourism/Leisure | 4% | 2% |
| Healthcare products | 2% | 3% | Universities | 1% | 0% |
| Healthcare services | 3% | 2% | Waste management | 1% | 4% |
| Household and pers. products | 1% | 2% | Water utilities | 3% | 1% |
| Logistics | 4% | 5% | Total | 100% | 100% |

[a]Classification included in the GRI database.
*Source*: Prepared by the authors.

CE activities/policies. Among this diverse pool of potential collaborators, the collaboration with the Ellen MacArthur Foundation was the most frequently cited. Mention could also be made of sectoral collaborations aimed to foster CE projects (e.g., *Policy Hub for Circular Economy in the Apparel and Footwear Industry*, *Circular Jeans Redesign project*, *Polyolefins Circular Economy Platform*, *Circular Economy for Flexible Packaging*) or international, national or regional programs of a set of different actors (e.g., *European Remanufacturing Council*, *WBCSD's Factor 10 working group on circular economy*, *Platform for Accelerating the Circular Economy*, *Circular Economy 100 program*).

In approximately 20% of the cases where the CE concept was mentioned, it was just associated with a general, vague, or elastic concept, or with a conventional definition of the term but without any other reference to specific activities the approach entails for the firm. Reporting companies mention the concept of CE in order to comply with a current conceptual trend, but without giving it a minimum of thought. The following extracts are illustrative examples of this trend:

> [Name of the company omitted] *is engaged with circular economy practices. (…). A circular economy is an alternative to the conventional linear business model. Ideally, in a circular economy, materials are maintained at the highest possible level of the value chain and undergo various cycles of production, use, recycling, and re-use*. (SME from the chemical sector, Germany)

> [Name of the company omitted] *is developing systems for using resources efficiently and sustainably across their entire life cycle, and has adopted the concept of the "Circular Economy" to maximize the value it provides to customers and society*. (MNC from the automotive sector, Japan)

> *The concept of circular economy has the highest applicability in any given production and consumption gamut. We have extended this diversified concept coupled with innovation, technology, scalability and marketability to improve our water consumption and waste management*. (MNC from the chemical sector, Thailand)

In one third of the cases analyzed, the CE concept was associated with one of the three sets/categories of traditional activities in the corporate environmental management, namely recycling activities (15%), waste management (12%), and packaging (6%). Here are some extracts that illustrate aspects of recycling activities with which the CE concept is associated in a relatively vague manner:

> [Name of the company omitted] *also promotes the circular economy by promoting recycling*. (Large company from the service sector, Spain)

> [Name of the company omitted] *commitment to the circular economy involves the adoption of recycling technologies, whenever feasible, as one of our main goals*. (Large chemical company, Portugal)

> *The recycling of waste is not only an important area of work for the environment and the reduction of electronic waste, but also an opportunity to contribute to the circular economy and to revalue elements that would otherwise have ended up in landfills*. (Large telecommunications company, Chile)

> *In 2019, meaningful progress was made towards bringing about a circular economy in which plastics are always reused and recycled, and never wasted*. (MNC from the chemical sector, Austria)

> *In line with our commitment to support a more sustainable, circular economy, we incorporate recycled materials into our supply chain where possible*. (Large health company, Germany)

With regards to waste management, the following quotes are illustrative:

> *Waste generated in stores and warehouses is managed differently in order to comply with regulations and also to contribute to the compliance of the precepts of the circular economy*. (SME from the textile and apparel sector, Spain)

> *We're specialists in waste minimization (…) We see waste as a valuable resource, which can be reused, redirected, or recycled back into a circular economy*. (SME from the education sector, New Zealand)

> *Under a circular economy approach, during 2018 we implemented a Strategic Plan for Solid Waste Management at our headquarters in Metropolitan Lima, promoting the segregation and reuse of the solid waste we generate as a company*. (SME from the insurance sector, Peru)

> *The transition to a circular economy requires fostering and implementing modern and innovative waste management methods, aiming to fully maximize the use of waste*. (Large electronic manufacturer, Greece)

> *With a view to developing a circular economy, we dedicate maximum care to the management of our waste and we have put many efforts in place to reduce the amount of waste generated and sent to external disposal*. (MNC from the chemical sector, Italy)

The term "waste management" is used to complement the CE concept in many of the analyzed cases. For example, it is common for sustainability reports to include section headings such as "Circular economy and waste management" or "Circular economy, waste prevention and management."

Finally, regarding the link between the CE concept and activities related to packaging, the following illustrative quotes might be mentioned:

> *Continue to invest in circular economy opportunities and other sustainable packaging breakthroughs*. (MNC from the beverage and food sector, UK)

> *Our environmental packaging strategy focuses on elimination, innovation, and circulation, to enhance customer experience while driving progress toward the circular economy*. (Large company from the real estate sector, USA)

> *This makes us one of the first packaging companies in the world that has committed itself to establishing a circular economy for plastic packaging to protect the environment*. (Large chemical company, Austria)

The rather generic, evasive and insubstantial nature of the information included in the analyzed sustainability reports should be emphasized. Other cases tend to be simply free associations between the concept of CE and other concepts (here packaging).

Surprisingly, one of the core principles of CE—resource efficiency and the reduction of environmental impact—does not receive much attention in association with the CE concept. The frequency with which this aspect was related to CE was only around 6%. Hence, when and association between CE and the R of Reduction was made, once again the very generic and elusive character of disclosure was found. Some examples of these references are given below:

> [Name of the company omitted] *has been actively committed to pursue a program inspired by the principles of the circular economy which envisages a series of initiatives focused on reducing the environmental impact of our activities and on developing lower $CO_2$ intensity products*. (MNC from the building materials sector, Italy)

> *By embracing the circular economy approach, we aim to achieve resource efficiency and carbon emission reduction*. (Large telecommunication company, Turkey)

> *While we continue making products and services that delight customers*, [Name of the company omitted] *has*

> *been adopting circularity in design to produce more with less. We are gradually moving towards circular economy, a regenerative system where resource input and waste, emission, and energy leakage are minimised by slowing, closing, and narrowing energy and material loops*. (Large chemical company, India)

Approximately 4% of the references to CE were associated with new business models that could or should be associated with circularity or in a more general sense with the business opportunities associated with this paradigm. As new business models may require more substantial changes, a greater concreteness in the disclosed information might be expected, but here again only generic and evasive references were found. The following two quotes are illustrative:

> […] *we are innovating a new business model that takes us closer to circular economy, providing precision irrigation as a full service. Working to help farmers reach optimum results and minimal upfront investment, access to drip irrigation is now easier than ever*. (MNC, conglomerate, Mexico)

> *Companies increasingly recognize the circular economy as a key business opportunity. Important stakeholders, including investors and consumers, are pressing companies to take a comprehensive look at their value chains for opportunities to transform their business model*. (SME from the consultation sector, UK)

In terms of the most frequently mentioned "4R" core principles associated in the literature with the CE concept, one of them (recycle) stood out, as the other Rs were hardly mentioned at all. This was particularly the case for activities that may be associated with the term "reuse." Considering the 9R framework, the reference to some of the core activities is practically nonexistent, as only one reference was made to them. This is particularly the case of the references to some Rs, such as "refuse", "reuse", "repair" and "remanufacture".

Finally, of all the sustainability reports analyzed, only one defined specific key performance indicators (KPIs) associated with the CE concept. Around a 70% of the KPIs focused on recycling and reduction, rather than on reuse and recover. Conversely, no integrative indicators explicitly took into consideration the more complex issues associated with CE indicators, such as the main CE loops or the potential impacts of CE loops on corporate environmental performance. Sector-specific indicators associated with CE suggested in the literature were also absent.

## 5 | DISCUSSION AND CONCLUSIONS

Based on a qualitative analysis of 1370 verified sustainability reports published by 1367 organizations worldwide, the results paint a rather disappointing picture of the disclosure of explicit information on the concept of CE. The empirical work found limited reference to the CE concept in the sustainability reports analyzed. Only in 30.6% of the cases was an explicit reference made. Among them, just 705 references from 15.9% of reports were coded as showing the concept of CE somehow associated with the reporting firm. Furthermore, the findings show that among the companies that do refer to CE, references tend to be generic, vague and evasive. As underlined by Merli et al. (2018), CE appears as an umbrella concept associated with a variety of well-known activities, such as waste management and the recycling of goods. Similarly, a tendency was found to associate CE with just one of its core principles or "4Rs"—recycle—while the others—namely reduce, reuse and recover—are rarely referred to.

The most frequently referenced meta-category (*Institutional relation*), suggested the importance of foundations and other networking organizations that have the aim of fostering the adoption of CE. The adoption of the CE paradigm implies the development of a set of organizational capabilities that are often poorly mastered in firms and the role of this type of stakeholder may be important. Similar results have been found in the case of other initiatives gathered under the concept of industrial ecology (e.g., Kabongo & Boiral, 2017).

Regarding the second most referenced meta-category (*General concept*), the concept of CE merges into a general elastic concept that replaces other concepts such as corporate sustainability or corporate environmental management. Firms cherry-pick conventional environmental management practices and disclose them under the umbrella of a trending concept such as CE. These findings are consistent with those obtained by Opferkuch et al. (2022) from a more limited sample of reports (138 reports published by 94 European companies), where they found that the use of the CE concept within sustainability reports was largely superficial and inconsistent. Conversely, regarding the dissemination of the use of the CE concept, Opferkuch et al. (2022) found that nearly all companies were explicitly referencing CE, although only 7% of them integrated CE in the core five elements of sustainability reports (namely, CEO's message, nonfinancial material assessments, SDG framework, targets, and indicators for CE).

With regard to the most frequently mentioned "R" core principles associated in the literature with the CE concept (meta-category of *Recycling* in the analysis), the findings are not consistent with the previous scholarly literature. For example, Stewart and Niero (2018), in their sector-focused work (46 corporate sustainability reports in the fast-moving consumer goods sector), found that concepts associated with the core principle of "recycle" were mentioned in almost two-thirds of reports, concepts associated with "reuse" were mentioned in 40% of the cases, while the concepts associated with "reduce" and "recover" were found in 35% and 20% of the cases, respectively. Perhaps the differences in the results observed could be due to a sectoral bias, but it seems difficult to attribute such a large difference to that effect.

Finally, the results illustrating the absence of the use of basic elements, implying a minimal internalization of the CE concept in the organizations analyzed, is in line with a few previously published works (Gunarathne et al., 2021; Opferkuch et al., 2022; Stewart & Niero, 2018). Although it is an even more discouraging outcome, the

absence of specific CE-related KPIs is in line with the findings of Stewart and Niero (2018), as they found reference to sustainability performance indicators or assessment methodologies were absent from most reports mentioning CE. These authors found that only a minority of companies adopt a dedicated set of KPIs for their approach to CE. This is definitely a matter of concern, considering the need underlined in the literature to monitor the CE transition and to measure its effects (e.g., Haas et al., 2015; Saidani et al., 2019).

From a theoretical perspective, these findings are consistent with and complementary to a set of critical theoretical works in the scholarly literature about corporate sustainability and corporate environmental management. Firms refer to the paradigm of CE as a way to strengthen their social legitimacy, a strategy that might be associated with window dressing or greenwashing (Boiral & Gendron, 2011; Nobre & Tavares, 2021; Testa et al., 2020). The increasing and often superficial use of the CE concept by companies (Bjørnbet et al., 2021) reflects a phenomenon of managerial fashion (Abrahamson & Fairchild, 1999), which aims at improving the image of companies much more than their actual sustainability performance. The lack of substantial information about how the CE concept is implemented in practical terms confirms its essentially symbolic use. The same applies to its elusive association with concepts that reflect a restrictive vision of CE—e.g., recycling, waste management, and packaging. Although some organizations emphasize that CE is part of a broader new business model, this more holistic approach is emphasized in a very small proportion of reports (less than 4%) and is not substantiated by convincing information on its concrete application.

These results suggest that the CE concept is used primarily as a strategy for managing impressions with stakeholders rather than as a practice that contributes to improving corporate sustainability. As many critical studies of sustainability reporting have shown, the disclosure of information in this area and the use of concepts in line with stakeholder expectations are shaped by impression management strategies aimed at improving the organization's image through reassuring and often superficial rhetoric (Boiral, 2016; Cho et al., 2012; Corazza et al., 2020; Diouf & Boiral, 2017). The use of the CE concept in which the part (e.g., waste management, recycling activity by companies) is confused with the idealized whole (the transition from a linear production model to a closed one) echoes the use of synecdoche—a figure of speech that conflates the source with the target, as underlined by Spence and Thomson (2009)—or other similar tropes identified in the critical literature on sustainability and CSR disclosure (e.g., Feller, 2004; Nwagbara & Belal, 2019; Spence & Thomson, 2009).

This work contributes to the literature at least in four complementary ways. First, it contributes to the scarce empirical scholarly literature that analyzes the adoption of the CE paradigm by analyzing a large sample of organizations ($n = 1367$) explicitly committed to sustainability and CSR practices (e.g., SDGs). Second, it contributes to the incipient and emerging branch of scholarly literature that questions the prevailing positive opinion about the engagement of organizations in the transition to the CE paradigm. In line with the critical literature on the subject (e.g., Korhonen, Honkasalo, & Seppälä, 2018; Korhonen, Nuur, et al., 2018; Kovacic et al., 2019) the results of this study raise questions about the consistency, usefulness, and credibility of the CE concept in practice. Some scholars (e.g., Ghisellini et al., 2016; Murray et al., 2017) have suggested that the concept of CE is of great interest to both scholars and practitioners as it entails an operationalization for businesses to implement the much discussed and too vague concept of sustainable development. Yet, if firms really use the CE concept as found in this empirical work, the reliability of the concept and its added value is questionable.

Third, the paper contributes to the critical literature on sustainability reporting (e.g., Cho et al., 2012; Diouf & Boiral, 2017; Moneva et al., 2006). As emphasized by the neo-institutional approach to sustainability reporting, the disclosure of information on sustainability issues aims more at reinforcing the legitimacy of organizations than at informing stakeholders in a transparent way about the real commitment and performance of companies (e.g., Boiral, 2016; Cho et al., 2012; Hahn & Lülfs, 2014; Moneva et al., 2006; Silva, 2021). With few exceptions (Dagiliene et al., 2020; Marco-Fondevila et al., 2021), this approach has been neglected in the analysis of CE disclosures. The results of the study show how the concept of CE tends to be instrumentalized, through rhetorical devices, to give the impression that conventional practices, such as recycling and waste management, indicate a more substantial and broader transformation aimed at making the organization and society more sustainable.

Fourth, this study sheds light on the practical side of sustainability reporting by organizations that refer to the CE concept, suggesting implications for managers, policy makers, and other stakeholders. Public decision makers and policy makers working at the macro-, meso-, and micro-level need to rethink policies that promote the transition to a CE in the light of these findings. If the CE concept, hyped by a set of stakeholders (e.g., policy-makers, consultants, businesses), is used as an umbrella and elastic term, where the business-as-usual fits without any real problem, it will become a concept associated with a paradigm destined to fail to fulfill the great expectations it has generated. As underlined by Barreiro-Gen and Lozano (2020), organizations need to improve their 4Rs efforts to contribute more to CE by better linking its theory with practice.

This work has limitations mainly due to its methodological approach. Beyond conventional subjectivity issues related to the general analytical approach adopted (Miles & Huberman, 2002), the specific approach focused on the search for explicit mention made to the CE concept. This might lead to an underestimate of the implementation of CE-related activities that may not have been *adequately* labeled in sustainability reports. However, this bias may be smaller than other biases detailed in the article, in the light of the impression management trends found in the reporting literature (e.g., Cho et al., 2012; Diouf & Boiral, 2017; Hahn & Lülfs, 2014). Reliability problems associated with the use of secondary and publicly available information contained in sustainability reports has been identified as problematic in the growing critical literature on environmental reporting (e.g., Cho et al., 2012; Moneva et al., 2006; Silva, 2021). Nevertheless, other alternative methods of gathering empirical data about this topic might be also biased by a set of issues (e.g., the social desirability bias) that should be taken into account.

These limitations suggest avenues for further research. Empirical qualitative and quantitative works that shed light on the way firms use the concept of CE in their day-to-day activities are needed, with a detailed analysis of the impact of contingent and mediating factors, such as the influence of sectoral, organizational, and sociocultural variables.

More research is also needed to explore the barriers and conditions for success in implementing CE practices at the micro-, meso-, and macro-levels. The success stories of such practices depend on the type of activity, external pressures, and economic issues beyond sustainability management per se. Among other things, the rising price of some raw materials may lead organizations to adopt more substantial CE practices in order to reduce the cost of resources used and to seize economic opportunities rather than to improve corporate sustainability.

Given the confusions and misinterpretations about CE observed in this study and other works (e.g., Gunarathne et al., 2021; Opferkuch et al., 2022), many organizations may not yet have developed the skills necessary to ensure successful initiatives in this area and are therefore limited to a cherry-picking logic. This observation confirms the importance of research on key competencies and capabilities underlying the implementation of CE practices (De los Rios & Charnley, 2017; Kabongo & Boiral, 2017; Prieto-Sandoval et al., 2018).

The cultural and institutional aspects that influence the success of CE initiatives should also be explored. Many initiatives depend on the contribution of various stakeholders (suppliers, local communities, researchers, organizations specialized in CE issues, competitors, governments, and so forth) whose participation requires close collaboration that can be facilitated or hindered by the cultural context. The negative impacts of some CE activities would also benefit from further study. For example, the use of certain industrial residues in the production process can lead to health risks for workers and surrounding populations. Research on how some companies use the CE concept to legitimize or hide this type of impact would certainly provide a less idealized and more realistic view of this concept and its possible contribution to sustainability.

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