



Circular economy disclosure in corporate sustainability reports: The case of European companies in sustainability rankings

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ABSTRACT

Circular economy (CE) continues to become an increasingly important topic within disclosure frameworks and taxonomies for sustainable finance, however, early evidence points to CE not readily being included within corporate sustainability reports. Therefore, this research aims to explore how CE is emerging within the sustainability reports of companies listed in sustainability rankings. More specifically, the presence of CE within five corporate sustainability reporting elements has been investigated (when applicable): (i) the Chief Executive Officer's message, (ii) non-financial materiality assessments, (iii) references to the Sustainable Development Goal framework, (iv) targets, and (v) indicators. Qualitative and quantitative content analysis techniques were utilised to review 138 reports published in 2020 from 94 European companies, not restricted by sector. Results showed that nearly all companies are explicitly referencing CE, however, only 7% of them integrate CE within all five sustainability reporting elements. Less than one third of companies were found to include both targets and indicators for CE suggesting that overall, CE content within sustainability reports is largely superficial and inconsistent. This investigation contributes a descriptive overview of current CE reporting trends and shortcomings, as well as detailing implications relevant for academia and practitioners developing sustainability reports and/or CE assessments. The transition towards a CE requires transparency, therefore, further research and engagement is needed to better define the value of CE within external corporate communication.

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1. Introduction

In light of evolving global environmental health crises, there are concerns that the private sector may abandon or deprioritise commitments towards sustainable development (Amankwah-Amoah, 2020). Companies who are recognised as sustainability leaders have increased stakeholder pressure and public attention to respond to these concerns, often through the disclosure of sustainability information (Abeydeera et al., 2016; Lozano et al., 2016). To make sense of this information for investors, agencies who provide sustainability ratings and rankings comprise a growing industry (Abhayawansa and Tyagi, 2021; Adams and Abhayawansa, 2021). Indeed, companies who rank highly on these ratings seem less exposed to systematic risks, therefore attracting more investments and higher stock returns (Broadstock et al., 2021; Ferriani and Natoli, 2021). For this reason, authors such as Pástor and Vorsatz (2020), argue that for investors, sustainability is now seen as a necessity, rather than a luxury good.

To support companies preparing sustainability disclosures, a variety of reporting frameworks, models, guidelines and other related initiatives (henceforth referred to as disclosure frameworks) have emerged (European Financial Reporting Advisory Group, 2021). Disclosure frameworks provide a format for organisations to report evaluated, comparable and reliable non-financial information required by national and/or international guidelines (European Commission, 2017). Corporate sustainability reports are merely an output of sustainability accounting and strategic management processes (Lozano and Huisingh, 2011) and the guidance provided within disclosure frameworks can influence the development and management of a company's sustainability objectives and strategy (Baumgartner and Rauter, 2017). Therefore, it is imperative to better understand the influence of voluntary disclosure frameworks on companies' sustainability strategies, as these frameworks continue to compete for dominance in the fast-changing reporting landscape (Siew, 2015).

To progress this landscape and prioritise funding for sustainability oriented companies, several governments are publishing and revising regulations to outline sustainable finance. First, taxonomies are being developed, which are classification systems that assist investors to understand whether an economic activity is environmentally sustainable

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(European Commission, 2020). Examples include the ‘Green Bond Endorsed Project Catalogue’ in China (People’s Bank of China et al., 2021), the ‘National Green Finance Taxonomy’ in South Africa (National Treasury of the Republic of South Africa, 2021), and the ‘Taxonomy Regulation’ in Europe (European Parliament, 2020), which is said to become the global standard (SustainAlytics, 2021). Second, several regulations concerning sustainability reporting are currently being revised, including the recent European adoption of the Corporate Sustainability Reporting Directive (CSRD) (European Commission, 2021), which is an update of the previous Non-Financial Reporting Directive first published in 2014 (European Commission, 2014). These revisions aim to prevent and reduce rising instances of ‘green washing’: the corporate practice of claiming or exaggerating sustainability with the purpose of hiding a questionable environmental or socio-economic performance (Braga Junior et al., 2019; Uyar et al., 2020). With more ambitious and detailed sustainability reporting requirements, companies will need to evolve and adapt their sustainability reporting practices, ensuring that they respond to emerging sustainability topics with a transparent approach (European Commission, 2021).

One such emerging sustainability topic, the transition to a circular economy (CE), has been explicitly included for the first time as one of six key environmental objectives for sustainable finance, appearing in both the European Taxonomy Regulation and the CSRD (European Commission, 2020, 2021). CE aims to redesign waste and resource management processes and can be defined as where *“the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste is minimised”* (European Commission, 2015, pp. 2). This novel inclusion of CE perpetuates the mainstreaming of CE practices and terminology, indicating that investors will be encouraged to identify and support companies adopting CE objectives. Despite these developments, in the last five years there has been a growing number of academic articles discussing the contested nature of CE (Korhonen et al., 2018a) and its growing role within society, more specifically: i) the various definitions of CE (e.g., Kirchherr et al., 2017; Prieto-Sandoval et al., 2018), ii) its relation with sustainable development (e.g., Sauvé et al., 2016; Walker et al., 2021a) and iii) the proposal of indicators, tools and other approaches for the assessment of CE activities (e.g., Kravchenko et al., 2019; Lindgreen et al., 2020; Saidani et al., 2018).

What largely remains absent from these discussions on CE is the role of- and potential for- sustainability reporting to address certain issues, as previous research efforts have established (Opferkuch et al., 2021). Whilst a few studies have explored the presence of CE within sustainability reports, they primarily focus on the sustainability reports of companies from a single country, operating within a single sector and/or utilising data from 2018 or earlier (e.g., Stewart and Niero, 2018; Dagilene et al., 2020). Early evidence from these studies points to a limited, inconsistent and mostly unquantified inclusion of CE within corporate sustainability reports. In light of upcoming international regulatory and policy updates within sustainable finance, an updated investigation is needed to determine whether companies are already voluntarily reporting CE and if so, what this reporting looks like.

Therefore, to address these research gaps, this article aims to explore CE-related content in the sustainability reports of European companies who are recognised for their sustainability performance and reporting practices. This will be achieved by targeting companies who are i) listed on international sustainability rankings and ii) located in Europe, a region on the front line of evolving CE and sustainable finance regulations (European Commission, 2020, 2021). By analysing specific elements of sustainability reports, insights will indicate if companies already consider CE a main environmental objective: one which is driven by commitments from senior management, is clearly framed with sustainability and is consistently measured and reported with the use of relevant targets and indicators for CE. Ultimately, research findings can offer practical suggestions to inform future sustainability reporting guidelines, in order to support companies, across sectors and countries,

who will be required to report progress on their CE objectives in the coming years. Furthermore, the results will shed light on how companies are currently interpreting and operationalising CE, ultimately contributing empirical evidence to the aforementioned ongoing theoretical discussions surrounding the contested nature of CE and its implementation.

This article is structured as follows. After the introduction, where the background and research aim are presented, Section 2 offers a literature review of previous relevant studies and concepts that are critical for this research. Section 3 describes the overall methodological approach, including the sampling strategy and content analysis framework. Section 4 presents the description of the sample of companies and the results of the content analysis, structured according to five elements of sustainability reports. Section 5 discusses main findings in the context of previous research as well as the implications of this study for academia and practitioners. Finally, Section 6 summarises the article with some concluding observations, presents some limitations of the study and proposes ideas for future work.

2. Theoretical overview

This section first provides a brief introduction to CE literature. Secondly, a review of previous academic studies which have explored evidence of CE within sustainability reports is presented. Then, a description of the five elements of sustainability reports chosen as the focus of this research is provided.

2.1. Introduction to circular economy literature

CE offers a restorative, regenerative and practical alternative to the current linear “take, make and dispose” production and consumption model (The Ellen MacArthur Foundation, 2012). As already mentioned, there has been a significant increase in academic articles discussing CE in recent years (Schögl et al., 2020). Private sector initiatives and corporate networks e.g., Ellen MacArthur Foundation (Ellen MacArthur Foundation, 2013) have equally played an active role within the promotion of CE throughout society. Despite CE gaining more prominence, several drawbacks of CE implementation are continuously being discussed within academic literature.

Numerous academics question the boundaries between the concepts of CE and sustainability, debating if and how CE activities positively contribute to broader societal sustainability objectives (Geissdoerfer et al., 2017; Walker et al., 2021a, 2021b). Primarily, CE is most often described as aiming to decouple economic development from finite resource consumption through transforming both production and consumption processes from linear to circular (Ghisellini et al., 2016). To this end, CE is most closely related to- and promoted in line with- Sustainable Development Goal (SDG) 12: Responsible Consumption and Production (United Nations Environment Programme (UNEP), 2017). However, Schroeder et al. (2018) determined that CE activities are relevant to progressing society towards a number of SDGs, including those that influence the social dimension of sustainability, which is often overlooked in the discussion of CE and sustainability (Murray et al., 2017). Additionally, an increasingly popular direction of CE literature relates to the inclusion of human development within the CE, with the goal of ensuring a socially just CE transition (Moreau et al., 2017; Schröder et al., 2020). Though these discussions remain largely theoretical, recent efforts from Walker et al. (2021a, 2021b) determined that companies engaged with CE do consider the social dimension relevant to implementing CE and conducting CE assessments, however, were not actually conducting any type of social sustainability assessment and thus not reporting any results. Regardless of these contestations, CE has been positioned as a solution to several sustainability challenges and offers companies a model of sustainable growth and the opportunity to rethink how they create value (Lozano, 2020).

Despite the rapid acceleration of CE implementation, CE literature continues to contribute research that is generally: sector-specific (e.g., van Straten et al., 2021), focus only on the internal assessment of CE activities (Parchomenko et al., 2019; Vinante et al., 2021) or work to identify drivers and barriers for CE implementation in both the private and public sectors (de Jesus and Mendonça, 2018; Klein et al., 2020). Indeed, Kirchherr and van Santen's (2019) critique on the field of CE research suggested that (among other things): i) there is a lack of empirical evidence, ii) most articles focus on manufacturing industries, and iii) the articles lack practical advice for practitioners.

2.2. Circular economy within sustainability reports

A search for studies conducting content analyses to investigate the inclusion of CE within corporate sustainability reports produced a list of thirteen articles which have been reviewed in this article (summarised in Appendix A). Most, have been published within the last few years, highlighting the increasing academic attention towards, and relevance of, CE within sustainability reporting literature. However, this review has revealed numerous limitations making it difficult to ascertain any trends or generalisations of global CE reporting practices, nonetheless, a summary of the main findings and shortcomings of the literature is described below.

Firstly, discrepancies were found across the reviewed articles concerning how CE has been defined by the authors of the content analyses. CE as a concept, the associated terminology and its role within society, has been continuously evolving over the past decade (Korhonen et al., 2018b; Reike et al., 2018). Therefore, it is rational that researchers have created coding schemes utilising *implicit* CE-related terminology (e.g., “reuse”) to extract and interpret relevant text from sustainability reports and then make assumptions on the company's CE implementation. However, these lists of CE-related terminology are more often a reflection of the authors conceptualisation of CE, as opposed to the company's. For example, Yang et al. (2019) analysed CSR reports from 293 Chinese manufacturing firms to explore the synergistic effects of CE on CSR performance. The authors identify CE within the reports as exclusively referring to two activities: 1) “reverse activities”, activities conducted after the sale of a product to recapture its value (de Brito and Dekker, 2004) and 2) “eco-design”, the integration of environmental aspects at all stages of the product development process, balancing economic and environmental requirements (UNEP, 2001). But this rationale ignores the possibility of companies reporting other CE-related activities, such as the development of new circular business models (Santa-Maria et al., 2021) or circular products (Diaz et al., 2021). It also ignores the presence and impact of individual “reverse activities”, such as those outlined and ranked in order of priority in the commonly utilised ‘10R framework’ from Potting et al. (2017). And yet, the article from Yang et al., (2019) presents the research findings as evidence of holistic CE reporting limited to China. A more recent example, comes from Gunarathne et al.'s (2021) review of corporate disclosures of Sri Lankan companies. The authors analysed the sustainability reports for the presence of CE-related keywords grouped in four categories: 1) direct keywords, such as “circular economy”; 2) explicit keywords, such as “industrial ecology”; 3) implicit keywords, such as “solar” and 4) other keywords, such as “electric vehicle”. Although the identification of these terms serves to inform valid discussions of the companies sustainability objectives, suggesting a company who mentions the terms “solar” or “electric vehicle” in their sustainability report is also intentionally reporting CE strategies could be a stretch. Indeed, this approach to content analysis may foster the narrative that CE is replacing sustainability (as discussed in D'Amato, 2021) as opposed to the dominant CE discourse held by many academics, companies and policy-makers that CE is a tool implemented to achieve sustainability (Calisto et al., 2021; European Commission, 2015). As CE-related terminology becomes more mainstreamed and incorporated into international policies, in the coming years it can be assumed that companies who are explicitly

reporting the term “CE” are referring to the same concept, albeit applied in their own context.

Across the articles reviewed, authors selected and accessed different databases of sustainability reports, in order to compile the sample of sustainability reports to be used within their analysis. Primarily, reports within private national-level databases have been used by authors examining CE reporting practices at a national level (e.g., Gunarathne et al., 2021; Scarpellini et al., 2020). Alternatively, some authors accessed reports from the Global Reporting Initiative (GRI)'s sustainability report database (e.g., Dagiliene et al., 2020; Sihvonen and Partanen, 2017). However, this choice restricts the sample to companies who prepare their reports in a similar format, e.g., according to one of the two most commonly used disclosure frameworks: the GRI guidelines (Global Reporting Initiative, 2016) and increasingly, the International Integrated Reporting Framework (Hahn and Kühnen, 2013; Peršić et al., 2017). Throughout the articles summarised here, the presence and influence of specific disclosure frameworks on CE reporting has been largely ignored. Dagiliene et al. (2020) determined that companies referencing at least one disclosure framework were more likely to report environmental information and key-performance indicators (KPIs) from a CE perspective. The authors then go on to suggest that the developers of disclosure frameworks may act as “*facilitators of translating circular business practice into companies' reports*” (p. 9, Dagiliene et al., 2020). However, few details are given about which disclosure frameworks and to what extent they may influence the presence of CE within sustainability reports. The authors of the present article in a previous study determined, through a review of major disclosure frameworks that the presence of CE is mainly absent (Opferkuch et al., 2021). Companies engaged with CE and preparing their sustainability report in accordance with common disclosure frameworks (e.g., GRI), most likely exclude any explicit direct mention of CE or “*qualitatively describe their circularity measures implemented with relation only to the environmental dimensions of sustainability, more specifically regarding the prevention of waste generation*” (p. 14, Opferkuch et al., 2021). For these reasons, the influence and relationship between the guidance from disclosure frameworks and the CE content currently being reported needs to be further explored.

To date, research exploring CE within sustainability reports has primarily been limited to the reports of manufacturing companies operating within the Industrials, Materials or Consumer Discretionary sectors (e.g., D'Amato et al., 2019; Sihvonen and Partanen, 2017; Stewart and Niero, 2018). This seems logical, as CE as a concept has evolved from precursor ideas and business models based on technological innovations for waste, including industrial ecology and cleaner production (Calisto Friant et al., 2020). However, several studies have shown that companies are engaging with CE across a number of sectors and service-oriented value propositions (Gusmerotti et al., 2019; Pereira and Vence, 2021). Additionally, most of the reviewed studies focus on the sustainability reports of companies operating within a single country, most frequently China (e.g., Wang et al., 2014; Yang et al., 2019), making it only possible to gain insights on the reporting practices of companies within that country. Four of the reviewed studies chose not to limit the reports by geographical location, but in turn all focussed on companies operating within one manufacturing industry e.g., cosmetics in the Consumer Discretionary sector (Fortunati et al., 2020). This highlights the challenges associated with making generalisations of sustainability reporting when numerous requirements and limitations exist according to national regulations (e.g., the German CSR Directive Implementation Act (2020)) or sectoral specific standards (e.g., GRI 11: Oil and Gas Sector (2020)). Moreover, the majority of reviewed studies, although published recently, have analysed sustainability reports issued in or before 2016, when CE was still an emerging topic within society (Kirchherr et al., 2017).

Overall, the studies reviewed determined a generally low uptake of CE within sustainability reports. However, all conclude that a more consistent approach to CE reporting is needed, one that is supported by

quantified objectives and actions (e.g., Fortunati et al., 2020; Pauliuk, 2018). In fact, the linkage between CE and sustainability has been mostly ignored, except for Stewart and Niero (2018) who found the relationship between the concepts presented within sustainability reports of companies within the Fast Moving Consumer Goods sector to be mostly unclear. The authors also found a limited connection between CE and sustainability assessment, with very few CE-related indicators observed (Stewart and Niero, 2018). Indicators can act as instruments which are vital to disputing potential claims of greenwashing and, when disclosed in combination with sustainability targets, may dispute claims of “selective disclosure” (de Freitas Netto et al., 2020; Marquis et al., 2016). Finally, among all of the reviewed articles little attention was paid to where (or what elements) of the sustainability report CE-related content has been integrated, making it difficult to obtain insights into the company's internal integration of CE within corporate sustainability processes. As Dagiliene et al. (2020) noted, previous studies have merely concluded that companies must disclose more CE-related information, but practical or methodological recommendations for CE disclosure are missing.

2.3. Circular economy within core elements of sustainability reports

Content analyses conducted within the sustainability reporting field often consider the location of the qualitative data within the report as well as its meaning. By isolating specific elements of the reports, additional findings can reflect how certain concepts are perceived and integrated within internal corporate sustainability reporting processes (Beske et al., 2020; Van der Lugt et al., 2020). The following section presents the core elements of sustainability reports identified as most relevant to the aim of this research: (i) CEO's message; (ii) non-financial materiality assessments (otherwise materiality matrix or analysis; iii) references to the SDG framework; (iv) targets; and (v) indicators for CE.

The CEO's message is a foreword, opening letter or interview of a sustainability report which outlines the company's sustainability performance, goals and vision for the coming year(s) (Armenic and Craig, 2006). Although it may be seen as merely a ritual public relations exercise (Clatworthy and Jones, 2006), a CEO's letter reveals to shareholders, investors and the general public the CEO's intentions concerning the company's future strategic objectives. For this reason, the CEO's message has been the topic of numerous content analysis studies which investigate corporate culture and strategic drivers of companies (e.g., Macellari et al., 2021; Na et al., 2020). Several authors suggest that CEO and senior management engagement with CE is a major enabler for improved CE implementation and performance (Stumpf et al., 2021; Ünal et al., 2019), however, to date, no empirical evidence of the inclusion of CE within CEO's message's in sustainability reports exists.

A non-financial materiality assessment is said to be the most significant framework guiding the creation of sustainability strategies and reporting (Torelli et al., 2020). It enables a company to identify, select and prioritise material issues (e.g., anti-corruption or GHG reduction) which could affect the company's reputation and ability to create value in the short, medium and long term. This process is carried out with the interests of external and internal stakeholders (Boesso and Kumar, 2009; de Villiers and Van Staden, 2010). More recently, the European Commission proposed the concept of ‘double-materiality’ (European Commission, 2021), which encourages companies to judge materiality from two perspectives: value creation for the organisation and for society (Adams et al., 2020), facilitating a shift from focussing on value in the monetary sense, to value within sustainable development. Usually, through the distribution of a survey, a large list of material issues are provided and then ranked by both internal and external stakeholders according to their perceived importance moving forward. Generally, issues deemed to be significant require the development of KPIs to demonstrate to stakeholders that positive progress is being made (GRI, 2016). The practice of materiality assessments is a

requirement of various disclosure frameworks (specifically within ‘GRI 101: Foundation’ (2016) and as a guiding principle of the ‘Integrated Reporting Framework’ (2021)). Within academic research, large-scale analyses of materiality assessments in sustainability reports have provided insights into both inter- and cross-sectoral responses to critical sustainability challenges (e.g., Boesso and Kumar, 2009; Calabrese et al., 2019). Recently, the Global e-Sustainability Initiative (GeSI, 2018) has included CE as one of the 55 material topics companies within the Information and Communications Technology (ICT) sector may utilise to develop their own materiality assessments, however, whether CE is actually being reported as an important material issue by companies remains unclear.

Acceptance of the SDGs as a major global sustainability framework (Biermann et al., 2017) has led to mounting attention on companies to demonstrate how their business activities and objectives contribute towards the goals (Rosati and Faria, 2019). Analysing sustainability reports to determine a company's operationalisation of the SDGs is an increasingly popular area of research (e.g., Izzo et al., 2020; Tsalis et al., 2020). However, the term “SDG-washing” has also emerged, describing the superficial engagement of companies with the SDGs, where often, symbols of individual SDGs are merely being inserted with existing CSR practices (Heras-Saizarbitoria et al., 2021; OECD and UNDP, 2020). As previously mentioned, with respect to CE and the SDGs, researchers have identified that CE can have positive contributions to numerous SDGs, not just SDG 12: Sustainable Consumption and Production, but SDGs beyond those linked with only the environmental dimension of sustainability (Schroeder et al., 2018). Nonetheless, the SDG framework has become a guiding aspect of corporate sustainability, and to date, little evidence exists on how companies may be operationalising CE within corporate reporting of the SDG framework.

In order to prove a company's progress (or shortcomings) towards the objectives outlined by their corporate sustainability strategy, as well as the SDGs, companies must report: (i) targets – defined as “*meaningful reference values that express a desired operational policy outcome in a synthetic (often numerical) manner*” (p. 657, Morsetto et al., 2017); and (ii) indicators – defined here as “*quantitative or qualitative factors or variables that provide a simple and reliable means to measure achievement, to reflect changes connected to an intervention, or to help assess the performance of a development actor*” (p. 13, OECD, 2014). These are especially important in the context of CE, given the contested and complex nature of the relation between CE and sustainability (Geissdoerfer et al., 2017; Korhonen et al., 2018b). Numerous articles have proposed and reviewed indicators for CE (e.g., Kristensen and Mosgaard, 2020; Saidani et al., 2018). However, recent evidence suggests that their actual application within the private sector is negligible (Stumpf et al., 2021; Roos Lindgreen et al., 2022). Furthermore, deciding what assessment approaches or indicators to report progress for CE objectives remains the responsibility of the company (Opferkuch et al., 2021), therefore, as Pauliuk, (2018) argued, could facilitate greenwashing practices as companies select which CE-related indicators best suits their corporate narrative. Regarding targets for CE, most studies have focussed on promoting the use of targets for limited aspects of CE such as recycling and recovery (e.g., Bjørn et al., 2017; Repo et al., 2018). More recently, Morsetto (2020), utilising the ‘10 R-strategy’ framework from Potting et al. (2017) proposed a new set of targets encompassing a more holistic view of the CE. What remains unclear is whether these targets and indicators for CE, discussed within academic and gray literature, are actually suitable for use in external corporate sustainability reporting.

As already established in previous research (Opferkuch et al., 2021), very few studies have examined the intersection of sustainability reporting and CE. The CE-specific reporting requirements within the European CSRD should be a step in the right direction to harmonising ongoing semantic discussions on CE and sustainability, such as those in Blum et al. (2020) or Cecchin et al. (2021). Eventually, directing

efforts towards supporting companies to assess and communicate the sustainability impacts of their CE practices, as has already been recommended by several authors (e.g., Kalmykova et al., 2018a; Roos Lindgreen et al., 2022; Schulte et al., 2021). However, until these regulatory developments are implemented, a cross-sectoral overview is needed to explore how companies are currently reporting CE, highlighting best practices and revealing any shortcomings. Once this has been determined, recommendations can be made to address these drawbacks and ensure that companies reporting their CE activities will do so in a consistent, comparable and transparent format.

3. Methods

In this research, the content analysis method has been used. This approach is commonly described using the definition from Holsti (1969, p.14), “any technique for making inferences objectively and systematically identifying specified characteristics of messages”. Both quantitative and qualitative approaches to content analysis were utilised in this research in order to: 1) quantify content within textual information to observe patterns and trends in systematic and replicable way; 2) understand and interpret the contextual use of this content, through repeated examination and comparison (Bryman, 2012). This flexible approach allows researchers to reduce large amounts of data and deduce meaning, causing it to be suitable for achieving the aims of this research. The overall methodological approach was developed based on the six components of content analysis: (i) sampling; (ii) unitising; (iii) recording; (iv) reducing; (v) inferring; and (vi) narrating, as described by Krippendorff, (2004) (illustrated in Fig. 1).

3.1. Sampling

A purposive sampling strategy (Palinkas et al., 2015) was used to produce a list of European reporting companies present on one or more global sustainability ranking lists published in 2020. As mentioned, Europe was selected as the geographical scope because of its advanced engagement with both CE and sustainability reporting. This is evident through the increasing number of policies, initiatives, and regulations for CE (e.g., the European Circular Economy Stakeholder Forum and the CE Action Plan, (European Commission, 2020), as well as for financial and non-financial reporting (e.g., the CSRD (European Commission, 2021) and the European Financial Reporting Advisory Group (EFRAG)). The year 2020 was chosen as these sustainability rankings are determined using the corporate non-financial performance data for the previous year 2019. Data was collected and analysed from February to July 2021, therefore, 2019 is the most recent year of complete and publicly available corporate non-financial information. Furthermore, analysing sustainability reports which present a company's 2019 performance removes any potential influence of covid-19 pandemic related disruptions. If the company's reporting period follows the financial calendar, then reports from 2018 to 2019 were utilised. To select the companies, firstly, the Dow Jones Sustainability Index (DJSI) was consulted. The DJSI is a collection of indexes which track the stock performances of the world's most “socially responsible companies”, in relation to their Environmental, Social and Governance (ESG) performance (Maas et al., 2016). The decision to utilise this list ensures that companies are not limited by country, sector or disclosure framework implemented. The DJSI is frequently utilised in both academic and non-academic

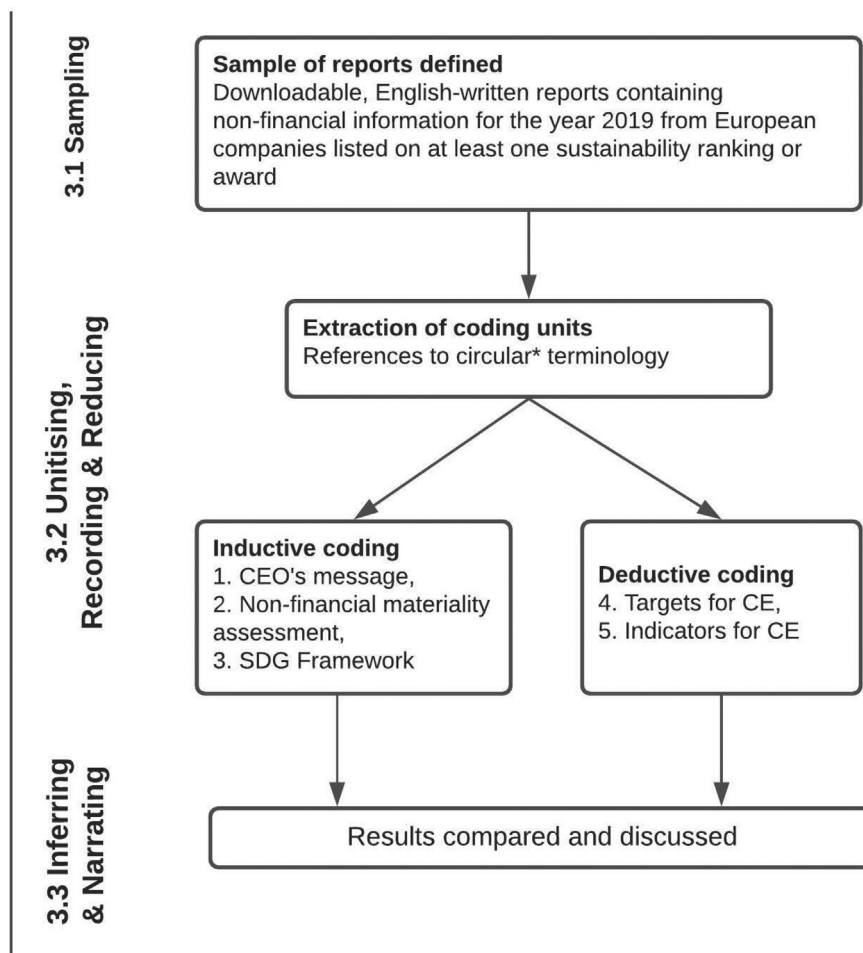


Fig. 1. Overview of research steps developed from content analysis framework from Krippendorff (2004).

Table 1
List of four global sustainability rankings based on non-financial performance of firms in 2019.

Ranking List (no.)	Name	Description	Companies included (no.)	Assessment methodology
#1	2019 DJSI Industry Leaders	<i>"Top performing company in each industry"</i>	61	SAM Corporate Sustainability Assessment (CSA)
#2	2019 DJSI ESG Score	<i>"Top 100 companies in terms of economic, environmental and social criteria with strong stock performance"</i>	100	SAM Corporate Sustainability Assessment (CSA)
#3	Corporate Knights Global 100 (2020)	<i>"World's 100 most sustainable corporations"</i>	100	Independent assessment – customised ESG KPIs
#4	SEAL Organisational Impact Awards (2020)	<i>"50 most sustainable companies globally"</i>	50	SAM Corporate Sustainability Assessment (CSA) and CDP Climate, Forest, Water scores

research to identify companies who are recognised as frontrunners for their sustainability performance (e.g., D'Amato et al., 2019; Michelon et al., 2015). Two separate lists from the DJSI were obtained (as seen in Table 1). Through an investigation of ESG ratings and rankings, Abhayawansa and Tyagi (2021) conclude that there can be significant divergences between rankings provided by different ESG rating agencies. Therefore, to increase the diversity of companies and remove ranking bias of individual rating agencies within the sample, an additional Google search, using the search string "list of sustainable companies 2020", was conducted to find other international lists of companies ranked by their sustainability performance for the year 2019. These lists must not have been restricted by location or sector and must be calculated using alternative assessment methodologies than the 'SAM Corporate Sustainability Assessment' (S&P Global, 2021), which compares companies across 61 industries via a questionnaire assessing cross-industry and industry specific questions. The result of this search added two sustainability ranking lists (#3 and #4 as seen in Table 1).

Combining the four global sustainability ranking lists and removing duplicates resulted in an initial sample of 98 European reporting companies. Additional selection criteria ensured that companies published at least one report including non-financial information (inclusive of all formats and titles) which was publicly available as a downloadable pdf and written in the English language. Application of these criteria resulted in four companies being removed ($n = 94$).

Once the total sample was finalised, each company's website was visited and any reports containing non-financial information were downloaded and input into the MAXQDA software (MAXQDA, 2021). As this study was not limited to one report per company, the final sample constituted 138 reports from 94 companies. If companies produced a separate sustainability report – that is merely one section of their Annual Report – it was not added as an additional document. Additionally, for each report downloaded, relevant attributes (e.g., company name, sector, country, report format) were specified. To distinguish sectors, the Global Industry Classification Standard (GICS) was utilised (MSCI, 2022).

3.2. Unitizing, recording and reducing

As a first step, the disclosure frameworks each sustainably ranked company is utilising was noted, to determine if there is any correlation between the type of materials and the extent of corporate CE reporting. To do this, a list of eighteen reference materials was compiled from three different sources: (i) international sustainability reporting frameworks: eleven reporting frameworks suggested for companies to use within the Guidelines on Non-Financial Reporting (methodology for reporting non-financial information) (2017/C 215/01) (European Commission, 2017); (ii) Sustainability rating agencies: three major sustainability rating agencies utilised in Europe, according to the results of report titled "Rate the Raters 2020: Investor Survey and Interview Results" (SustainAbility, 2020); and (iii) CE-specific initiatives and material: the Ellen MacArthur Foundation and three specific guidelines established to assist companies evaluate and report CE strategies, as first compiled in Opferkuch et al., 2021. The complete list and results can be seen in Appendix B.

Following this, segments of text that are of interest to the research aims were defined. Through a unitizing process, 'coding units' were collected and can be defined as *"the constellation of sentences or paragraphs containing aspects related to each other, answering the question set out in the aim"* (Catanzaro, 1988; Bengtsson, 2016). A search query was developed consisting of the term: "circular*" to ensure all related terms e.g., "circularity" or "circular product" were identified. Each search result was reviewed to ensure its relevance to the research aim (and not, for example, extracting text which discusses a "business circular letter" – which is a format of business communication (de Villiers and Maroun, 2017)). The authors acknowledge ongoing discussions on the precursors and other labels for CE activities (e.g., in Calisto Friant et al., 2020), however, the decision to use the term "circular economy" within this study follows the European Commission and the UNEP's explicit use of the term within multiple international environmental frameworks (e.g., in (European Commission, 2020; UNEP, 2017)). This indicates that there is an international common understanding and acceptance of CE terminology and language to be used moving forward. All text segments containing the defined keywords were extracted and recorded as coding units. These coding units were then assigned to one of the five chosen elements of sustainability reporting based on which report section they occurred in. The specific coding protocol for each of the five elements are described and justified below:

1. *CEO's message*: To determine how (and if) CEO's or senior management are discussing CE issues, coding units found in the CEO's message of each sustainability report (if included) were analysed and inductively coded to identify common themes of how CE is presented;

2. *Non-financial materiality assessment*: To explore whether companies on sustainability rankings are rating CE as an important material issue, coding units found in the non-financial materiality assessments of sustainability reports were examined. First, the titles of the material issues were qualitatively analysed, and any similarities and trends were noted. When a company was found to be reporting CE as a material issue, observations were also made on where stakeholders had placed CE on the two dimensions (and axes) of the (double) materiality assessment, i) the significance of the company's ESG impacts on the material issue to society and ii) the relative significance of the material issue on the assessments and decisions of the company's stakeholders (GRI, 2016). Additionally, if the company classified material issues according to the three main dimensions of sustainability – environmental, social or economic –, it was noted how the CE-related material issue was classified;

3. *SDG framework*: All coding units (and the surrounding paragraphs) were analysed, and any direct references made to the SDG framework (be it to a single goal or the overall framework) were collected. The specific goals were noted as well as the total number of goals linked with CE-related content inside each report (e.g., a company stating their CE projects, collaborations and activities align with the goals of SDG 12);

4. and 5. *Targets and indicators for CE*: First, a list of targets and indicators containing circular* terminology were compiled from the extracted text. Then, the sustainability reports were individually reviewed to find any other targets or indicators which were being

reported by the companies to demonstrate the performance of their CE objectives but were not using circular* terminology. For example, as part of the report section titled 'circular economy and waste management', Kesko (Consumer Staples sector) measure the number of eco take-back points intended for consumer recycling as a measure of progress towards their CE objectives. In this instance, the indicator 'number of eco take-back points' was deemed to be designed to measure progress towards their CE objectives in this company's context. Once the lists were finalised, targets and indicators were deductively coded one-by-one using a thematic analysis coding framework seen in Table 2 created and employed for this study (Braun and Clarke, 2006).

The coding framework presented in Table 2 builds on previous studies which have proposed CE strategies and then used them to categorise targets or indicators for CE; Categories 1–3 proposed in Potting et al. (2017) and Morsetto (2020); Category 4 proposed in Moraga et al. (2019) and Category 5 proposed in WBCSD (2018). As the coding process developed, it became clear that for the context of sustainability reporting, companies were including targets and indicators for aspects of CE not captured within Categories 1–5. Therefore, through deductive coding, three more strategies for CE were added (seen in Table 2 as Category 6: *Other*). All targets and indicators for CE were coded individually and then critically analysed and discussed with three independent and experienced researchers working within the CE field in order to reduce both intra-coder variability and inter-coder variability (Bryman, 2012). In addition, during this process researchers noted any evidence of company's mentioning the use of either existing approaches (e.g., Life Cycle Assessment (LCA)) or tailor-made tools for the assessment of their CE-related activities.

3.3. Inferring and narrating

The final stage of the content analysis was to convert the quantitative data and descriptive accounts of text to meaningful insights to answer the research aims. Due to the uneven distribution of 94 companies across 11 sectors and 14 countries, it was not possible to determine any significant correlation between the company's sector, country, number of reports published or materials referenced with the extent of CE reporting. However, descriptive statistics were determined using the IBM SPSS software (IBM, 2020). Finally, to ensure the validity and reliability of results as much as possible, investigator and methods triangulation techniques were considered in the research design (Breitmayer et al., 1993). With respect to performing the actual coding

of sustainability reports, both software-assisted and manual coding was performed to ensure any errors were not overlooked. Additionally, critical cases were discussed among all authors to ensure consistency in interpretation of the data extracted. To further increase reliability, coding categories were grounded in academic literature (Kohlbacher, 2006), however, as with all content analyses, research findings should not be considered to be accurately representative of a company's actual sustainability performance.

4. Results

This section first presents a descriptive overview of the sample of the 94 companies and their sustainability reports. This is then followed by the results of the content analysis, revealing evidence of CE within each of the elements of sustainability reports analysed within this study: CEO messages, materiality assessments, references to the SDG's framework, targets and indicators for CE.

4.1. Sample description

Almost all companies ($n = 85$ or 90%) were found to include references to CE within at least one of their sustainability reports. Using the sampling method described in Section 3.1, the geographical and sectoral distribution of companies can be viewed below in Fig. 2 and Table 3 respectively. The companies operate across fourteen European countries, most frequently from France or Spain. All eleven sectors of the GICS are present within the sample, however, the Real Estate and Energy sectors are underrepresented. Companies in the Financials sector were least likely to not have explicitly mentioned CE within any of their reports (25% of all companies in financial sector).

The majority of companies within the sample are present on only one of the global sustainability rankings, with the DJSI Top 100 and Corporate Knight Global 100 being the most common (for more details see Appendix C). The most common report formats and their frequencies are presented in Table 4. More than half of the companies within the sample ($N = 52$ or 55%) produced only one report containing non-financial information in 2020, whilst 40% ($n = 38$) produced two and the remaining few companies (3% or $n = 3$) produced three reports each. For companies only producing one report, the format is most likely to be an Annual Report ($n = 22$ or 42% of companies producing one report) followed by an Integrated Report ($n = 12$ or 9%). If producing two reports, companies are most likely to produce an Annual Report in

Table 2

Coding framework based on academic literature used to deductively code targets and indicators for CE extracted from sustainability reports (Based on the literature cited in the text: Potting et al., 2017; Morsetto, 2020; Moraga et al., 2019; World Business Council for Sustainable Development (WBCSD), 2018).

#	Category	CE strategy	Description
1	Smarter Product Use and Manufacture	Refuse	Make product redundant by abandoning its function or by offering the same function with a radically different product
		Rethink	Make product use more intensive through design
		Reduce	Increase efficiency in product use or manufacture by consuming fewer natural resources
2	Extend Lifespan of Products and its Parts	Reuse	Re-use by another consumer of discarded product which is still in good condition and fulfils its original function
		Repair	Repair and maintenance of defective product so it can be used with its original function
		Refurbish	Restore an old product and bring it up to date
		Remanufacture	Use parts of discarded product in a new product with the same function
		Repurpose	Use discarded products or its part in a new product with a different function
3	Useful Application of Materials	Recycle	Process materials to obtain the same (high grade) or lower (low grade) quality
		Recovery	Incineration of material with energy recovery
4	Reference to Linear Economy	Waste generation	Volume of waste generated as an indication of progress towards CE
		Waste to landfill	Volume of waste going to landfill as an indication of progress towards CE
5	Circular Value Creation	Develop new circular business models	Investments in or the quantity of new circular business models created by a company
		Revenue from circular products/projects	Revenue made from the sale of products or establishment of projects using CE strategies
6	Other	Total circularity	Aiming for total circularity of products, the value chain or organisation, without detailing how this is achieved
	Other	Return of products	The volume of products returned to the company, without specifying end-of-life treatment
	Other	Internal CE strategy development (and employee training)	Number of employees that undertook training or education specifically for CE issues OR declaring objectives to improve organisational CE strategy

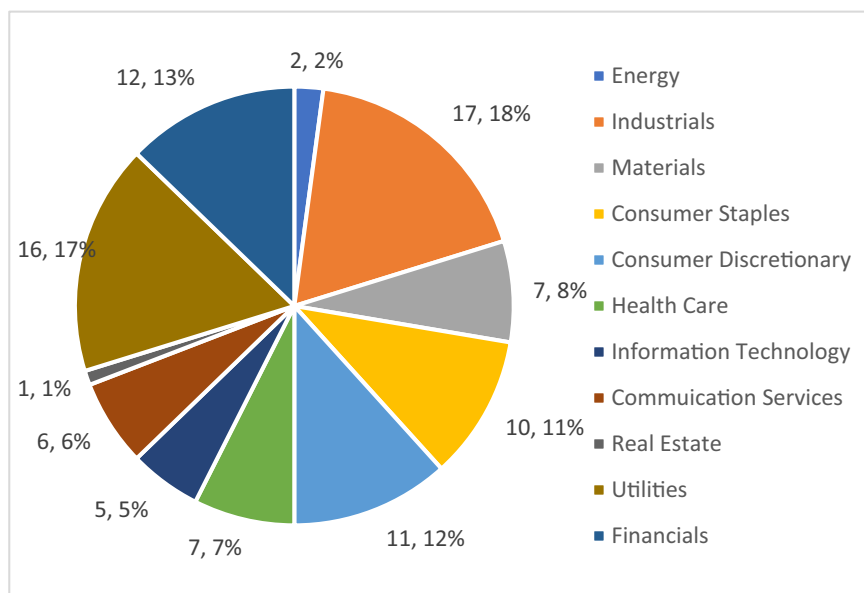


Fig. 2. Distribution of companies according to GICS sector classification (n = 94).

combination with a Sustainability Report (n = 29 companies or 31% of total sample) (for more information see Appendix D).

Using the methods described in Section 3.2, reports were qualitatively analysed to identify references to common disclosure frameworks, ESG rating agencies and CE-specific materials (details shown in Appendix B). All but one company make reference to the SDG's within their sustainability reports, reaffirming that it is indeed the most commonly utilised framework for operationalising sustainability. Overall, only 10 of the 18 reports labelled as Integrated Reports, explicitly make reference to the International Integrated Reporting Council's (IIRC) framework. A total of 30 reports reference both the GRI and IIRC, whilst 83% of reports labelled as Sustainability Reports (n = 30) explicitly refer to the GRI Standards, reinforcing findings from previous studies that state GRI is the most commonly used disclosure framework, particularly within Europe (European Financial Reporting Advisory Group, 2021; Hahn and Kühnen, 2013). It should also be noted that the vast majority of companies are a member of the UN Global Compact (85%) and the CDP (90%), strengthening the assumption that sustainably ranked companies are recognised for their commitment to advancing the international sustainability agenda. From a CE perspective, only 22% of companies have referenced material and/or are partners with the EMF.

Table 3

Distribution of companies according to their country (n = 94).

Country	Absolute frequency (No.)
Austria	1
Denmark	5
Finland	6
France	14
Germany	10
Ireland	2
Italy	10
Norway	2
Portugal	2
Spain	11
Sweden	5
Switzerland	8
The Netherlands	8
United Kingdom	10
TOTAL	94

4.2. Circular economy within key elements of corporate sustainability reports

Contrasting previous research efforts, the results here showed that companies (operating within all sectors, not just manufacturing) consider CE a relevant topic for sustainability reporting. However, only seven companies (7%) were observed to have integrated CE within all five elements of sustainability reports (1–7 listed in Table 5), ultimately presenting CE as a key environmental objective for the company. Over 40% of the sustainably ranked companies do not include CE content within any of the five elements of sustainability reports analysed within this research.

Results show that in general, companies based in the Netherlands were most likely to identify CE as a key objective, irrespective of their sector.

4.2.1. CE within CEO messages

The majority of sustainability reports (91% of companies or n = 86) did include a CEO's message, however, for companies producing more than one report, the text was not exactly the same in each report. Therefore, 19 companies (20%) were observed to include circular* terminology within the CEO's message of 23 sustainability reports (17% of all reports). It should be acknowledged that 5 of these companies only mentioned CE within the CEO's message of their sustainability report, whereas in their Annual report CE content was excluded.

Table 4

Frequency of report formats as indicated by number of companies and individual reports.

Report format	Absolute Frequency (No.)	Relative Frequency (%)
Annual report	57	41.3
Sustainability report	35	25.4
Integrated report	18	13.0
^a Other document	13	9.4
Integrated annual report	8	5.8
Non-financial statement	3	2.2
Corporate responsibility report	4	2.9
TOTAL	138	100

^a 'Other document' includes report formats present in the sample only once or twice, including ESG Report or CSR Report.

Table 5

Companies found to have integrated CE within four or five elements of sustainability reports (columns), where X indicates that CE is present.

Company name	Country	Sector	CEO's message	Materiality assessment	SDG Framework	Targets	Indicators
KPN	The Netherlands	Communications	X	X	X	X	X
H&M	Sweden	Consumer Discretionary	X	X	X	X	X
Essity	Sweden	Consumer Staples	X	X	X	X	X
Philips	The Netherlands	Health Care	X	X	X	X	X
Signify	The Netherlands	Industrials	X	X	X	X	X
DSM	The Netherlands	Materials	X	X	X	X	X
Hera	Italy	Utilities	X	X	X	X	X
Naturgy Energy Group	Spain	Utilities	X		X	X	X
Acciona	Spain	Utilities	X	X		X	X
Akzo Nobel	The Netherlands	Materials		X	X	X	X
Schneider Electric	France	Industrials	X		X	X	X
CNH Industrial	United Kingdom	Industrials		X	X	X	X
Moncler	Italy	Consumer Discretionary	X	X	X	X	
Melia Hotels International	Spain	Consumer Discretionary		X	X	X	X
Inditex	Spain	Consumer Discretionary		X	X	X	X
Electrolux	Sweden	Consumer Discretionary	X	X		X	X

Inductive coding of these 23 CEO's messages highlighted six common themes describing how senior leadership perceive and implement CE activities (as displayed in Table 6). Most often, the CEO's messages describe CE's importance to the company for internal reasons, either describing CE as one of the major pillars of the company's broader strategy or announcing targets and commitments for CE to be achieved the following year. Around one third of the CEO's messages discuss CE's importance for external reasons, describing collaborations and partnerships that the company has established to further the development of circular solutions, as well as identifying CE as a 'megatrend', presenting opportunities for the company moving forward. For example, "We continue to advocate on (mal)nutrition, climate change and circularity and the role of business in society. These are issues that define our times and can be addressed by our competences" (DSM, Materials sector). Finally, a small portion of CEO's messages described their company's role in promoting CE within society or their ambition to become a global leader in CE development. Despite almost all of the companies within the sample mentioning CE within their sustainability reports, the results show that there is an overall lack of engagement with CE from the CEO's of these companies, as only few have publicly identified CE as a key objective for the future.

4.2.2. CE within non-financial materiality assessments

Most companies (85% or $n = 80$) include a materiality assessment within at least one of their sustainability reports, however, less than one third (28% or $n = 23$) reported a material issue with circular* terminology (listed in Table 7).

Most often, companies frame CE as its own material issue (as can be seen in Table 7, in the first and fourth "Material issue title"). However, some companies merge the term "CE" with other terms associated with waste, resource- or product-related issues. To further explore whether companies perceive CE as its own issue or simply another name for waste and resource related issues, all other material issues

reported within these 23 materiality assessments were collected and analysed (see Appendix E). Eleven companies report other material issues which contain terminology related to waste and resource management (e.g., reporting 'Transition to the circular economy' as well as 'Optimized water and waste management' and 'resource scarcity' – Suez group, Utilities sector). Alternatively, the remaining twelve companies report only one material issue relevant to waste and resource use, with a title that includes the term CE as well as terms related to waste and resource use (e.g., 'Waste and the Circular Economy' – Acciona, Utilities sector). These two different approaches signal two pathways emerging for how company's may be operationalising CE: (i) implementing CE as a major strategic issue of its own, separate to waste or resource management; and (ii) CE is a part of (or replacement of) waste and resource related issues on an operational level. Two companies (H&M, Consumer Discretionary sector and Signify, Industrials sector) have in fact classified waste management as a subtopic under CE, symbolising the strategic importance of CE within their corporate strategies.

The majority of those companies ($n = 16$ or 70%) that include a materiality assessment with CE-related topics categorise CE-related material issues as an environmental topic. A few companies classified CE under categories titled Innovation ($n = 2$) and Products/Solutions ($n = 1$), suggesting that for these companies CE is being implemented for reasons other than only environmental benefits. Following this, the materiality assessments were analysed to determine how the CE-related material issues are considered within double materiality, where stakeholders indicated a level of importance for value creation for: 1) the company (internal) or 2) for society (external) (Adams et al., 2021; European Financial Reporting Advisory Group, 2021). Fig. 3 shows that CE is seen as an important issue by both internal and external stakeholders of the companies almost equally. This suggests that there are internal and external pressures to prioritise and promote CE implementation for these companies. The majority of companies

Table 6Six themes revealed through inductive coding of CEO's message, listed in order of frequency of the codes. Note that CEO messages could be coded more than once ($n = 23$ reports from 19 companies).

Description of CE-related theme	Frequency
1 CE is one major pillar of the company's overall strategy	12
2 Specific CE targets and/or commitments	12
3 CE related to collaborations and partnerships	9
4 CE is a dominant megatrend and presents opportunities for the company	7
5 Promotion of CE to society	5
6 Company aspires to become a global leader in CE development	3

Table 7Material issues containing circular* terminology reported within materiality assessments and their frequencies ($n = 23$).

Material issue title	Absolute frequency of companies (no.)
Circular economy	10
Circular economy and resources	3
Circular economy and products/business services/solutions	3
Transition to a circular economy	2
Circular economy and waste	2
Circular economy, resources and waste	2
Circular economy and consumption	1

reporting CE as a material issue were found to rate it as a priority issue for their company (that has been rated with either Critical or High priority within the company's materiality assessment) (Fig. 4), demonstrating their likely future commitment towards CE integration. It should be noted that these results are only representative of the companies that have rated CE as a material issue which is ranked medium or higher. It is possible that other companies have determined CE to be an important material issue, however, have given it a low ranking and therefore, not required to include it within their sustainability report.

It was also noted that around one quarter of companies ($n = 26$ or 28% of companies) recognise CE as a topic presenting potential business risks and/or opportunities for the company in the coming years. Specifically, 18 companies (across all sectors) associated CE with potential regulatory risks, considering the implications of the introduction of the European Union's (EU) Green Deal (European Commission, 2020) and other upcoming regulations concerning packaging and waste management. Alternatively, 26 companies recognised CE as a business opportunity, specifically for the possibility to: enter new markets, reduce risks associated with price volatility of future materials and to develop new supply chain partnerships. These findings signal the inclusion of CE within strategic level discussions regarding compliance and long term value creation.

4.2.3. Integration of CE within the UN's SDG framework

As mentioned in Section 4.1, almost all companies ($n = 93$ or 99%) within the sample refer to the UN's SDG framework within at least one of their sustainability reports. Results of the content analysis showed that less than one third of companies (30% or $n = 28$) directly link CE-content (using circular* terminology); such as objectives, targets, indicators, with references to the SDG framework.

Across these reports, CE was linked with eleven of the seventeen SDGs as displayed in Fig. 5. Most often, CE was linked with SDG 12: Responsible Consumption and Production, followed by SDG 13: Climate Action and SDG 17: Partnership for the Goals. In fact, all but one of these companies explicitly linked CE with SDG 12, echoing the dominant discourse that CE is a progression from precursor topics such as cleaner production and industrial ecology (Calisto Friant et al., 2020). Nearly half of the reports (43%) linking CE with the SDGs did so with only 1 SDG, however, few companies did explicitly connect CE-content with the objectives of as many as 8 or 9 SDGs. Concerning the format of the reports, only one company explicitly linked CE with the SDGs in every report they produced, the remaining companies only included this content within their separate sustainability report (or format other than Annual report).

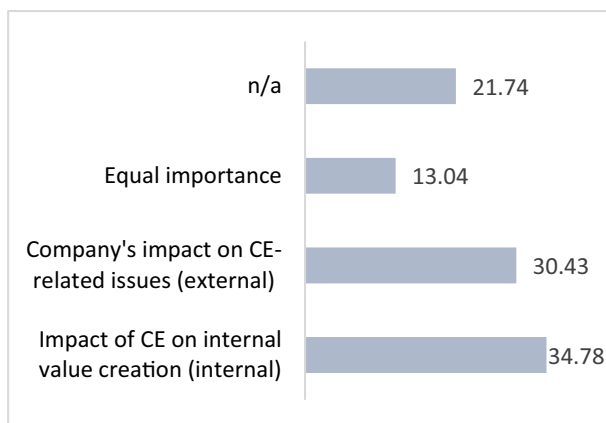


Fig. 3. Companies reporting CE as a material issue (%) and the level of priority attributed by stakeholders of the company, where Critical priority is the highest ($n = 23$).

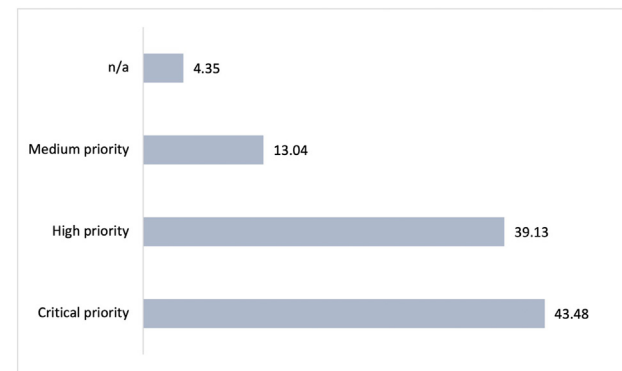


Fig. 4. Companies reporting CE as a material issue (%) and the level of importance indicated by stakeholders for internal and external value creation ($n = 23$).

* N/a indicates that the company does not rate material issues in order of importance or level of priority.

4.2.4. Targets and indicators for circular economy

Less than one third of companies within the sample (29%) reported both targets and indicators that they attributed to measure progress towards their CE objectives. A total of 106 targets, reported by 39 companies (41%), and 96 indicators, reported by 36 companies (38%), were extracted from the sustainability reports and then deductively coded and classified against the coding framework presented in Section 3.2. The results of this analysis are presented below in Fig. 6.

From the analysis it is clear that companies are reporting targets for CE which involve higher-priority CE strategies (according to Potting et al., 2017), as almost half of all targets (42%) were classified under Category 1: *Smarter Product Use and Manufacture*. Within this category, 35 targets relate to the CE strategy of 'Reduce'. Most often, the targets aim to eliminate and/or replace non-renewable resources within packaging e.g., '50% plastic packaging made from recycled or renewable materials' (Orkla, Consumer Staples sector). The remaining targets for 'Reduce' aim for either the elimination and replacement of non-renewable resources within the company's own products e.g., 'Replace virgin materials with recycled materials in our products' (Electrolux, Consumer Discretionary sector) or; the reduction of on-site plastic use e.g., 'Plastic-free catering at UK facilities' (BT Group PLC, Communication Services sector). Two thirds of the targets (67%) classified under 'Reduce' were from companies operating in either the Consumer Staples or Consumer Discretionary sectors, both involving the manufacture of goods. It was noted that under Category 6: *Other*, 8% of all targets describe achieving some form of 'Total Circularity', whether that be on a product, company or supply chain level. For example, 'close to 100% circular operations and services in 2025' (KPN, Communication Services sector) or 'close the loop on all large medical equipment by 2025' (Philips, Health Care sector). These targets were reported by six different companies, however, in all cases they were not accompanied by indicators that may demonstrate how and/or if the company is progressing towards this goal of total circularity.

In contrast, the indicators for CE which have been reported mainly concern lower-ranking CE strategies, with 34% of all indicators classified under Category 4: *Reference to the Linear Economy* and 27% under Category 3: *Useful Application of Materials*. Zooming in on the indicators within Category 4, they can be divided into two groups: 1) indicators that show the volume of waste being generated e.g., 'Total waste generated (t)', (Melia, Consumer Discretionary sector) and 2) indicators that demonstrate either the volume of waste going to landfill e.g., 'Volume of non-hazardous waste to landfill', (Acciona, Utilities sector) or measure progress on actions towards zero waste to landfill e.g., 'Number of sites labelled toward zero waste to landfill' (Schneider Electric, Industrials sector). Often within the former group, these indicators are measured according to particular waste streams (e.g., hazardous and non-

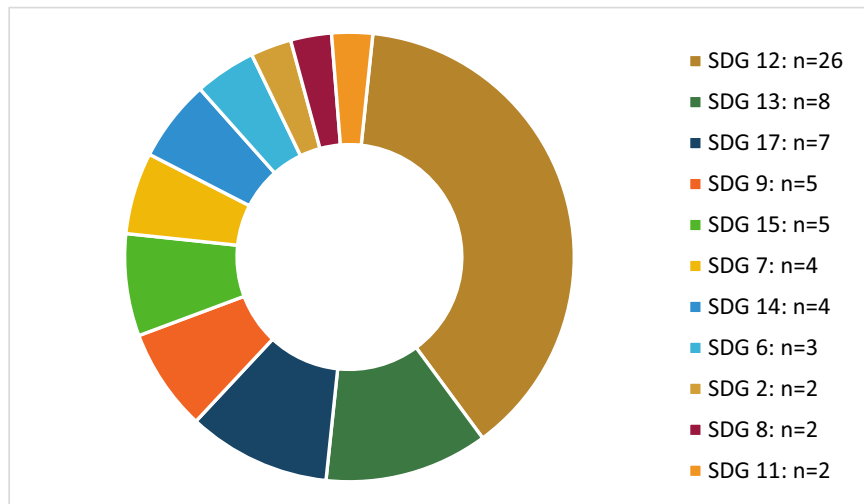


Fig. 5. Link between SDGs and CE (frequency of mentions of CE with each SDG within sustainability reports) (n = 28 companies).

hazardous waste), in accordance with the requirements of the GRI Sustainability Standards (GRI, 2016). For the indicators classified under Category 3, similar trends can be observed, with indicators either representing: 1) the volume of waste recycled e.g., '% Manufacturing waste recycled' (*Signify*, Industrial sector), or 2) the volume of waste incinerated with recovery of energy e.g., '% waste materials recovered', (*EDP*, Utilities sector).

Several observations can be made on the design of both targets and indicators for CE reported. Firstly, several targets and indicators

combine multiple CE strategies, for example, '% of waste that is recycled, reused or recovered' (*Sanofi SA*, Health Care sector). By doing this it is not clear whether the company is giving preference to higher-ranked CE strategies, in this case 'Reuse'. Furthermore, comparing changes in these reported values over time will not accurately demonstrate whether the company has actually improved from a CE perspective nor will it indicate the potential sustainability impacts of each CE strategy (e.g., higher level of circularity should equal fewer natural resources being consumed (Potting et al., 2017)). Similarly, several targets and

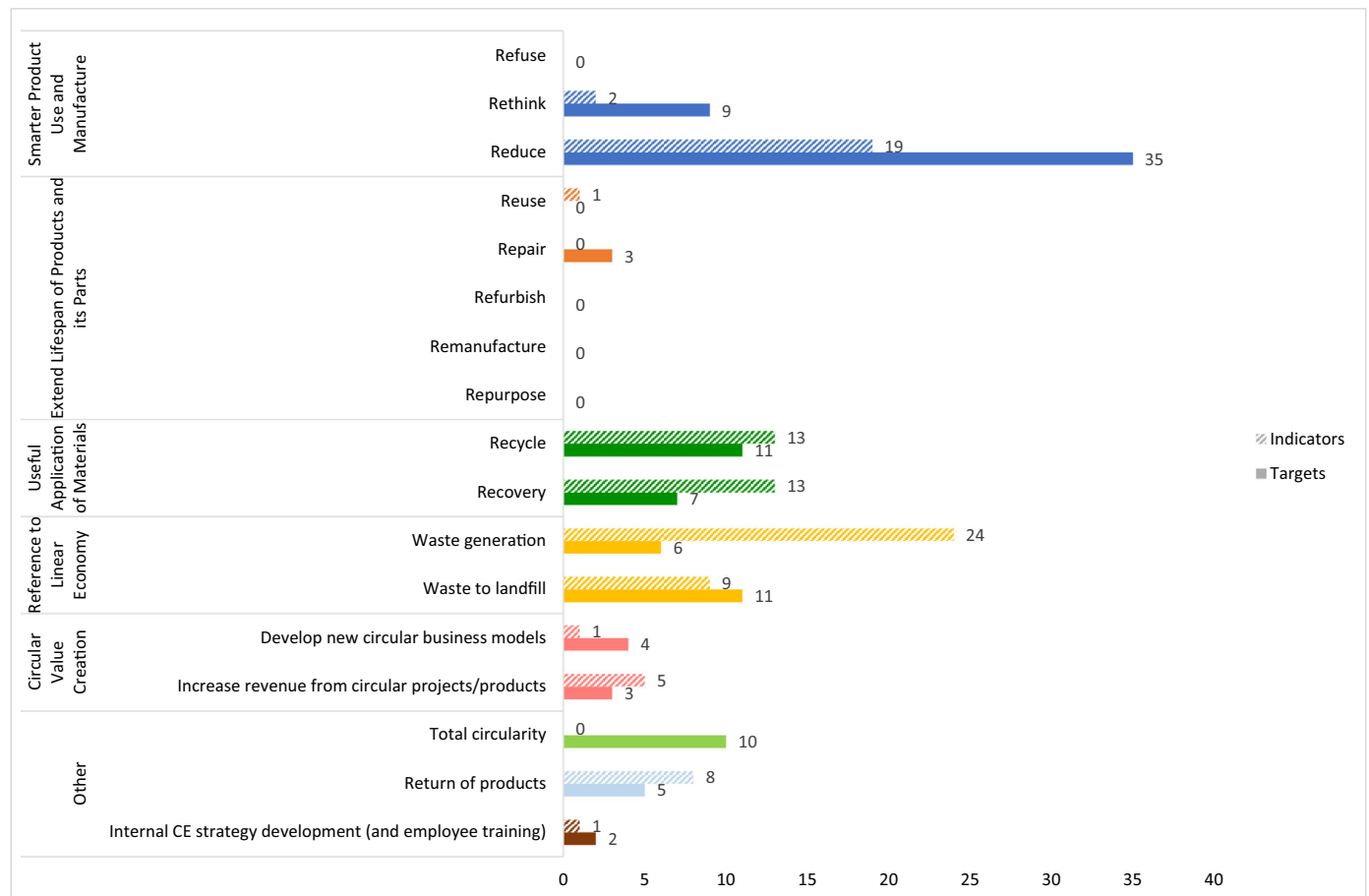


Fig. 6. Targets (n = 106) and indicators (n = 96) for CE extracted from the sustainability reports from sustainably ranked European companies.

indicators were observed to focus solely on the return of products or materials to the company, without specifying what end-of-life treatment would then be applied (shown in Category 6: *Return of Products*). For example, '100% of stores with containers to collect used garments in 2020' (*Inditex*, Consumer Discretionary sector) or 'Return of products' (*Philips*, Health Care sector). However, again, from a CE perspective is not clear from the design of these targets and indicators if the returned products and materials are then for example, remanufactured or sent to landfill, both being different end-of-life strategies with potentially significantly different sustainability impacts. Finally, very few of the analysed targets and indicators measured the CE strategy 'Refuse' or strategies classified under Category 2: *Expand Lifespan of Products and its Parts*.

Despite the uneven distribution of companies across the eleven sectors and fourteen countries, some trends in the reporting of targets and indicators for CE can be observed (as seen in [Appendix F](#)). Companies from the Financials and Information Technology sectors were the least likely to report both targets and indicators for their CE objectives. Whilst 70% of all companies from the Materials and Consumer Staples sector reported targets for CE and 50% reported indicators for CE. Additionally, indicators for CE classified under Categories 3 and 4 were most likely reported from companies operating within resource-intensive sectors; specifically from the Industrials, Materials and Utilities sectors. Furthermore, companies from the Consumer Discretionary sector had the highest average number of targets (3.89) and indicators (4) for CE included within their reports. From a geographical perspective, 75% of all companies from the Netherlands ($n = 6$) reported both targets and indicators for CE whilst 75% of companies from Switzerland ($n = 6$) reported neither targets or indicators for CE (as seen in [Appendix F](#)).

During the analysis, it was observed that numerous companies (23) are designing sections of their sustainability reports which combine CE-content and terminology with climate change. For example, declaring an overall objective for the company to become "circular and climate neutral" (*Electrolux*, Consumer Discretionary sector) or using such terminology: transition to a "decarbonised circular economy" (*Naturgy Energy Group*, Utilities sector) and "circular and low-carbon economy" (*Neste*, Energy sector). These examples may reinforce the significance of climate change related issues for companies and particularly, the scrutiny they increasingly face regarding accounting for their carbon emissions (e.g., UN Climate Change Conference COP26). At the same time, this trend may further exacerbate the confusion surrounding: i) the conceptual and assessment boundaries which exist between sustainability themes (such as CE and climate change); ii) efforts made by the developers of disclosure frameworks to 'harmonise' the sustainability reporting language ([Adams and Abhayawansa, 2021](#)).

Another finding relates to the inclusion of CE-content across the different report formats. Through the content analysis, attention was also paid to which report format companies chose to include the CE-related targets and indicators (further details in [Appendix G](#)). Of the companies reporting targets or indicators for CE and producing more than one sustainability report ($n = 16$ and 15 respectively), most often they were only included within their sustainability reports, not included within the Annual report. Furthermore, few companies ($n = 5$) were observed to include different CE-related indicators across each of the reports the company produces. Finally, only a few companies mentioned the use of either tailormade ($n = 4$) or corporate assessment approaches ($n = 13$) as part of the sustainability assessment of their CE strategies (listed in [Table 8](#)). Most often, companies connect LCA with the evaluation of CE activities ($n = 8$).

5. Discussion

This study used the content analysis method to explore the integration of CE within the sustainability reports of 94 sustainably ranked European companies. The results are here discussed in line with six key topics: 1) CE and sustainability within corporate sustainability

reports; 2) measuring and reporting progress towards CE objectives; 3) addressing CE claims of greenwashing; 4) the importance of CEO engagement with CE; 5) format of sustainability reports; and 6) the integration of sustainability reporting criteria within CE assessment approaches. Following this, the implications of the research findings for both theory and practice will be presented.

As mentioned earlier, the transition to a circular economy has been introduced as one of six key environmental objectives within EU-level policies, however, the boundaries separating it from the other environmental objectives (e.g., climate change adaptation) remain ambiguous. Within the context of sustainability reporting, companies are mostly reporting CE strategies having impacts on only the environmental dimension of sustainability. [Schöggel et al. \(2020\)](#) state that CE research from 2000 to 2019 has been dominated by waste management and recycling solutions, thus the influence of CE on other sustainability components, such as social impacts and consumption-based solutions remain unresolved. Results of this study showed that within materiality assessments, CE is sometimes being classified by companies as a material issue that is more than just waste management, whilst the other half considered it merely a replacement of waste and/or resource management issues. Furthermore, of those companies linking CE and the SDG framework, almost half only associated it with SDG 12, despite CE being known to have contributions on several more SDGs ([Schroeder et al., 2018](#)). This is similar to findings from [Stewart and Niero \(2018\)](#) who reported an unclear linkage between CE and sustainability in their content analysis of corporate sustainability reports. Additionally, the results support the notion that the link between CE and the social dimension of sustainability is uncertain, as no companies explicitly linked their CE activities to progressing social-oriented SDGs, for example, SDG 3: Good Health and Well-being or SDG 10: Reduced Inequality. Nonetheless, despite some authors and companies stating that definitional nuances of CE are unimportant ([Kirchherr & Van Santen, 2019](#); [Walker et al., 2021a](#)), the inconsistent reporting of CE strategies observed in this study show that there is an opportunity for future sustainability reporting guidelines to work to clarify the relation between CE and sustainability, by advising the implementation of CE strategies through a social-ecological systems thinking perspective ([Berkes et al., 1998](#); [Webster, 2013](#); [Ahlström et al., 2020](#)). Companies should avoid assessing and reporting corporate actions in isolation between: i) different systems e.g., the economic, natural and social; financial and non-financial reporting, or ii) on material issues within one system, e.g., CE strategies to prevent waste generation and energy use. By encouraging companies to acknowledge the existence of dynamic interactions within and across interconnected social and natural systems, they can realise their dependency on them for inputs as well as how their organisational actions can impact these systems, through feedback loops ([Whiteman et al., 2013](#); [Starik and Kanashiro, 2013](#)).

With respect to measuring and reporting progress towards CE objectives, results here echo previous studies which observed minimal corporate adoption of corporate assessment approaches for CE ([Stumpf et al., 2021](#); [Roos Lindgreen et al., 2022](#)). LCA studies are being increasingly recommended and used to evaluate the sustainability impacts of CE strategies ([Birat, 2015](#); [Niero and Rivera, 2018](#); [Schulte et al., 2021](#)). However, this study found limited evidence of LCAs being mentioned within sustainability reports, let alone linked with the evaluation of CE strategies. This finding highlights the potential lack of suitability LCA results have within external communication, largely due to the results' complexity and use of multiple assumptions, as discussed in previous studies ([Finnveden et al., 2009](#); [Roos Lindgreen et al., 2021](#)). Concerning the reporting of targets and indicators for CE, findings showed an imbalance between company's ambitions and what they are actually measuring and consequently reporting progress towards. [Reike et al. \(2018\)](#) indicated that CE-related policies and measurements focus on capturing recycling rates, rather than higher-ranking CE strategies e.g., reuse rates. Building on this, through an analysis of EU-level CE policies, [Calisto et al. \(2021\)](#) highlighted a dichotomy between 1) EU discourse (words),

Table 8

Assessment approaches used for CE reported within sustainability reports.

Tailormade approaches		Companies	Corporate assessment approaches for CE		Companies
1	Tailormade environmental management system	Inditex	1	Life Cycle Assessment (LCA)	Ericsson, H&M, Moncler, Siemens, BillerudKorsnas, Acciona, Enel, Terna Rete Elettrica Nazionale
2	Kering Materials Circularity Index	Kering	2	Carbon Footprint	Electrolux
3	CirculAbility Model	Enel	3	Sustainable Apparel Coalition's Material Sustainability Index	H&M
4	Global Circularity Indicator for goods and services (in development)	Suez	4	Material Circularity Indicator (EMF)	Siemens
			5	Circulytics (EMF) (pilot phase)	Hera
			6	Product and Environmental Footprint (PEF)	Terna Rete Elettrica Nazionale

which portrays a holistic optimist understanding of CE and 2) EU policies (actions), which take a technocentric approach to CE, including targets and indicators focussing on resource efficiency. The impact of this dichotomy can be seen in the evidence of corporate sustainability reports, as companies are primarily reporting indicators for lower-ranking CE strategies (e.g., Recovery or Recycling) or even references to the linear economy (e.g., volume of waste to landfill). As mentioned, this research shows inconsistencies between targets and indicators according to the ranking of CE strategies, but the results also show inconsistencies between targets and indicators addressing the same CE strategy. For example, companies most often reported indicators for the CE strategy of 'Reduce', however, these indicators generally describe producer-oriented activities, e.g., dematerialisation, as opposed to any consumer-oriented 'Reduce' activities, where an overall decrease in consumption and use can be encouraged (Sihvonen and Ritola, 2015; Worrell and Reuter, 2014). It was also observed that companies are reporting targets and indicators aside from traditional resource-oriented CE indicators, measuring progress through business value creation e.g., 'revenue from circular projects (€)'. This shows that companies are increasingly looking to communicate CE in a way investors will understand, adding to the discussion on which units should be used to calculate circularity and raising questions on the comparability of CE data disclosed within sustainability reports (Linder et al., 2017; Saidani et al., 2018).

It is suggested that in order to combat claims of greenwashing, and more recently "SDG washing", companies should develop appropriate targets and indicators to increase transparency of the company's actual sustainability impacts and intentions (de Freitas Netto et al., 2020). The results of this study show that only a small group of companies who recognised CE as a significant material issue within materiality assessments are reporting both targets and indicators for CE, therefore, determining which and how many indicators for CE are sufficient to combat potential claims of "CE washing" remains unclear. It must be acknowledged that if this study was replicated using a sample of companies who are not recognised on sustainability rankings, it is likely that even less integration of CE within sustainability reporting would be observed. Therefore, as the reporting of CE activities becomes increasingly mandatory, it is expected companies will do so in a reactive manner or through an 'outside-in' managerial approach, which is driven by external communication requests from stakeholders. This, as Burritt and Schaltegger (2010) suggest, can lead corporate external communication to suffer from "potential greenwashing or the suspicion of conspiracy to mislead" (p.839, Burritt and Schaltegger, 2010). In an attempt to address this uncertainty, for the first time, 'circularity claims' has been included as a topic within the International Chamber of Commerce (ICC)'s Framework for Responsible Environmental Marketing Communications (ICC, 2021). Yet, the advice for companies is vague, merely suggesting that "any claims of circularity should be based on appropriate assessment" (p. 22, ICC, 2021). This once again leaves the responsibility of selecting indicators and assessment approaches for CE on the company, as is the case for most disclosure frameworks, as already determined in previous research (Pauliuk, 2018; Opferkuch et al., 2021).

Companies found to have CE content within the CEO's letter were more likely to integrate CE within other sustainability reporting elements, outlining the significance of upper management commitment to embedding sustainability issues throughout organisations (Walls and Berrone, 2015). Review of the materiality assessments showed that CE is considered significantly important from the perspective of both external and internal stakeholders, symbolising the presence of internal (proactive) drivers for sustainability change as well as external (reactive) as stressed by Lozano (2013). Another internal driver for sustainability explored in literature is leadership (DeSimone & Popoff, 2000; Doppelt, 2003). For the integration of CE, previous studies found that 'Hesitant company culture' and 'No leadership commitment for CE assessment' to be two significant barriers for CE implementation in both private and public sector organisations (Droege et al., 2021; Kirchherr et al., 2018). This stresses the importance of CEO (and senior management) engagement with CE in order to advance the CE agenda within organisations and society.

This research also offers a reflection on the format and total number of reports being produced by companies each year. In many instances, companies were not reporting the same sustainability information across each of their reports. Often, targets and indicators for CE, as well as references to the SDG framework were either only partially included or completely excluded from the company's Annual report. Generally, the Annual report is designed to communicate the company's operations and performance of the preceding year to shareholders (Gray et al., 2014). As sustainability data becomes increasingly important for all stakeholders and investors, it is imperative that they receive this data in order to make informed decisions which consider the company's impacts on all three dimensions of sustainability. Indeed, the EU has moved away from language such as 'non-financial' and 'financial' as it discourages integrated thinking on value creation (European Commission, 2021). In this study, six of the seven companies found to be extensively integrating CE produced only one report – an integrated report (or 'Integrated Annual Report'). In these instances, CE was not only perceived as an environmental objective, but as a key objective within the overall corporate strategy. Therefore, when compiling reports, companies must not only consider the quality of data being reported but also how (and what format) the data is being published (e.g., either as integrated reports or separated financial and sustainability reports) as this reflects the company's perception of sustainable value creation.

Recent studies within CE literature advocate for the assessment of CE strategies using a two-step process; first, mapping the organisations resource flows (e.g., through the application of MFA-based approaches). Then, establishing the related impacts in the three dimensions of sustainability by applying life-cycle impact assessment methods (Kalmykova et al., 2018b; Roos Lindgreen et al., 2022; Rufi-Salis et al., 2021; Schulte et al., 2021). However, what is not being considered within these discussions and recommendations is the role of external corporate communication within the sustainability assessment process. Specifically, these studies do not demonstrate how companies can select relevant CE assessment results for use in external communication

and then disclose them in the context of broader sustainability and corporate objectives. As other authors have stated, an abundance of assessment tools and indicators for CE already exists (De Pascale et al., 2020; Kravchenko et al., 2020), therefore, what is truly needed are frameworks to support the selection of CE indicators specifically for sustainability reporting. These frameworks should build on (and not replace) previous academic and industry efforts advancing the sustainability assessment of CE activities and ultimately, streamline this process with existing sustainability reporting processes. The often limited capabilities of companies for sustainability assessments and reporting should also be acknowledged (Khan et al., 2020), so as not to burden companies and potentially induce or amplify ‘assessment fatigue’ (Khalid et al., 2020; Roos Lindgreen et al., 2022). As Bae & Smardon (2011) suggested, the disclosure of indicators for sustainability can accelerate the integration of sustainable business practices within corporate strategic decision-making processes. Therefore, the integration of CE within corporate sustainability reports can be seen as a driver and tool for increasing the implementation rate of CE activities as well as embedding CE as a key objective within corporate strategies.

5.1. Implications for academia

This article contributes findings, from a sustainability reporting perspective, on the theoretical discussions on CE assessment as well as the relation between CE and sustainability. Firstly, the findings from this study demonstrate that despite a number of indicators for CE being proposed and revised in literature (e.g., Saidani et al., 2018; Moraga et al., 2019), their suitability for inclusion within corporate sustainability reports remains unclear for companies. Secondly, the results here show that the ambiguity between CE and sustainability found in academic literature is being reproduced within the contents of corporate sustainability reports. Therefore, as academic discussions continue to find a more harmonised approach to CE assessment and a holistic understanding of CE that is considerate of potential sustainability trade-offs (Millar et al., 2019), researchers should continue to analyse the message of CE being presented by companies within their corporate sustainability reports. This will allow researchers to understand if companies are indeed implementing, evaluating and communicating CE with an approach that is in line with current research trends.

Whilst previous studies most often focus on single sectors (e.g., manufacturing), the findings of this study show that CE content is emerging in the reports of companies active in a number of sectors, therefore requiring more cross-sectoral studies, as opposed to the ongoing trend in CE literature focusing on specific case studies (e.g., Pigosso and McAloone, 2021; van Straten et al., 2021). Furthermore, as less one third of companies reported both targets and indicators for CE, it is clear that companies face difficulties in assessing and disclosing relevant CE data. To address this, findings from previous studies which aim to improve the communication of sustainability within corporate reports (e.g., Bovea et al., 2021) should be utilised in order to reduce the complexity of communicating CE data. A number of opportunities exist for academia to direct efforts to support the capacity building of companies to meet the CE-specific reporting requirements set out by the CSRD in the future. Specifically, it is recommended that stakeholders involved with sustainable finance (e.g., financial institutions) and agencies developing sustainability rankings should be included within discussions on CE assessment. This will help to align academic research with efforts to develop CE-specific screening and eligibility criteria for financial incentives in line with the various national and international taxonomy regulations being developed (e.g., the EU Taxonomy (European Commission, 2021)).

5.2. Implications for practitioners

The findings of this research have implications for managers and practitioners producing corporate sustainability reports as well as

those developing and conducting CE assessments. In general, this article calls for increased engagement with CE by senior management in order to influence corporate culture and reduce barriers to CE implementation. This engagement can be driven by internal and external stakeholders through the materiality assessment process, where CE is likely to become a critical material issue for companies to respond to moving forward. Managers can utilise sustainability reports as a communication tool and strategic driver describing the implementation of current and planned CE strategies, in line with the company's broader sustainability objectives. Furthermore, sustainability reporting practitioners must work towards integrating CE within key content elements of sustainability reports in order to reduce potential CE claims of greenwashing. This includes avoiding CE reporting shortcomings observed within this research, e.g., simply connecting the term CE with the label of one or many SDGs or reporting targets for CE without appropriate indicators measuring progress the company has made towards those targets. Additionally, sustainability reporting practitioners should acknowledge the hierarchy of CE strategies (as illustrated by Potting et al., 2017) and establish a roadmap that will allow their company to measure and report both targets and indicators for individual strategies of increasing CE priority (when possible) in the future.

This article has identified a lack of consistency concerning how CE is being evaluated and reported by companies across countries and sectors. It is recommended that existing CE assessment approaches incorporate criteria and/or steps to support the selection of results for corporate external communication. These findings can create a basis for the development of a framework to assist companies to uniformly report progress towards CE, one that is in line with the requirements of evolving international sustainable finance regulations as well as the current assessment and reporting capabilities of companies engaged with CE.

6. Conclusions

This article explored the presence of CE content in the corporate sustainability reports of European companies recognised for their sustainability performance and reporting practices. A set of 94 European companies were selected, not restricted by sector. A quantitative and qualitative content analysis approach was developed and employed to analyse the contents of these company's sustainability reports, integrated reports, annual reports and other relevant documents published for the year 2019. The results show that the majority of companies are aware of the CE concept and including explicit CE references within their sustainability reports. However, upon further analysis of this content, it became evident that less than one fifth of companies were going beyond merely mentioning CE, but also integrating the concept within key sustainability reporting elements. About 20% of CEO's messages made reference to CE, highlighting the opportunities CE provides for their company as well as declaring the importance of CE to the company's overall corporate strategy, not only their sustainability strategy. CE is generally only associated with the environmental dimension of sustainability, although, in some instances CE was classified as an issue separate to waste and resource management issues within the reported materiality assessments. CE was most often linked with references to SDG 12: Sustainable Consumption and Production, although sometimes described to progress towards as many as seven or eight SDGs. If companies were reporting targets for CE, they most often addressed higher-ranking CE strategies, more specifically involving the reduction of virgin materials in packaging and products. Companies reporting indicators for CE were most likely measuring lower-ranking CE strategies, aiming to reduce the volume of waste generated and/or going to landfill. Given the current climate of increasing international attention on sustainable finance and the inclusion of CE within associated regulations, the results contribute an overview of current CE reporting trends and shortcomings from European companies working across a variety of sectors.

As this research was carried out using manual and software-assisted content analysis techniques, certain decisions were made when designing the methodological approach to ensure meaningful insights could be obtained in a feasible and timely manner. This, however, resulted in some limitations which should be acknowledged before generalising the findings. The sample contained only large companies (≥ 500 employees) who have been recognised for their sustainability performance. Therefore, this study does not consider any potential insights from Small and Medium Enterprises (SME's) who are by law, not currently required to publish a sustainability report but may still communicate non-financial information using a different format. As 99% of all companies within the EU are in fact SME's (Eurostat, 2018), future research should consider exploring the capacities and needs of SME's with respect to external sustainability reporting and particularly, their critical role within promoting CE through engaging with local communities. Furthermore, this sample of companies demonstrate best practices of sustainability reporting, thus, it should be remembered that if this study was to have been repeated with companies not listed on sustainability rankings results would differ. Despite best efforts, the final spread of companies was not evenly distributed across sectors or countries. Therefore, the generalisations of findings with respect to sector and/or country could not often be made. Additionally, Europe was selected as the focus due to the context of the incoming CSRD, meaning insights from other regions where CE implementation may be advanced, particularly in China (as discussed in the theoretical review) were excluded.

Future studies should consider larger samples of companies evenly distributed across sectors in order to statistically account for sectoral differences. Additionally, the data analysed represents

the perspectives/strategies of companies during the 2019–2020 period. Further sustainability reporting research could take a longitudinal approach, as has been suggested by other authors (Stewart and Niero, 2018), to identify changes to the CE reporting practices of companies after the CSRD takes effect, which could then be contrasted with results presented here. Moreover, evolving research on approaches for CE assessment must incorporate criteria and processes which make the results of such assessments applicable for external reporting and communication. It should also be repeated that the data contained within sustainability reports is not always an accurate portrayal of a company's performance, therefore, the findings should only be linked to sustainability reporting practices and not the actual CE or sustainability performance of each company.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A

Table A.1

Previous studies utilising content analysis of sustainability reports to identify CE related data (in chronological order).

#	Study	Focus of article	CE defined/identified as	Number of analysed reports	Year of reports	Database of reports	Geographic scope	Sectoral or Industry scope
1	Kuo et al. (2012)	Examine environmental disclosure within CSR reports of Chinese firms; determine if environmentally sensitive industries or ownership patterns influence CSR reporting	CE is analysed under indicator: Paying attention to energy saving/carbon reduction and development of circular economy	529	2008–2009	www.csr-china.net	China	"All industries", divided into environmentally sensitive industries and ownership types
2	Wang et al. (2014)	Examine Chinese firm's social responsibility reports to determine correlation between corporate ownership governance structure, ownership concentration ratio, share loading ratio of institutional investors and report quality	CE is reviewed qualitatively, and each report graded in 4 categories: honours and performances of CE, investment and expenditure of CE, CE policies and implementation and resource reuse of CE	218	Unknown	Shanghai and Shenzhen stock exchange	China	Iron, steel, cement, chemical and petroleum industries
3	Sihvonen and Partanen (2017)	Examine how companies report quantitative environmental targets for products, what areas are in focus related to products' reuse and the relationships between published targets and environmental performance	CE represented through eco-design related terms including R9 strategies	43	2015	GRI database	No limit	ICT sector
5	Stewart and Niero (2018)	Determine the level of uptake of CE in companies' corporate sustainability (CS) reports; examine how companies link CE and sustainability within CS reports; identify what CE practices are present within CS reports	Explicit mentions of CE extracted and data analysed using inductive approach	46	2016	Corporate Register Database + reports of EMF100 and CEC companies	No limit	Fast moving consumer goods (FMCG)
6	Yang et al. (2019)	Examine the synergistic effects between circular economy, represented as eco-design strategies and reverse activities, on	CE is represented as i) eco-design and ii) reverse activities	293	2013–2015	CNRDS database, Shanghai and Shenzhen stock exchange	China	Manufacturing

Table A.1 (continued)

#	Study	Focus of article	CE defined/identified as	Number of analysed reports	Year of reports	Database of reports	Geographic scope	Sectoral or Industry scope
7	Fortunati et al. (2020)	the CSR performance of a company Examine the maturity of managerial and strategic approaches to CE within MNC's in the cosmetics industry	Bom et al. model (design, sourcing, manufacturing etc) (i) Circular economy, (ii) recycling/reuse; (iii) zero waste/waste reduction; (iv) water/energy consumption; (v) gas emission; and (vi) soil use/biodiversity.	8	2018–2019	Company's website	No limit	Cosmetics
9	Scarpellini et al. (2020)	Define and measure the environmental capabilities applied when CE is introduced in businesses. Analyse different environmental competences that firms apply during this process.	Authors developed items classified as 'environmental activities related to the CE'	87	Unknown	SABI database	Spain	No limit
10	Sehnm et al. (2019)	Examine the reporting practices of CE and sustainability overlap within one firm reports, Natura.	Using GRI G4 guidelines to code sustainability, ReSOLVE classification for CE (EMF)	16 (1 company)	2001–2016	Company's website	Brazil	Cosmetics
11	D'Amato et al. (2019)	Examine the presence and framing of circular, green and bioeconomy concepts within sustainability reports of land-use intensive companies.	CE: direct, explicit and implicit keywords derived from literature and EMF terminology, frequency of keywords is noted, but words like UNCG are used and the connection to CE is unjustified.	123	Most recent from 2008 to 2016	DJSI	No limit	Land-use intensive sectors: Paper & Forest, Food, Beverages, Mining, Energy Manufacturing
12	Dagiliene et al. (2020)	Examine reporting framework = Deloitte etc	CE: 4R framework (expanded), quantitative env KPIs	226	2016	GRI database	EU	
13	Gunarathne et al. (2021)	Examine the presence of CE within sustainability and integrated reports of Sri Lankan companies.	CE: direct, explicit and implicit keywords derived from literature and EMF terminology, frequency of keywords is noted, but words like UNCG are used and the connection to CE is unjustified.	20	2018–2019	Institute of Certified Management Accountants of Sri Lanka (CMA); Excellence in Integrated Reporting Awards scheme; Association of Certified Chartered Accountants (ACCA) Sri Lanka Awards for Sust. Reporting.	Sri Lanka	No limit

Appendix B

Table B.1

The frequency of reporting frameworks and approaches referenced (at least once) within the sample, listed by number of companies and reports in order of most frequently mentioned.

#	Organisations	Reporting frameworks and approaches referenced	Companies (n = 94)		Reports (n = 138)	
			N	%	N	%
International sustainability reporting frameworks						
1	United Nations	SDGs	93	98.9	124	89.2
2	International Standard Organisation	ISO standards (assorted)	85	90.4	111	79.9
3	CDP (formerly Carbon Disclosure Project)	CDP	85	90.4	105	75.5
4	United Nations	United Nations Global Compact	80	85.1	103	74.1
5	GRI	GRI Sustainability Standards	77	81.9	105	75.5
6	Taskforce for Climate Disclosure (TCFD / TFCF)	Any materials	60	63.8	81	58.3
7	International Integrated Reporting Council	Integrated Reporting (IR) Framework	33	35.1	35	25.2
8	Sustainability Accounting Standards Board (SASB)	Sustainability Accounting Standards Board (SASB)	26	27.7	30	21.6
9	European Commission	EMAS	19	20.2	19	13.7
10	European Commission	Product or Organisational Environmental Footprint (PEF or OEF)	4	4.3	4	2.9
11	Climate Disclosure Standards Board (CDSB)	Climate Disclosure Standards Board (CDSB)	3	3.2	3	2.2
Sustainability rating agencies						
12	Ecovadis	–	38	40.4	42	30.2
13	Sustainalytics	–	32	34.0	36	25.9
CE-specific material						
14	Ellen MacArthur Foundation (EMF)	Any material	21	22.3	24	17.3
15	British Standards Institute (BSI)	Any material	9	9.6	9	6.5
15	GRI	GRI 306: Waste	33	35.1	34	24.5
16	UL	UL 3600: Measuring and Reporting Circular Economy Aspects of Products, Sites and Organizations	0	0	0	0

Appendix C

Table C.1

Companies and their presence on sustainability rankings (n = 94).

Number of companies present on	N	% of all companies
DJSI Industry Leader list	22	23.4
DJSI Top 100	44	46.8
Corporate Knights Global 100	45	47.9
Seal award winners list	30	31.9
1 ranking	61	64.9
2 rankings	22	23.4
3 rankings	8	8.5
4 rankings	3	3.2

Appendix D

Table D.1

Frequency of report formats for companies producing only one report containing non-financial information in 2019 (n = 52 companies).

Report Format	Number of companies	%
Annual Report	22	42.31
Integrated Report	12	23.08
Other document	6	11.54
Sustainability report	5	9.62
Integrated Annual Report	5	9.62
Non-Financial Statement	1	1.92
Corporate Sustainability Report	1	1.92
Total	52	100

Table D.2

Frequency of report formats for companies producing two reports containing non-financial information (n = 38 companies).

Report formats	N	%
Sustainability Report + Annual Report	29	71.05
Annual Report + Other	1	2.63
Integrated Annual Report	1	2.63
Annual Report	0	0
Other Document	5	13.16
Non-Financial statement	2	5.26
Corporate Sustainability Report	2	5.26
Total	38 companies	100

Table D.3

Frequency of combinations of report formats for companies producing three reports containing non-financial information (n = 3 companies).

Report formats	No. companies
Sustainability Report + Integrated Report + Annual Report	2
Sustainability Report + Annual Report + Other Document	1
Total	3

Appendix E

Table E.1

List of companies which are reporting material issues labelled within circular* terminology and the labels of other related material issues contained within the same materiality assessment.

#	Company name	Explicit CE material issue	Other related material issues reported
1	Koninklijke KPN NV	Circular Operations	–
2	Telenet Group Holding	“contributes to the circular economy by developing circular supply chains, recovering and recycling materials, extending the product lifecycle through refurbishment of CPE and by offering products as a service”	–
3	Electrolux	Offer circular products and business solutions	Lead in energy and resource-efficient solutions
4	H & M Hennes & Mauritz	100% Circularity	–
5	Industria de Diseno Textil SA (inditex)	Circularity	Responsible sourcing, Sustainable products, Packaging
6	Melia Hotels International SA	Circular Economy and Responsible Consumption	–
7	Moncler SpA	Circular Economy	Responsible sourcing, Product quality and safety,

Table E.1 (continued)

#	Company name	Explicit CE material issue	Other related material issues reported
8	British American Tobacco PLC	Circular Economy	Environmentally friendly packaging Water and waste
9	Essity AB	Waste/circularity and plastics	–
10	Nestle SA	Resource efficiency, (food) waste and the circular economy	–
11	Koninklijke Philips NV	Circular Economy	Sustainable value creation, Waste management, Energy efficiency, Product responsibility and safety
12	CNH Industrial NV	Circular Product lifestyle	Water and waste efficiency, Value chain management, Emissions, Innovation to zero
13	Signify NV	Circular Economy	Responsible packaging, Energy efficiency, Water usage, Carbon footprint, Subtopics: Circular lighting, Weight and materials, Waste management
13	Akzo Nobel NV	Circular Economy	Resource productivity, Supplier sustainability
14	BillerudKorsnas AB	Circularity of products and solutions	Waste, Sustainability in innovation, Water and effluents
15	Koninklijke DSM	Resources and Circularity	–
16	Novozymes A/S	Circular economy and resource efficiency	–
17	Acciona SA	Waste and the circular economy	–
18	Galp Energia SGPS SA	Circular Economy	Operational eco-efficiency
19	Hera SpA	Transition to the circular economy	–
20	Iberdrola SA	Circular Economy	–
21	Red Elctrica Corporacion S.A.	Circular Economy	–
22	Suez	Transition to the circular economy	Optimized water and waste management, Reducing energy consumption, Greenhouse gas emissions, Eco-design and processes and facilities, Resource scarcity, Fight against waste trafficking

Appendix F

Table F.1

Distribution of companies according to the presence of targets and indicators for CE within their sustainability reports according to their countries.

Country	Total number of companies in sample	Both CE targets and indicators reported	% of all companies within country	Neither targets or indicators for CE reported	% of all companies within country
Austria	1	0	0	1	100
Denmark	5	2	40	3	60
Finland	6	3	50	3	50
France	14	3	21.43	7	50
Germany	10	2	20	6	60
Ireland	2	0	0	2	100
Italy	10	1	10	5	50
Norway	2	0	0	1	50
Portugal	2	1	50	1	50
Spain	11	4	36.4	3	27
Sweden	5	3	60	1	20
Switzerland	8	1	12.5	6	75
The Netherlands	8	6	75	2	25
United Kingdom	10	2	20	6	60
TOTAL	94	28		47	

Appendix G

Table G.1

Share of companies reporting targets and indicators for CE according to how many reports they produce.

	CE-related targets		CE-related indicators	
	Companies (N)	Companies (%)	Companies (N)	Companies (%)
Company produces only one report	23	59.0	22	61.1
Company includes the same data in all reports published	2	5.1	3	8.3
Company includes CE data only in sustainability or non-annual reports	11	28.2	9	25
Company includes CE data within only the annual report	0	0	0	0
Company includes different CE data in each report	3	7.7	2	5.6
Total	39	100	36	100

References

- Abeydeera, S., Tregidga, H., Kearins, K., 2016. Sustainability reporting more global than local? *Meditari Account. Res.* 24 (4), 478–504. <https://doi.org/10.1108/MEDAR-09-2015-0063>.
- Abhayawansa, S., Tyagi, S., 2021. Sustainable investing: the black box of environmental, social, and governance (ESG) ratings. *J. Wealth Manag.* 24 (1), 49–54. <https://doi.org/10.3905/jwm.2021.1.130>.
- Adams, C.A., Abhayawansa, S., 2021. Connecting the COVID-19 pandemic, environmental, social and governance (ESG) investing and calls for 'harmonisation' of sustainability reporting. *Crit. Perspect. Account.* 102309. <https://doi.org/10.1016/j.cpa.2021.102309>.
- Adams, C.A., Druckman, P.B., Picot, R.C., 2020. Sustainable Development Goal Disclosure (SDGD) Recommendations. ACCA, Chartered Accountants ANZ, ICAS, IFAC, IIRC and WBA.
- Adams, C.A., Alhamood, A., He, X., Wang, L., Wang, Y., 2021. The Double-materiality Concept Application and Issues.
- Ahlström, H., Williams, A., Vildåsen, S.S., 2020. Enhancing systems thinking in corporate sustainability through a transdisciplinary research process. *J. Clean. Prod.* 256. <https://doi.org/10.1016/j.jclepro.2020.120691>.
- Amankwah-Amoah, J., 2020. Stepping up and stepping out of COVID-19: new challenges for environmental sustainability policies in the global airline industry. *J. Clean. Prod.* 271, 123000. <https://doi.org/10.1016/j.jclepro.2020.123000>.
- Armenic, J., Craig, R., 2006. *CEO-speak: The Language of Corporate Leadership*. McGill Queen's University Press.
- Bae, H., Smardon, R.S., 2011. Indicators of sustainable business practices. In: Broniewicz, E. (Ed.), *Environmental Management in Practice*. InTech, pp. 177–206. <https://doi.org/10.5772/17254>.
- Baumgartner, R.J., Rauter, R., 2017. Strategic perspectives of corporate sustainability management to develop a sustainable organization. *J. Clean. Prod.* 140 (January), 81–92. <https://doi.org/10.1016/j.jclepro.2016.04.146>.
- Bengtsson, M., 2016. How to plan and perform a qualitative study using content analysis. *NursingPlus Open* 8, 8–14. <https://doi.org/10.1016/j.npls.2016.01.001>.
- Berkes, F., Kislalioglu, M., Folke, C., Gadgil, M., 1998. Minireviews: exploring the basic ecological unit: ecosystem-like concepts in traditional societies. *Ecosystems* 1 (5), 409–415. <https://doi.org/10.1007/s100219900034>.
- Beske, F., Hausteiner, E., Lorson, P.C., 2020. Materiality analysis in sustainability and integrated reports. *Sustain. Account. Manag. Policy J.* 11 (1), 162–186. <https://doi.org/10.1108/SAMPJ-12-2018-0343>.
- Biermann, F., Kanie, N., Kim, R.E., 2017. Global governance by goal-setting: the novel approach of the UN Sustainable Development Goals. *Curr. Opin. Environ. Sustain.* 26–27, 26–31. <https://doi.org/10.1016/j.cosust.2017.01.010>.
- Birat, J.P., 2015. Life-cycle assessment, resource efficiency and recycling. *Metall. Res. Technol.* 112 (2), 206.
- Bjørn, A., Bey, N., Georg, S., Røpke, I., Hauschild, M.Z., 2017. Is earth recognized as a finite system in corporate responsibility reporting? *J. Clean. Prod.* 163, 106–117. <https://doi.org/10.1016/j.jclepro.2015.12.095>.
- Blum, N.U., Haupt, M., Bening, C.R., 2020. Why “circular” doesn't always mean “sustainable”. *Resour. Conserv. Recycl.* 162 (July), 105042. <https://doi.org/10.1016/j.resconrec.2020.105042>.
- Boesso, G., Kumar, K., 2009. An investigation of stakeholder prioritization and engagement: who or what really counts. *J. Account. Organ. Chang.* 5 (1), 62–80. <https://doi.org/10.1108/18325910910932214>.
- Bovea, M.D., Pérez-Belis, V., Torca-Adell, L., Ibáñez-Forés, V., 2021. How do organisations graphically communicate their sustainability? An exploratory analysis based on corporate reports. *Sustain. Prod. Consum.* 28, 300–314. <https://doi.org/10.1016/j.spc.2021.04.011>.
- Braga Junior, S., Martínez, M.P., Correa, C.M., Moura-Leite, R.C., Da Silva, D., Braga Junior, S., Martínez, M.P., Correa, C.M., Moura-Leite, R.C., Da Silva, D., 2019. Greenwashing effect, attitudes, and beliefs in green consumption. *RAUSP Manag. J.* 54 (2), 226–241. <https://doi.org/10.1108/RAUSP-08-2018-0070>.
- Braun, V., Clarke, V., 2006. Using thematic analysis in psychology. *Qual. Res. Psychol.* 3 (2), 77–101. <https://doi.org/10.1191/1478088706qp0630a>.
- Breitmayer, B.J., Ayres, L., Knaff, K.A., 1993. Triangulation in qualitative research: evaluation of completeness and confirmation purposes. *Image J. Nurs. Sch.* 25 (3), 237–243. <https://doi.org/10.1111/j.1547-5069.1993.tb00788.x>.
- de Brito, M.P., Dekker, R., 2004. A framework for reverse logistics. In: Dekker, R., Fleischmann, M., Inderfurth, K., Van Wassenhove, L.N. (Eds.), *Reverse Logistics*. Springer, Berlin Heidelberg, pp. 3–27. https://doi.org/10.1007/978-3-540-24803-3_1.
- Broadstock, D.C., Chan, K., Cheng, L.T.W., Wang, X., 2021. The role of ESG performance during times of financial crisis: evidence from COVID-19 in China. *Financ. Res. Lett.* 38 (August 2020), 101716. <https://doi.org/10.1016/j.frl.2020.101716>.
- Bryman, A., 2012. *Social Research Methods*. 4th ed. Oxford University Press. <https://doi.org/10.1017/CBO9781107415324.004> (Issue November).
- Burritt, R.L., Schaltegger, S., 2010. Sustainability accounting and reporting: fad or trend? *Account. Audit. Account. J.* 23 (7), 829–846. <https://doi.org/10.1108/09513571011080144>.
- Calabrese, A., Costa, R., Levaldi Ghiron, N., Menichini, T., 2019. Materiality analysis in sustainability reporting: a tool for directing corporate sustainability towards emerging economic, environmental and social opportunities. *Technol. Econ. Dev. Econ.* 25 (5), 1016–1038. <https://doi.org/10.3846/tede.2019.10550>.
- Calisto Friant, M., Vermeulen, W.J.V., Salomone, R., 2020. A typology of circular economy discourses: navigating the diverse visions of a contested paradigm. *Resour. Conserv. Recycl.* 161 (April), 104917. <https://doi.org/10.1016/j.resconrec.2020.104917>.
- Calisto, M., Vermeulen, W.J.V., Salomone, R., 2021. Analysing European Union circular economy policies: words versus actions. *Sustain. Prod. Consum.* 27, 337–353. <https://doi.org/10.1016/j.spc.2020.11.001>.
- Catanzaro, M., 1988. Using qualitative analytical techniques. In: Woods, N.F., Catanzaro, M. (Eds.), *Nursing Research: Theory and Practice*. C. V. Mosby, pp. 437–456.
- Cecchin, A., Salomone, R., Deutz, P., Raggi, A., Cutaia, L., 2021. What is in a name? The rising star of the circular economy as a resource-related concept for sustainable development. *Circ. Econ. Sustain.* 1 (1), 83–97. <https://doi.org/10.1007/s43615-021-00021-4>.
- Clatworthy, M.A., Jones, M.J., 2006. Differential patterns of textual characteristics and company performance in the chairman's statement. *Account. Audit. Account. J.* 19 (4), 493–511. <https://doi.org/10.1108/09513570610679100>.
- <collab>Africa, N.T.of the R.of S</collab>, 2021. Draft: Green Finance Taxonomy of South Africa (Issue June).
- D'Amato, D., Korhonen, J., Toppinen, A., 2019. Circular, green, and bio economy: how do companies in land-use intensive sectors align with sustainability concepts? *Ecol. Econ.* 158, 116–133. <https://doi.org/10.1016/j.ecolecon.2018.12.026>.
- Dagilene, L., Frenzdel, M., Sutiene, K., Wnuk-Pel, T., 2020. Wise managers think about circular economy, wiser report and analyze it. Research of environmental reporting practices in EU manufacturing companies. *J. Clean. Prod.* 274, 121968. <https://doi.org/10.1016/j.jclepro.2020.121968>.
- D'Amato, D., 2021. Sustainability narratives as transformative solution pathways: zooming in on the circular economy. *Circular Economy and Sustainability* (Issue November).
- De Pascale, A., Arbolino, R., Szopik-Depczyńska, K., Limosani, M., Ioppolo, G., 2020. A systematic review for measuring circular economy: the 61 indicators. *J. Clean. Prod.* 2050. <https://doi.org/10.1016/j.jclepro.2020.124942> (xxxxx).
- DeSimone, L.D., Popoff, F., 2000. Eco-efficiency: the business link to sustainable development. *Int. J. Sustain. High. Educ.* 1 (3), 305–308. <https://doi.org/10.1108/ijsh.2000.1.3.305.5>.
- Diaz, A., Schögl, J.P., Reyes, T., Baumgartner, R.J., 2021. Sustainable product development in the circular economy: implications for products, actors, decision-making support and lifecycle information management. *Sustain. Prod. Consum.* 26, 1031–1045. <https://doi.org/10.1016/j.spc.2020.12.044>.
- Doppelt, B., 2003. *Leading Change Toward Sustainability: A Change-Management Guide for Business, Government and Civil Society*. Greenleaf Publishing.
- Droege, H., Raggi, A., Ramos, B., 2021. Overcoming current challenges for circular economy assessment implementation in public sector organisations. *Sustainability (Switzerland)* 13 (1182), 1–22.
- Ellen MacArthur Foundation, 2013. *Towards the Circular Economy*. Ellen MacArthur Foundation. <https://doi.org/10.1162/108819806775545321>.
- European Commission, 2014. *Directive 2014/95/EU on the Disclosure of Non-financial and Diversity Information by Certain Large Undertakings and Groups*.
- European Commission, 2015. *Closing the Loop: An Ambitious EU Circular Economy Package*. COM(2015) 614. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions.
- European Commission, 2017. *COMMISSION DECISION (EU) 2017/2285 of 6 December 2017*. 1221, pp. 38–86.
- European Commission, 2020. *Circular Economy Action Plan*. <https://www.switchtogreen.eu/wordpress/wp-content/uploads/wp-post-to-pdf-enhanced-cache/1/circular-economy-strategy.pdf>.
- Proposal for a Directive of the European Parliament and of the Council amending Directive 2013/34/EU, Directive 2004/109/EC, Directive 2006/43/EC and Regulation (EU) No 537/2014, as regards corporate sustainability reporting (Issue COM(2021) 189 final). European Commission. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021PC0189&from=EN>.
- European Financial Reporting Advisory Group, 2021. *CURRENT NON-FINANCIAL REPORTING FROMATS AND PRACTICES* (Issue February).
- Ferriani, F., Natoli, F., 2021. ESG risks in times of Covid-19. *Appl. Econ. Lett.* 28 (18), 1537–1541. <https://doi.org/10.1080/13504851.2020.1830932>.
- Finnveden, G., Hauschild, M.Z., Ekvall, T., Guinée, J., Heijungs, R., Hellweg, S., Koehler, A., Pennington, D., Suh, S., 2009. Recent developments in life cycle assessment. *J. Environ. Manag.* 91 (1), 1–21. <https://doi.org/10.1016/j.jenvman.2009.06.018>.
- Fortunati, S., Martiniello, L., Morea, D., 2020. The strategic role of the corporate social responsibility and circular economy in the cosmetic industry. *Sustainability (Switzerland)* 12 (12). <https://doi.org/10.3390/su12125120>.
- de Freitas Netto, S.V., Sobral, M.F.F., Ribeiro, A.R.B., Soares, G.R.da L., 2020. Concepts and forms of greenwashing: a systematic review. *Environ. Sci. Eur.* 32 (1). <https://doi.org/10.1186/s12302-020-0300-3>.
- Geissdoerfer, M., Savaget, P., Bocken, N.M.P., Hultink, E.J., 2017. The circular economy – a new sustainability paradigm? *J. Clean. Prod.* 143 (April 2018), 757–768. <https://doi.org/10.1016/j.jclepro.2016.12.048>.
- GeSI, 2018. *Materiality Assessment Review and Alignment With the SDC's*.
- Ghisellini, P., Cialani, C., Ulgiati, S., 2016. A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems. *J. Clean. Prod.* 114, 11–32. <https://doi.org/10.1016/j.jclepro.2015.09.007>.
- Global Reporting Initiative, 2016. *Consolidated Set of GRI Sustainability Reporting Standards 2016* Amsterdam.
- Gray, R., Adams, C.A., Owen, D., 2014. *Accountability, Social Responsibility and Sustainability: Accounting for Society and the Environment*. Pearson. <https://doi.org/10.4337/9781781006733.00016>.
- Gunaratne, N., Wijayasundara, M., Senaratne, S., Kanchana, P.D.K., Cooray, T., 2021. Uncovering corporate disclosure for a circular economy: an analysis of sustainability and integrated reporting by Sri Lankan companies. *Sustain. Prod. Consum.* 27, 787–801. <https://doi.org/10.1016/j.spc.2021.02.003>.

- Gusmerotti, N.M., Testa, F., Corsini, F., Pretner, G., Iraldo, F., 2019. Drivers and approaches to the circular economy in manufacturing firms. *J. Clean. Prod.* 230, 314–327. <https://doi.org/10.1016/j.jclepro.2019.05.044>.
- Hahn, R., Kühnen, M., 2013. Determinants of sustainability reporting: a review of results, trends, theory, and opportunities in an expanding field of research. *J. Clean. Prod.* 59 (November 2013), 5–21. <https://doi.org/10.1016/j.jclepro.2013.07.005>.
- Heras-Saizarbitoria, I., Urbiet, B., Boiral, O., 2021. Organizations' engagement with sustainable development goals: from cherry-picking to SDG-washing? *Corp. Soc. Responsib. Environ. Manag.* (April), 1–13 <https://doi.org/10.1002/csr.2202>.
- Holsti, O.R., 1969. *Content Analysis for the Social Sciences and Humanities*. Addison-Wesley Publishing Company.
- IBM, 2020. IBM SPSS Statistics. 26.
- ICC, 2021. *ICC Framework for Responsible Environmental Marketing Communications* (Issue November).
- Izzo, M.F., Ciaburri, M., Tiscini, R., 2020. The challenge of sustainable development goal reporting: the first evidence from Italian listed companies. *Sustainability* 12 (8), 1–18. <https://doi.org/10.3390/su12083494>.
- de Jesus, A., Mendonça, S., 2018. Lost in transition? Drivers and barriers in the eco-innovation road to the circular economy. *Ecol. Econ.* 145 (September 2017), 75–89. <https://doi.org/10.1016/j.ecolecon.2017.08.001>.
- Kalmykova, Y., Sadagopan, M., Rosado, L., 2018a. Circular economy – from review of theories and practices to development of implementation tools. *Resour. Conserv. Recycl.* 135, 190–201. <https://doi.org/10.1016/j.resconrec.2017.10.034>.
- Kalmykova, Y., Sadagopan, M., Rosado, L., 2018b. Circular economy – from review of theories and practices to development of implementation tools. *Resour. Conserv. Recycl.* 135, 190–201. <https://doi.org/10.1016/j.resconrec.2017.10.034>.
- Khalid, M.K., Agha, M.H., Shah, S.T.H., Akhtar, M.N., 2020. Conceptualizing audit fatigue in the context of sustainable supply chains. *Sustainability (Switzerland)* 12 (21), 1–11. <https://doi.org/10.3390/su12219135>.
- Khan, O., Daddi, T., Iraldo, F., 2020. The role of dynamic capabilities in circular economy implementation and performance of companies. *Corp. Soc. Responsib. Environ. Manag.* 27 (6), 3018–3033. <https://doi.org/10.1002/csr.2020>.
- Kirchherr, J., van Santen, R., 2019. Research on the circular economy: a critique of the field. *Resour. Conserv. Recycl.* 151, 104480. <https://doi.org/10.1016/j.resconrec.2019.104480>.
- Kirchherr, J., Reike, D., Hekkert, M., 2017. Conceptualizing the circular economy: an analysis of 114 definitions. *Resour. Conserv. Recycl.* 127 (April), 221–232. <https://doi.org/10.1016/j.resconrec.2017.09.005>.
- Kirchherr, J., Piscicelli, L., Bour, R., Kostense-Smit, E., Muller, J., Huibrechtse-Truijens, A., Hekkert, M., 2018. Barriers to the circular economy: evidence from the European Union (EU). *Ecol. Econ.* 150, 264–272. <https://doi.org/10.1016/j.ecolecon.2018.04.028>.
- Klein, N., Ramos, T.B., Deutz, P., 2020. Circular economy practices and strategies in public sector organizations: an integrative review. *Sustainability (Switzerland)* 12 (10), 1–24.
- Kohlbacher, F., 2006. The use of qualitative content analysis in case study research. *Forum Qual. Soc. Res.* 7 (1). <https://doi.org/10.17169/fqs-7.1.75>.
- Korhonen, J., Nuor, C., Feldmann, A., Birkie, S.E., 2018a. Circular economy as an essentially contested concept. *J. Clean. Prod.* <https://doi.org/10.1016/j.jclepro.2017.12.111>.
- Korhonen, J., Nuor, C., Feldmann, A., Birkie, S.E., 2018b. Circular economy as an essentially contested concept. *J. Clean. Prod.* 175, 544–552. <https://doi.org/10.1016/j.jclepro.2017.12.111>.
- Kravchenko, M., Pigosso, D.C., McAloone, T.C., 2019. Towards the ex-ante sustainability screening of circular economy initiatives in manufacturing companies: consolidation of leading sustainability-related performance indicators. *J. Clean. Prod.* 241, 118318. <https://doi.org/10.1016/j.jclepro.2019.118318>.
- Kravchenko, M., McAloone, T.C., Pigosso, D.C.A., 2020. To what extent do circular economy indicators capture sustainability? *Procedia CIRP* 90, 31–36. <https://doi.org/10.1016/j.procir.2020.02.118>.
- Krippendorff, K., 2004. *Content Analysis: An Introduction to Its Methodology*. 2nd ed. SAGE.
- Kristensen, H.S., Mosgaard, M.A., 2020. A review of micro level indicators for a circular economy – moving away from the three dimensions of sustainability? *J. Clean. Prod.* 243, 118531. <https://doi.org/10.1016/j.jclepro.2019.118531>.
- Kuo, L., Yeh, C.C., Yu, H.C., 2012. Disclosure of corporate social responsibility and environmental management: evidence from China. *Corp. Soc. Responsib. Environ. Manag.* 19 (5), 273–287. <https://doi.org/10.1002/csr.274>.
- Linder, M., Sarasin, S., van Loon, P., 2017. A metric for quantifying product-level circularity. *J. Ind. Ecol.* 21 (3), 545–558. <https://doi.org/10.1111/jiec.12552>.
- Lindgreen, E.R., Salomone, R., Reyes, T., 2020. A critical review of academic approaches, methods and tools to assess circular economy at the micro level. *Sustainability (Switzerland)* 12. <https://doi.org/10.3390/su12124973>.
- Lozano, R., 2020. Analysing the use of tools, initiatives, and approaches to promote sustainability in corporations. *Corp. Soc. Responsib. Environ. Manag.* 27 (2), 982–998. <https://doi.org/10.1002/csr.1860>.
- Lozano, R., 2013. A holistic perspective on corporate sustainability drivers. *Corp. Soc. Responsib. Environ. Manag.* 22 (1), 32–44. <https://doi.org/10.1002/csr.1325>.
- Lozano, R., Huisin, D., 2011. Inter-linking issues and dimensions in sustainability reporting. *J. Clean. Prod.* <https://doi.org/10.1016/j.jclepro.2010.01.004>.
- Lozano, R., Nummert, B., Ceulemans, K., 2016. Elucidating the relationship between sustainability reporting and organisational change management for sustainability. *J. Clean. Prod.* 125, 168–188. <https://doi.org/10.1016/j.jclepro.2016.03.021>.
- Maas, K., Schaltegger, S., Crutzen, N., 2016. Advancing the integration of corporate sustainability measurement, management and reporting. *J. Clean. Prod.* 133, 859–862. <https://doi.org/10.1016/j.jclepro.2016.06.006>.
- Macellari, M., Yuriev, A., Testa, F., Boiral, O., 2021. Exploring bluewashing practices of alleged sustainability leaders through a counter-accounting analysis. *Environ. Impact Assess. Rev.* 86 (November 2020), 106489. <https://doi.org/10.1016/j.eiar.2020.106489>.
- Marquis, C., Toffel, M.W., Zhou, Y., 2016. Scrutiny, norms, and selective disclosure: a global study of greenwashing. *Organ. Sci.* 27 (2), 483–504. <https://doi.org/10.1287/orsc.2015.1039>.
- MAXQDA, 2021. MAXQDA (2021).
- Michelon, G., Pilonato, S., Ricceri, F., 2015. CSR reporting practices and the quality of disclosure: an empirical analysis. *Crit. Perspect. Account.* 33, 59–78. <https://doi.org/10.1016/j.cpa.2014.10.003>.
- Millar, N., McLaughlin, E., Börger, T., 2019. The circular economy: swings and roundabouts? *Ecol. Econ.* 158, 11–19. <https://doi.org/10.1016/j.ecolecon.2018.12.012>.
- Moraga, G., Huysveld, S., Mathieux, F., Blengini, G.A., Alaerts, L., Van Acker, K., de Meester, S., Dewulf, J., 2019. Circular economy indicators: what do they measure? *Resour. Conserv. Recycl.* 146, 452–461. <https://doi.org/10.1016/j.resconrec.2019.03.045>.
- Moreau, V., Sahakian, M., van Griethuysen, P., Vuille, F., 2017. Coming full circle: why social and institutional dimensions matter for the circular economy. *J. Ind. Ecol.* <https://doi.org/10.1111/jiec.12598>.
- Morseletto, P., 2020. Targets for a circular economy. *Resour. Conserv. Recycl.* 153 (October 2019), 104553. <https://doi.org/10.1016/j.resconrec.2019.104553>.
- Morseletto, P., Biermann, F., Pattberg, P., 2017. Governing by targets: reductio ad unum and evolution of the two-degree climate target. *Int. Environ. Agreements: Polit. Law Econ.* 17 (5), 655–676. <https://doi.org/10.1007/s10784-016-9336-7>.
- MSCI, 2022. Global Industry Classification Standards (GICS) Methodology: Guiding Principles and Methodology for GICS. <https://www.msci.com/documents/1296102/11185224/GICS+Methodology+2022.pdf/f9910041-6127-17d2-1246-4052926ada77?t=1645738126436>.
- Murray, A., Skene, K., Haynes, K., 2017. The circular economy: an interdisciplinary exploration of the concept and application in a global context. *J. Bus. Ethics* 140 (3), 369–380. <https://doi.org/10.1007/s10551-015-2693-2>.
- Na, H.J., Lee, K.C., Choi, S.U., Kim, S.T., 2020. Exploring CEO messages in sustainability management reports: applying sentiment mining and sustainability balanced scorecard methods. *Sustainability (Switzerland)* 12 (2). <https://doi.org/10.3390/su12020590>.
- Niero, M., Rivera, X.C.S., 2018. The role of life cycle sustainability assessment in the implementation of circular economy principles in organizations. *Procedia CIRP* 69 (May), 793–798. <https://doi.org/10.1016/j.procir.2017.11.022>.
- OECD, 2014. Measuring and Managing Results in Development Co-operation: a review of challenges and practices among DAC members and observers. The Development Assistance Committee. <https://www.oecd.org/dac/peer-reviews/Measuring-and-managing-results.pdf>.
- OECD, UNDP, 2020. *Framework for SDG Aligned Finance*.
- Opferkuch, K., Caeiro, S., Salomone, R., Ramos, T.B., 2021. Circular economy in corporate sustainability reporting: a review of organisational approaches. *Bus. Strateg. Environ.* (June), 1–22. <https://doi.org/10.1002/bse.2854>.
- Palinkas, L.A., Horwitz, S.M., Green, C.A., Wisdom, J.P., Duan, N., Hoagwood, K., 2015. Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Admin. Pol. Ment. Health* 42 (5), 533–544. <https://doi.org/10.1007/s10488-013-0528-y>.
- Parchomenko, A., Nelen, D., Gillabel, J., Rechberger, H., 2019. Measuring the circular economy – a multiple correspondence analysis of 63 metrics. *J. Clean. Prod.* 210, 200–216. <https://doi.org/10.1016/j.jclepro.2018.10.357>.
- Pástor, L., Vorsatz, M.B., 2020. Mutual fund performance and flows during the COVID-19 crisis. *Rev. Asset. Pric. Stud.* 10 (4), 791–833. <https://doi.org/10.1093/rapstu/raaa015>.
- Pauliuk, S., 2018. Critical appraisal of the circular economy standard BS 8001:2017 and a dashboard of quantitative system indicators for its implementation in organizations. *Resour. Conserv. Recycl.* 129, 81–92. <https://doi.org/10.1016/j.resconrec.2017.10.019>.
- People's Bank of China, National Development and Reform Commission, China Securities Regulatory Commission, 2021. Notice on Issuing the Green Bond Endorsed Projects Catalogue (2021 Edition). 96, pp. 1–64. <https://www.climatebonds.net/files/files/the-Green-Bond-Endorsed-Project-Catalogue-2021-Edition-110521.pdf>.
- Pereira, Á., Vence, X., 2021. The role of KIBS and consultancy in the emergence of Circular Oriented Innovation. *J. Clean. Prod.* 302. <https://doi.org/10.1016/j.jclepro.2021.127000>.
- Peršić, M., Janković, S., Krivačić, D., 2017. Sustainability accounting: upgrading corporate social responsibility. In: Aluchna, M., Idowu, S.O. (Eds.), *The Dynamics of Corporate Social Responsibility*. Springer, pp. 285–303. https://doi.org/10.1007/978-3-319-39089-5_15.
- Pigosso, D.C.A., McAloone, T.C., 2021. Making the transition to a circular economy within manufacturing companies: the development and implementation of a self-assessment readiness tool. *Sustain. Prod. Consum.* 28, 346–358. <https://doi.org/10.1016/j.spc.2021.05.011>.
- Potting, J., Hekkert, M., Worrell, E., Hanemaaijer, A., 2017. *Circular Economy: Measuring Innovation in the Product Chain*. 42. PBL Netherlands Environmental Assessment Agency.
- Prieto-Sandoval, V., Jaca, C., Ormazabal, M., 2018. Towards a consensus on the circular economy. *J. Clean. Prod.* 179, 605–615. <https://doi.org/10.1016/j.jclepro.2017.12.224>.
- Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088. *Off. J. Eur. Union* L. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A2020R0852>.
- Reike, D., Vermeulen, W.J.V., Witjes, S., 2018. The circular economy: new or refurbished as CE 3.0? – exploring controversies in the conceptualization of the circular economy

- through a focus on history and resource value retention options. *Resour. Conserv. Recycl.* 135, 246–264. <https://doi.org/10.1016/j.resconrec.2017.08.027>.
- Repo, P., Anttonen, M., Mykkänen, J., Lammi, M., 2018. Lack of congruence between European citizen perspectives and policies on circular economy. *Eur. J. Sustain. Dev.* 7 (1), 249–264. <https://doi.org/10.14207/ejsd.2018.v7n1p249>.
- Roos Lindgreen, Erik, Mondello, G., Salomone, R., Lanuzza, F., Saija, G., 2021. Exploring the effectiveness of grey literature indicators and life cycle assessment in assessing circular economy at the micro level: a comparative analysis. *Int. J. Life Cycle Assess.* 26 (11), 2171–2191. <https://doi.org/10.1007/s11367-021-01972-4>.
- Roos Lindgreen, E., Opferkuch, K., Walker, A.M., Salomone, R., Reyes, T., Raggi, A., Simboli, A., Vermeulen, W.J.V., Caeiro, S., 2022. Exploring assessment practices of companies actively engaged with circular economy. *Bus. Strateg. Environ.* 1–25. <https://doi.org/10.1002/bse.2962>.
- Rosati, F., Faria, L.G.D., 2019. Addressing the SDGs in sustainability reports: the relationship with institutional factors. *J. Clean. Prod.* 215, 1312–1326. <https://doi.org/10.1016/j.jclepro.2018.12.107>.
- Ruffi-Salís, M., Petit-Boix, A., Villalba, G., Gabarrell, X., Leipold, S., 2021. Combining LCA and circularity assessments in complex production systems: the case of urban agriculture. *Resour. Conserv. Recycl.* 166 (October 2020), 105359. <https://doi.org/10.1016/j.resconrec.2020.105359>.
- Saidani, M., Yannou, B., Leroy, Y., Cluzel, F., Kendall, A., 2018. A taxonomy of circular economy indicators. *J. Clean. Prod.* 207, 542–559. <https://doi.org/10.1016/j.jclepro.2018.10.014>.
- Santa-Maria, T., Vermeulen, W.J.V., Baumgartner, R.J., 2021. Framing and assessing the emergent field of business model innovation for the circular economy: a combined literature review and multiple case study approach. *Sustain. Prod. Consum.* 26, 872–891. <https://doi.org/10.1016/j.spc.2020.12.037>.
- Sauvé, S., Bernard, S., Sloan, P., 2016. Environmental sciences, sustainable development and circular economy: alternative concepts for trans-disciplinary research. *Environ. Dev.* 17, 48–56. <https://doi.org/10.1016/j.envdev.2015.09.002>.
- Scarpellini, S., Marín-Vinuesa, L.M., Aranda-Usón, A., Portillo-Tarragona, P., 2020. Dynamic capabilities and environmental accounting for the circular economy in businesses. *Sustain. Account. Manag. Policy J.* <https://doi.org/10.1108/SAMPJ-04-2019-0150>.
- Schöggel, J.P., Stumpf, L., Baumgartner, R.J., 2020. The narrative of sustainability and circular economy – A longitudinal review of two decades of research. *Resour. Conserv. Recycl.* 163 (April), 105073. <https://doi.org/10.1016/j.resconrec.2020.105073>.
- Schröder, P., Lemille, A., Desmond, P., 2020. Making the circular economy work for human development. *Resour. Conserv. Recycl.* 156, 104686. <https://doi.org/10.1016/j.resconrec.2020.104686>.
- Schroeder, P., Anggraeni, K., Weber, U., 2018. The relevance of circular economy practices to the sustainable development goals. *J. Ind. Ecol.* 00 (0), 1–19. <https://doi.org/10.1111/jiec.12732>.
- Schulte, A., Maga, D., Thonemann, N., 2021. Combining life cycle assessment and circularity assessment to analyze environmental impacts of the medical remanufacturing of electrophysiology catheters. *Sustainability (Switzerland)* 13 (2), 1–23. <https://doi.org/10.3390/su13020898>.
- Sehnm, S., Pandolfi, A., Gomes, C., 2019. Is sustainability a driver of the circular economy? *Social Responsibility Journal* <https://doi.org/10.1108/SRJ-06-2018-0146>.
- Siew, R.Y.J., 2015. A review of corporate sustainability reporting tools (SRTs). *J. Environ. Manag.* 164, 180–195. <https://doi.org/10.1016/j.jenvman.2015.09.010>.
- Sihvonen, S., Partanen, J., 2017. Eco-design practices with a focus on quantitative environmental targets: an exploratory content analysis within ICT sector. *J. Clean. Prod.* 143, 769–783. <https://doi.org/10.1016/j.jclepro.2016.12.047>.
- Sihvonen, S., Ritola, T., 2015. Conceptualizing ReX for aggregating end-of-life strategies in product development. *Procedia CIRP* 29, 639–644. <https://doi.org/10.1016/j.procir.2015.01.026>.
- Stewart, R., Niero, M., 2018. Circular economy in corporate sustainability strategies: a review of corporate sustainability reports in the fast-moving consumer goods sector. *Bus. Strateg. Environ.* 27 (7), 1005–1022. <https://doi.org/10.1002/bse.2048>.
- van Straten, B., Dankelman, J., van der Eijk, A., Horeman, T., 2021. A circular healthcare economy: a feasibility study to reduce surgical stainless steel waste. *Sustain. Prod. Consum.* 27, 169–175. <https://doi.org/10.1016/j.spc.2020.10.030>.
- Starik, M., Kanashiro, P., 2013. Toward a theory of sustainability management. *Organ. Environ.* 26 (1), 7–30. <https://doi.org/10.1177/1086026612474958>.
- Stumpf, L., Schöggel, J.P., Baumgartner, R.J., 2021. Climbing up the circularity ladder? – A mixed-methods analysis of circular economy in business practice. *J. Clean. Prod.* 316. <https://doi.org/10.1016/j.jclepro.2021.128158>.
- SustainAbility, 2020. Rate the Raters 2020: Investor Survey and Interview Results. <https://www.sustainability.com/globalassets/sustainability.com/thinking/pdfs/sustainability-ratetheraters2020-report.pdf>.
- SustainAlytics, 2021. EU Taxonomy Solution: Assess companies' alignment to the EU Taxonomy. <https://www.sustainalytics.com/investor-solutions/esg-research/eu-sustainable-finance-action-plan-solutions/eu-taxonomy-solution>.
- The Ellen MacArthur Foundation, 2012. Towards the Circular Economy Vol. 1: an economic and business rationale for an accelerated transition. <https://www.ellenmacarthurfoundation.org/publications/towards-the-circular-economy-vol-1-an-economic-and-business-rationale-for-an-accelerated-transition>.
- Torelli, R., Balluchi, F., Furlotti, K., 2020. The materiality assessment and stakeholder engagement: a content analysis of sustainability reports. *Corp. Soc. Responsib. Environ. Manag.* 27 (2), 470–484. <https://doi.org/10.1002/csr.1813>.
- Tsalis, T.A., Malamateniou, K.E., Koulouriotis, D., Nikolaou, I.E., 2020. New challenges for corporate sustainability reporting: United Nations' 2030 Agenda for sustainable development and the sustainable development goals. *Corp. Soc. Responsib. Environ. Manag.* (February) <https://doi.org/10.1002/csr.1910>.
- Ünal, E., Urbinati, A., Chiaroni, D., 2019. Managerial practices for designing circular economy business models: the case of an Italian SME in the office supply industry. *J. Manuf. Technol. Manag.* 30 (3), 561–589. <https://doi.org/10.1108/JMTM-02-2018-0061>.
- United Nations Environment Programme (UNEP), 2001. Cleaner production: a guide to information sources. <https://www.eea.europa.eu/help/glossary/eea-glossary/eco-design>.
- United Nations Environment Programme (UNEP), 2017. *Eco – i Manual: Eco-innovation Implementation Process*.
- Uyar, A., Karaman, A.S., Kilic, M., 2020. Is corporate social responsibility reporting a tool of signaling or greenwashing? Evidence from the worldwide logistics sector. *J. Clean. Prod.* 253, 1–13. <https://doi.org/10.1016/j.jclepro.2020.119997>.
- Van der Lugt, C.T., van de Wijs, P.P., Petrovics, D., 2020. Carrots & Sticks 2020 - Sustainability reporting policy: global trends in disclosure as the ESG agenda goes mainstream. www.globalreporting.org.
- de Villiers, Charles, Maroun, W., 2017. Introduction to sustainability accounting and integrated reporting. In: de Villiers, Charles, Maroun, W. (Eds.), *Sustainability Accounting and Integrated Reporting*, 1st ed. Routledge, pp. 1–12.
- de Villiers, Charl, Van Staden, C.J., 2010. Shareholders' requirements for corporate environmental disclosures: a cross country comparison. *Br. Account. Rev.* 42 (4), 227–240. <https://doi.org/10.1016/j.bar.2010.08.002>.
- Vinante, C., Sacco, P., Orzes, G., Borgianni, Y., 2021. Circular economy metrics: literature review and company-level classification framework. *J. Clean. Prod.* 288, 125090. <https://doi.org/10.1016/j.jclepro.2020.125090>.
- Walker, A.M., Opferkuch, K., Roos Lindgreen, E., Raggi, A., Simboli, A., Vermeulen, W.J.V., Caeiro, S., Salomone, R., 2021. What is the relation between circular economy and sustainability? Answers from frontrunner companies engaged with circular economy practices. *Circular Economy and Sustainability* <https://doi.org/10.1007/s43615-021-00064-7>.
- Walker, A.M., Opferkuch, K., Roos Lindgreen, E., Simboli, A., Vermeulen, W.J.V., Raggi, A., 2021. Assessing the social sustainability of circular economy practices: industry perspectives from Italy and the Netherlands. *Sustainable Prod. Consum.* 27, 831–844. <https://doi.org/10.1016/j.spc.2021.01.030>.
- Walls, J., Berrone, P., 2015. The power of one: how CEO power affects corporate environmental sustainability. *Acad. Manag. Proc.* 1, 12338. <https://doi.org/10.5465/ambpp.2015.40>.
- Wang, P.C., Che, F., Fan, S.S., Gu, C., 2014. Ownership governance, institutional pressures and circular economy accounting information disclosure: an institutional theory and corporate governance theory perspective. *Chin. Manag. Stud.* 8 (3), 487–501. <https://doi.org/10.1108/CMS-10-2013-0192>.
- WBCSD, 2018. *Circular Metrics: Landscape Analysis*.
- Webster, K., 2013. What might we say about a circular economy? Some temptations to avoid if possible. *World Future: The Journal of New Paradigm Research* 69 (7–8), 542–554. <https://doi.org/10.1080/02604027.2013.835977>.
- Whiteman, G., Walker, B., Perego, P., 2013. Planetary boundaries: ecological foundations for corporate sustainability. *J. Manag. Stud.* 50 (2), 307–336. <https://doi.org/10.1111/j.1467-6486.2012.01073.x>.
- Worrell, E., Reuter, M.A., 2014. *Recycling. Handbook of Recycling*. Elsevier, pp. 3–8 <https://doi.org/10.1016/B978-0-12-396459-5.00001-5>.
- Yang, Y., Chen, L., Jia, F., Xu, Z., 2019. Complementarity of circular economy practices: an empirical analysis of Chinese manufacturers. *Int. J. Prod. Res.* 57 (20), 6369–6384. <https://doi.org/10.1080/00207543.2019.1566664>.