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Review

Addressing the Social Aspects of Circular Economy: A Systematic Literature Review

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Abstract: Circular Economy (CE) is a growing topic among scholars, industry and government aiming at decoupling economic growth and development from the consumption of finite resources. CE incorporates different meanings, from reduce, reuse and recycle activities to environmental degradation or resource scarcity, and supported by specific indicators to attain sustainable development. However, so far, there has been no agreement to measure how effective an industry/product is in making the transition from linear to circular approaches, particularly those affected the society. This research work aims to perform a systematic literature review (n=60) to analyze and discuss how social aspects have been considered and integrated in the CE research so far. Moreover, this review provides and overview of the literature on social impact within CE, that resulted in three main outputs: a knowledge map of the CE, an analysis of social aspects within CE, and the theories/frameworks used to evaluate social impact of CE. Finally, this study brings to light how CE implementation can affect society and highlights the importance of social dimension in the domains of CE and policy-making community, which could help moving CE towards a sustainable development.

Keywords: Circular Economy; Social Aspects; Systematic Review; Sustainable Development

1. Introduction

Circular Economy (CE) has emerged as a paradigm recently, highlighting a path to attain sustainable development and to proposing ways to create value for costumers, societies and other stakeholders. Moreover, the understanding of CE has attracted increasing research interest and its currently mainstreamed in several stakeholders, from municipal to national governments, academia and business around the world, since it has become a policy tool to move forwards sustainability. [1].

CE puts forward the concept of developing new business models that transform traditional closed-loop economies of "take, make, dispose" [2] into an alternative flow model- one that is cyclical-, looking for closed loops. It has been argued that cyclical materials reduce negative environmental impacts, by minimizing the consumption of virgin materials and energy, and stimulate new business opportunities [3]. However, CE is emerging as an economy strategy rather than a sustainability strategy, which should require a complete mapping of three sustainability dimensions. Indeed, although sustainability has as main goal benefiting the environment, the economy, and society at large, the current main beneficiaries of the CE appear to be economic actors that implement the system [4].

Recently, a considerable number of reviews have taken the challenge of undertaking research focused on the relationship between CE and sustainability concept, as well as the large amount of terms that are related to it. For instance, studies have referred to CE as new sustainability paradigm, that enables progress in sustainable development through the implementation of CE [4–6]. Other researchers have investigated the imitations and challenges of CE attempting to contribute to global net sustainability [3,7]. Moreover, discussions and critics about the various CE conceptualizations have made towards the coherence of CE [1,8]. Other authors as De Pádua Pieroni et al. [9] propose business models based on business model innovation as a strong foundation to transition to CE, with sustainability as a strong foundation.

In short, notwithstanding a few voices from authors advocating for the inclusion of social aspects in CE concepts, tools and metrics, the concept of CE today clearly appears to prioritise the economic system with primary benefits for the environment, either resource efficiency or environmental efficiency, and only implicit gains for social aspects. Some of these voices are Korhonen et al. [3] that emphasize the importance of including a social objective in CE, establishing the sharing economy, increased employment and participative democratic decision making as main issues to be included. Additionally, Homrich et al [11] point out the lack of more research approaches applying a triple bottom line perspective, since the focus until now remains from economic-environment perspectives, while concern with social aspects are still missing. Both suggest integrated CE policies and regulation implementation to increase CE effectiveness. Thus, if social dimension is included in the basic formulation, we can hope to move forwards to full sustainability.

Reviews on CE have pointed out weaknesses in the current concept, particularly because there is lack of social and institutional dimensions, issues that are considered important to the development of the CE concept [12]. As quoted by Geissdoerfer et al., [4], many conceptualizations of the term seems to ignore socioeconomic effects and only emphasise on economic issues, while simplify the environmental dimension. Similarly, Murray et al. [7]support that circularity benefits some aspects of sustainability, but lacks the integration with social dimension. Besides, many researchers highlight that there is no evidence the contribution of CE to sustainability, particularly to social wellbeing. [4] So far, insufficient consideration is given to how CE will interact with normality (habits, norms), and meanings in circularity approaches [14].

Although various benefits that CE potentially could lead to society, the conceptual relationship between CE concept, tools and social impact is not clear. This has potential implications to outline how social impacts can be associated with CE implementation on the affected stakeholder groups. As far as we know, no research has systematically reviewed how socials aspects are dealt and integrated in CE strategies and tools. Therefore, to fill this gap, this wok aims to analyze and summarized through a systematic literature review, the social dimension within CE. Hence, the research questions addressed in this paper are: what are the socio-economic aspects related to CE? and which methodological tools and metrics are used for assessing the social dimension within CE?

2. Research Methodology

This review was conducted in accordance with general systematic review principles [15], and is based on research articles published up from 2009 to the march 2019 and academic search databases (Springer, Science Direct, MDPI and Whiley). First, searching words were associated by the Boolean operators OR and AND, and defined using the following topics: “circular economy” OR “circularity” AND “social aspects, OR “social indicators”, OR “social issues”, OR “social implications”, OR social indicators, OR social impact, OR social value, OR social cohesion, OR social capital. Our first search generated 3,647 potentially studies.

Following Becheikh et al., [16], we performed a two-step screening (practical screening, inclusion criteria). As a first step, a practical screening was applied to titles and abstracts (3647

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studies) to eliminate duplicates. The practical screening was done by one author and repeated once after the coding of all papers to ensure all relevant works were included. The searching was limited to peer-review works and only published in English language. We concentrated on English literature to make this review replicable for readers. After the application of practical-screening, 1,580 relevant studies were identified.

As a second step screening, we defined the following criteria inclusion for the studies in order to be considered in the final systematic review:

- The articles must deal-evaluate-propose with, either separately or mixed, at least one social aspect/indicator/issue/parameter/implication and;
- The articles must consider as a core CE or its associated concepts (green economy, cradle-to-cradle, industrial ecology and bioeconomy);

The screening criteria were applied to abstract-introduction-conclusion sections. It was found that 1,319 studies did not achieve the inclusion criteria; thus, 261 potentially studies were kept for analysis. Finally, a full-text analysis (261) was launched to determine the final studies for the systematic review. After that, only 60 relevant studies, which included all inclusion criteria established above were considered for the systematic review process. Figure 1 shows the process adopted to carry out the literature review.

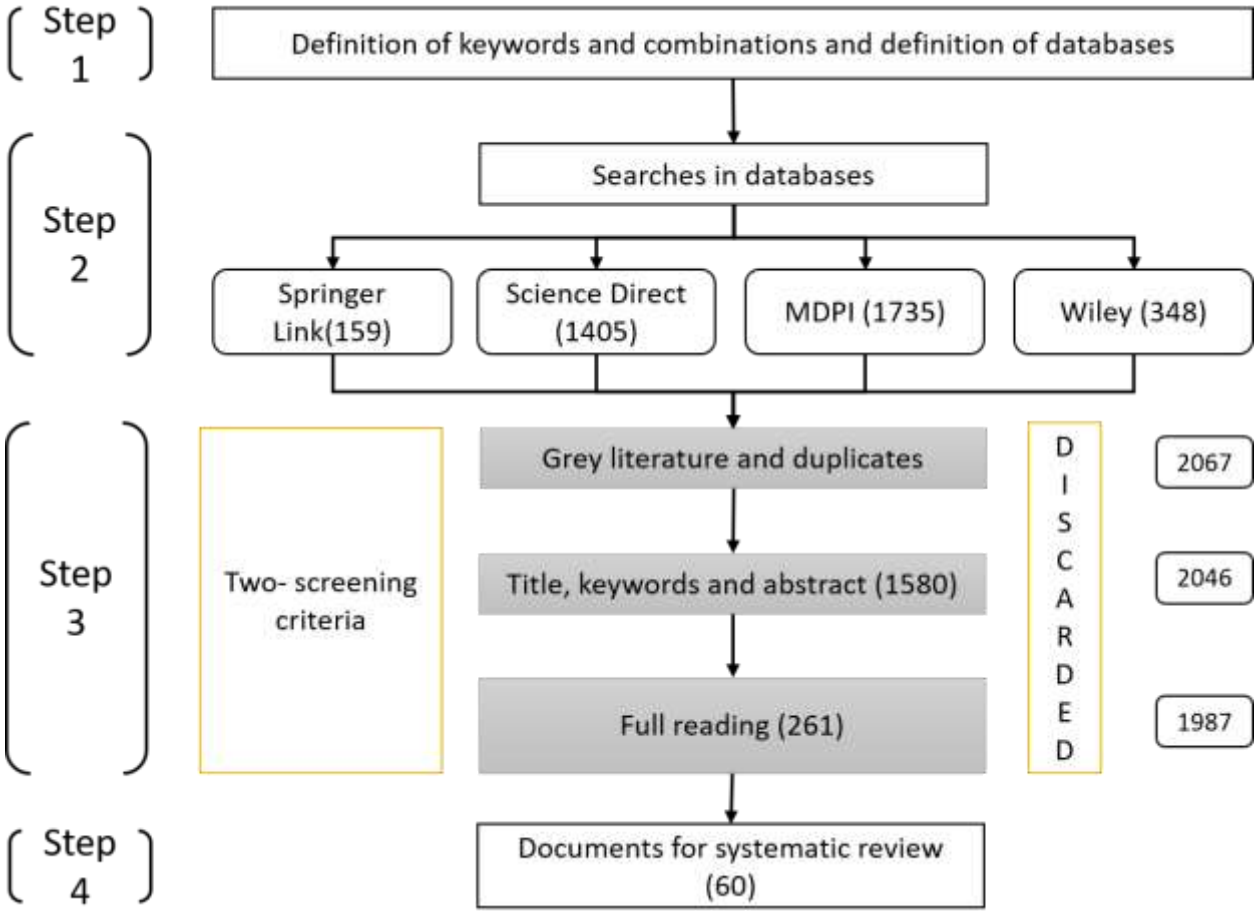

Figure 1. Research strategy implemented to undertake the systematic review.

3. Systematic Literature Review

3.1. Characteristic of the Included Studies

From the 60 articles reviewed it can be seen that interest on social dimension within CE academia grew from 2015 onward. This behaviour can be explained due to the increment of environmental international regulations as highlighted by Sassanelli et al., [17]. Some of these

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regulations became more closed and important because of climate change, urbanization and consumerism. Moreover, The Ellen MacArthur Foundation report, published in 2015 [18], has emphasized the inclusion of social dimension within circular performance assessment. Table 2 shows the number of publications in the last ten years, with the greatest part (38%) of them published in 2018.

Regarding the type of research, both, articles published in international journals (59) and proceedings of international conferences (1) were considered. Three journals present bigger contribution in terms of social implications within CE works, Sustainability (25%), Journal of Cleaner Production (25%) and Resources, Conservation & Recycling (9%), with almost 60% of papers reviewed.

Most of papers selected (53%) gave relevance to the analytical assessment that is the approach most exploited, analytical assessment is used to break CE down into its respective constituents in order to drive the methodology (elements of CE), while theoretical approaches (22%) tend to describe various aspects of human behaviour providing models for investigating complexity of CE (whole object-CE), followed by case study (13%) and surveys (12%).

3.2. Geographical context

In order to analyze the region where circular economy works are applied and implemented, the papers were allocated regarding to the geographic context (Figure 2), wherever possible. 85% of studies investigated have a exact geographic zone. Of these, 70% settle their investigation in Europe, 23% in Asia, while Africa, North America and Latin America, together reach only 7%.

For Europe, most of the studies focused on Germany (16%) and The European Community (EC) (16%) as a whole, followed by Sweden (10%), Italy (10%) and United Kingdom (10%) and other European countries (38%). It should be notice that in Europe, CE first emerged in Germany with the 1976 Waste Disposal Act, and then supported by the Waste Directive 2008/98/EC [19] and the CE Package [20].

Regarding to Asia, China (55%) is the country with the greatest number of works on the subject in this review. This could be attributed to the early adoption (year 2002) of CE as nationwide development strategy. In the wake of this Chinese strategy, many other countries have promoted CE as a new development strategy. However, the current China policy framework stresses too much on the means and not enough on the ends of the CE.

In contrast, North America and Latin America have only a few works represented in this review. This could be attributed to the existence of few initiatives in the region [21]. United States (US) is one of the few countries that present a relevant CE federal policy, based on previous regulations: the Resource Conservation and Recovery Act of 1976 [22] and the Pollution Prevention Act of 1990 [23].

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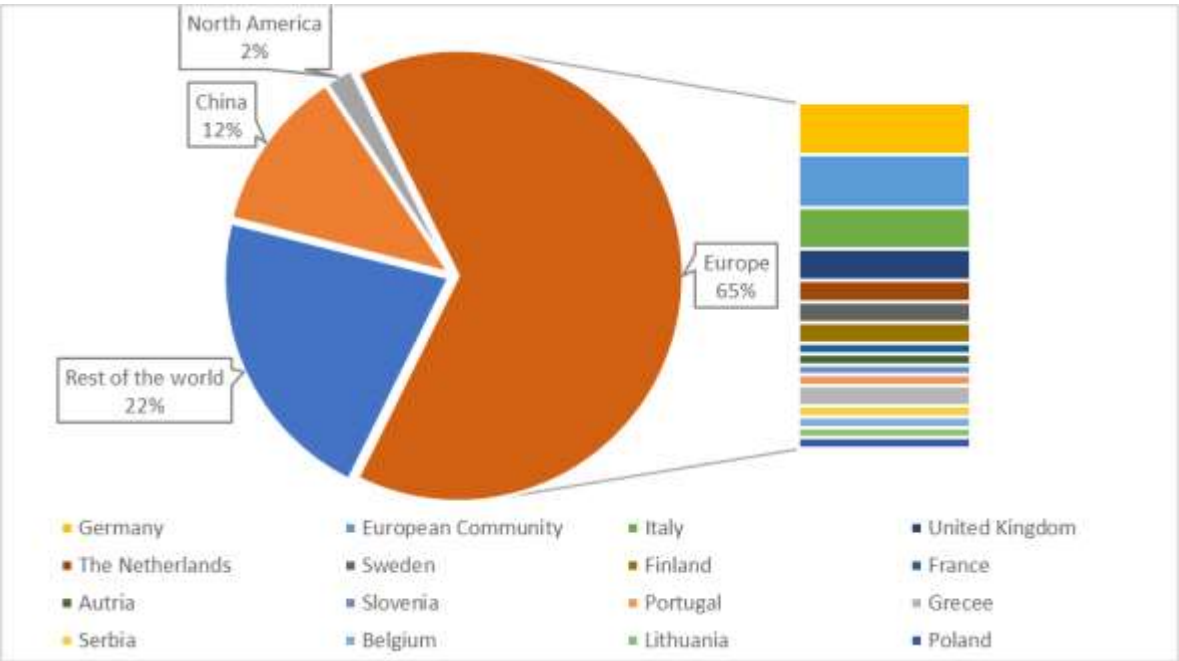

Figure 2. Geographical context found in CE documents.

3.3. Level of Analysis (scale)

The implementation of CE is categorized according three systematic levels [21] . The micro level which emphasize on products, companies, or consumers. The meso level focus on industrial parks, industrial symbiosis districts, and macro level that includes activities within a city, region, nation and beyond. In this review, the level of analysis present that a-third of studies reviewed (32%) conducted studies oriented at macro level: either society level (eg. Egenolf et al., (2019); Pitkänen et al., (2016)), municipal (eg. Sun et al., 2017) or regional level (eg. Girard and Nocca, 2017; Puppim de Oliveira et al., 2013). The micro level of analysis portrays 30% of studies (eg. company: Azevedo et al., 2017; Biber-Freudenberger et al., 2018, consumers Biber-Freudenberger et al., 2018, products: Laurenti et al., 2018a), followed by Not mentioned (17%) (eg. Millar et al., 2019; Murray et al., 2017; Schroeder et al., 2018) and meso level (17%) (eg. industrial parks Zhang et al., 2009; Zhao et al., 2018, 2017). An important number of studies (3%) presented a combined (micro and macro) level of analysis (eg. Iacovidou et al., 2017; Mattila et al., 2018).

3.4.Industries

In this section, the papers reviewed were categorized in relation to the industry of implementation. In almost 50% of works analyzed it was possible to distinguish a sector of activity. The most relevant sectors are waste management (14%) (eg. Ashton and Bain, 2012) and manufacture (7%) (eg. Azevedo et al., 2017). This is supported by [39] who highlighted that most of the circular economy works focus on waste industry, since one the objectives of CE is to minimize wastes and improve its use. With regards to the manufacture sector, the most investigated areas are metal [40] and paper production [41].

About other industries, the chemical (5%) (eg. He et al., 2018b) is the most investigated regarding the technological sphere, while the agri-food industry (5%) (eg. Winkler et al., 2019) and wood (5%) (eg. Jasinevičius et al., 2017) are the most studied in the biological sphere. While in services the tourism and commodity accounted for 8%. The rest of industries accounted for (12%) include cities (3%), high-tech (3%), energy generation (2%), textile (2%) and communication (2%).

4. Results and Discussions

4.1. Classification of Social Aspects

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In order to help to articulate the findings of this review, the social aspects were first classified, in order to analyse their meaning and relevance in the sustainability context. Typically, the meaning of sustainability has been interpreted differently according to the actors involved, the context, and the indicators used to measure it. Sustainability aspects often appear classified in three dimensions: environmental, economic and social. While this three-dimension classification is being debated, no other categorization schemes haven been proposed so far in the literature. However, while the concept of a social dimension to sustainability is generally accepted, its implementation in sustainability strategies has not been very clearly defined or agreed. Indeed, despite the variety of available social sustainability categories/aspects/indicators, Hutchins et al., (2019) note the absence of a commonly accepted indicators of social sustainability.

Therefore, in this review, we based our analysis on the sustainability categories identified by Dempsey et al., and Ellen Macarthur Foundation, [18,46]. The categories gave an overview of social dimension in terms of sustainable development and circularity, the categories were grouped into thematic areas and social aspects according to the Table 1.

Table 1. Thematic areas and aspects for social dimension within CE.

Thematic areas	Labor Practices and Decent Work	Human Rights	Society	Product Responsibility
Social Aspects	Employment Labor/Management Relations Occupational Health and Safety Training and Education Diversity and Equal Opportunity Fair distribution of income Quality and Well-being	Investment Non-discrimination Freedom of Association and Collection Bargaining Child Labor Forced or Compulsory Labor Security Practices Human Rights Mechanisms	Social inclusion (equity) Social networks Social cohesion Participation and Local Democracy Anti-corruption Public Policy Compliance Supplier Assessment for Impacts on Society Cultural Traditions Tourism and Recreation Local Communities (Sense of community and belonging)	Customer Health and Safety Product and Service Labelling Marketing Communications Costumer Privacy Compliance Anti-competitive behavior

*A fifth thematic area, named as "Others" present those indicators that cannot be classified in the thematic areas proposed.

4.2. Thematic areas and social aspects within CE

After determining the classification above, the thematic areas and the social aspects identified in this review are shown in Figure 3. The social aspects used in the papers reviewed addressed a wide spectrum of issues related to the social dimension of CE, within which numerous aspects aim to support CE assessment across the macro, meso and micro levels. Society is the thematic area that has the highest percentage of indicators found in the literature (49%), followed by labor practices

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and decent work (41%), while others (6%), human rights (2%) and product responsibility (2%) presented the lowest level of occurrence.

Concerning the single aspects, employment has the highest frequency (reported in 23 out 60 studies) in the reviewed studies, tied at second level of occurrence are quality and wellbeing, social networks and local community (reported in 13 out 60 studies). Social equity has also a high frequency (reported in 12 out 60 studies). From Figure 3 also emerges that some indicators (like participation and local democracy (10/60), social cohesion (9/60) and occupational and health and safety (8/60)) are increasingly used to assess the social dimension within CE. It should be noted that although sharing economy and green purchasing/consumption indicators do not represent a high frequency in reviewed studies (less than 3%) they have been recognized as a new vision for the consumption culture within CE for sustainable development [3]. The role of institutions/governance have (reported in 3 out 60) gained an insight within CE practitioners because they provide the basic requirements for transitioning to CE, and they also stimulate the creation of new policies enhancing sustainability. In the following section are analyzed in detail the most frequented social aspects (employment, social inclusion, participation and democracy and health and safety) to provide a more compressive overview.

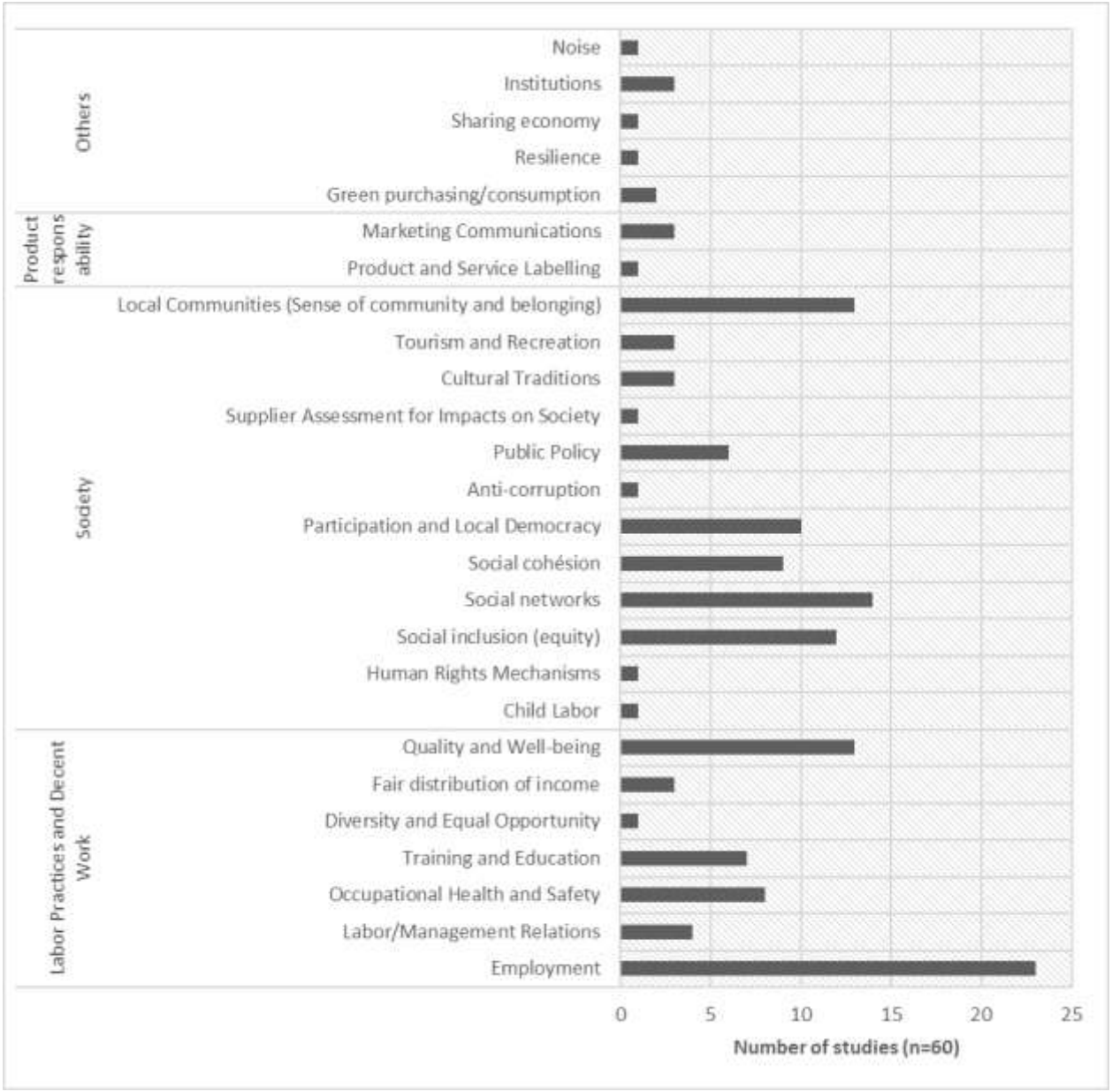

Figure 3. Thematic areas and social aspects in the systematic review.

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4.2.1.Employment

As seen in Figure 3, employment was the social aspect most often cited in this review, since CE has the potential to create employment opportunities which directly deals with regional unemployment disparities and occupational mismatch. These studies highlight the importance of promoting circularity-based economies and show that it is necessary that governments are involve by proposing new policies and incentive their development in order to create more jobs. These policies should also help improve energy efficiency through greener technologies, smarter strategies to move forward better waste management systems, lower carbon emissions, increased renewable energy sources, etc. All these new developments would require the development of new business models that incorporate greener jobs

In this review, Pociovălişteanu et al., [48] studied the relationship between environment and jobs, by means of determining the jobs created derived from the environmental policies. Their findings suggest that measures to promote green jobs in the context of sustainability should be oriented towards the development of educational programmes and training and encouraging the adoption of greener technologies among different stakeholders. It was also found that investment in green infrastructure should promote green economy at social level. In this sense, employment in the CE plays an important role in overcoming socio-economic challenges, by which CE has the possibility to create new jobs, even if modest or transformational, and combating against unemployment and social inequity, for an exponentially growing population in a shifting economy.

Jobs in circular economy can be newly created, created by substitution or redefined. Moreover, green jobs on the road to contribute to decent work have to: 1) incentive jobs that meet conditions in terms of pollution (which have to be minimized), 2) commute traditional jobs to greener jobs, by employing non fossil sources, by retraining workers and by greening working methods and 3) stop working in excessively contaminated areas. The CE can also contribute to offsetting the disappearance of low-level occupations. However, if the circular economy aimed to be developed extensively, there would be necessarily some types of higher skilled employment. In this sense, education and training contribute to the development of these skills, increase labour productivity, and thus move forward sustainable development. Thus, to promote employment in circular economies, attempts must be carried out both at the industry and government levels. Both must strengthen employment through strategies and incentives, either to close material loops or to use products more efficiently. But, this transition would also depend on how workers receive the necessary training and skills to fulfil the employment demanded in CE.

4.2.3. Social Inclusion (Equity)

As noted in Section 4.2 and Figure 3, equity is one of the most frequent aspect. In this review, there are multiple references to social equity ranging from intra-generational equity and inter-generational equity [49], equitable distribution of systems' benefits [36] to improving social benefits for poverty alleviation [50]. The importance of equity resides, among other aspects, in improving human rights and social justice. It has its base in social justice, distributive justice, and equality condition [51]. This reflects the connectedness of the concept of social equity within interpretation of sustainable development aimed at satisfying the needs of present as well as future generations.

Moreover, there are some cases of inconclusive approaches, found in the literature, on how the CE will promote social equity. For example, Xue et al., [53]propose that the CE can improve social welfare distribution, at the same time Geng and Dobertein, [54] suggest that CE helps to further social justice. However, these approaches seem to be vague suggestions in terms of measuring CE due to no quantitative studies have been proposed which support these statements. In addition, no suggestions are found on how CE improve aspects of this dimension. In this regard, some efforts haven been made to measure social equity, for example, Gross Domestic Product (GDP) has been proposed as a relevant indicator of social equity. On the one hand, Zhijun and Nailing, [55] suggest that the CE can incentive economic and social growth, and discussion about that the implementation of the CE in certain areas has been associated with an important raise in GDP. They advocate the

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idea that GDP increment can be employed as an indicator for social equity. On the other hand, Van Den Bergh, [56] argue that GDP is not sufficient for improving social equity. Therefore, as indicated by Moreau et al., [58] it seems that there is no knowledge about how CE could support the promotion of social equity, there has been no detailed analysis, and it is necessary, explicitly, that CE empirically supports this fact.

As a consequence, if CE is seen as a tool to move forwards sustainable development it must firstly develop a framework to show how CE strategies can promote/incentive social equity and it can be incorporated with other aspects. However, as supported by Moreau et al.,[57] so far, there is no explicitly evidence on how CE could support the encouragement of social equity. Thus, it is necessary to create the tools and mechanisms that can adequately and accurately integrate the concept of social equity within CE discourse to progress in different directions, in this regard, further work is necessary in this area.

4.2.4. Sharing Economy /collaborative economy

Defining 'sharing economy' has been a challenge, particularly considering the widespread usage and its multiple definitions, including peer to peer economy, collaborative economy, fair trade, community currencies, on-demand, collaborative consumption, to name but a few. However, these approaches agree that sharing economy aims to distribute the goods/services or other resources by multiple people. The sharing economy assumes the principle of maximizing the utility of benefits via lending, renting, exchanging, etc., issued by technology.

Moreover, practitioners of the theme suggest that this type of economy is conducted by three main assets: more efficient and resilient use of financial resources (economic), more efficient use of natural resources (environmental) and deeper social interactions among people (social) [59]. In parallel, the sharing economy also support targets such community-building, economic empowerment, creative expression, but also resource management.

In the last years the concept has perhaps become progressively less transparent in a context where sharing and collaborative frameworks are together linked with a perception of start-ups and the promotion of small enterprises. All these models are facilitating and extended by technology platforms, wherein the three main systems drive within the collaborative consumption and sharing economy: redistribution markets, product service systems and collaborative lifestyles platforms. The principal examples of these business include sectors as: office space, transportation, accommodation, tourism, retail products and financial services. However, sharing models is only a little part of the large CE picture, and in-deep questions should be asked to have clearer implications for consumers/users and its shortage of acceptance. In this sense, it is imperative the adoption of digital technologies to increase the use of and optimise resources and material flowss, and promote the integration of user and consumption perspectives into design processes in order to integrate them into circular solutions.[60].

4.2.5. Participation and Local Democracy

Participation and local democracy are two ways in which society can express their own opinions, and in some cases, they can influence in decisions makings, in instance, circularity decisions. Both aspects can serve as local change mechanisms to educate people and to easy information about a bureau's activities and enable people to be part of conducting decisions. On this subject, the understandings and outcomes from society participation can play an important role in tackling persistent societal problems in a reasonable, transparent, and multi-aspect way, along with enable innovations for circularity. So, CE strategies should explicitly propose strategic and systematic approaches to bring all stakeholders together to attempt policy coherence. Therefore, all CE actors must be connected more closely with multi-perspective policy process and intergovernmental discussions and should be organized by a common perspective of a sustainable CE system.

In terms of participation related to environmental issues, there are recognized three levels of participation: participation in the planning process, participation via information and participation

in finance decisions. In studies reviewed, different goals and scopes are pursued, from the decision making progress [61], stakeholders interest and perceptions of bio economy [62] to consumers' perspective on CE strategies for reducing wastes [63]. These approaches have the powerful either to give an insight base for short-term democratic and decision-making agendas of incentives and measures forwards a potentially sustainable CE as well as to actually put them into practice.

From a community perspective, a greater participation within and by local communities develops the functional benefits, as mentioned by Korhonen et al., [64]. Thus, operation of CE should increase participative democratic decision-making through a community user. Moreover, it is important pay attention from stakeholder perspective, since this approach can generate better decisions that are more likely to be implemented, raises legitimacy, and promotes a wider understanding of the complexity of societal problems. Participation by local actors, plays also an important role in a community-centred perspective that accentuates local empowerment.

Another area related to community and involvement in decision-making is social acceptance, also referred to as community acceptance. Community acceptance involves specific acceptance of siting decision within projects, in this case projects related to CE, by local actors, particularly residents and local authorities. This is the place where the Not in My Back Yard (NIMBY) concept spreads. The NIMBY reflects a phenomenon defined as "public opposition to construction of certain public facilities in urban development" [65]. NIMBY conflict increases when residents have different perceptions of gains and losses resulting from the development of certain projects. This concept is basically an effect of community perceptions; particularly on the perception of the visual impact, noise, hygiene, safety etc., requirements of such facilities, on which most habitants are against to [66].

In addition, the NIMBY syndrome is commonly seen as negative term involving selfishness, ignorance, and irrationally on favor of residents interested in conserving their own turf and putting their own interests ahead of societal assets [67]. However, some scientists have criticized this concept since they argue that it lacks robust theoretical framework and conceptual models for measuring it, and it is suggested that language of NIMBY should be excluded [68] . Furthermore, public policy and researchers need to develop frameworks for understanding public perceptions involving CE strategies affecting local communities. In this regard, education and awareness raising campaigns could modify this opposition (NIMBY) and provide a better community cohesion when it comes to implementing strategies for CE projects [69]. Implementing these strategies is a way to address citizens' environmental concerns and give them access to decision-making information about transition to CE.

4.2.6. Health and Safety (occupational and consumer)

The transition to a CE has implications for the stated priorities of human health in the following years. These priorities include dealing with major disease concerns, strengthening people-centred health systems and public health capacity, and creating supportive environments and resilient communities, among others. The CE may affect the burden of disease both positively (e.g. though reduction of air pollution due to transition to circular economy mobility and production modes; such as [70,71] and negatively (e.g. if hazardous chemicals are not managed to minimize health risks; such as Garrido-Azevedo et al., [72]. The CE can also contribute to improving the delivery of public health and health care services by providing a range of cost saving and efficiency measures. In this regard, the transition to the circular economy could promote supportive environments and resilient communities to the extent that this translates into improved well-being and quality of life. Up to now, however, the coverage of the health link to transition to a circular economy has been nearly insufficient.

There have been a few specific and indirect CE actions that attempted to evaluate and improve health consequences. Direct actions include those case studies on chemicals of concern, e-waste and food safety, while indirect actions would result in reduced global environmental pollution from production and consumption process. In the context of assessing the health implications of the transition to a CE, it is necessary to develop a framework to identify pathways through which

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implementation of circular economy models may affect human health and welfare. The framework should be designed to describe the health and welfare impacts identified according to their key characteristics, including the type of effects (positive/negative, direct/ indirect) and the economic sectors and groups affected (distributional issues). To the extent possible, the framework should draw on and adapt existing frameworks and classifications from the environment and health literature, including from WHO initiatives. A key question in this context is to what extent circular economy actions do and will alleviate or contribute to environmental health risks for the vulnerable stakeholders.

4.3. Theoretical approaches within CE

The multiple choices in terms of social aspects within CE is a difficult decision that usually entails the application/development of theories and frameworks/method/index/approach. In this review, the documents were classified according their level of empiricism by non-empirical (theoretical approaches) and empirical studies (analytical assessment, case study and survey). Regarding to non-empirical studies they contribute to 22% of papers reviewed. From these studies (13 articles) use socio-economic theories as following: the social and solidarity economy [58,73,74], socio-technical transition theory [75], stakeholder theory [76], governance theory [61,77], historical analysis [50,78], grounded theory [79], social embeddedness and social capital [80], sustainable oriented theory of the firm [81] and Gideen's structuration theory [82].

4.4. Methods and tools

Methodologies for quantifying and valuing social aspects are not yet well stablished, however our results found that approximately 78% of the reviewed literature sample use quantitative related-social methodologies. The increment of quantitative studies, 44 studies, indicate a progression in social performance measurement, rising from a theoretical base to a quantitative framework. This is interesting because normally social impacts are often of a qualitative nature and not easily quantifiable [83]. The outlook of social indicators in performance measurement can be interrogated if significant qualitative indicators are overlooked in favor of more easily quantifiable effects.

The overall publication of frameworks for guiding the social dimension within CE are diverse, principally four principal approaches are frequently mentioned (in 56% of empirical studies) by researchers ranging from UN sustainable development goals (used as targets indicators) (8 articles), forecasting and statistical methods (surveys and Delphi-method) (18%), UNEP Social Life Cycle Assessment (SLCA) (7%) and generic sustainable indicators (7%). The rest of approaches (eco-innovative solutions, monitoring framework, dynamics systems, sustainable business model, IPCC guidelines and ecological footprint) account for 45% of empirical studies.

4.5. International Reports on Circular Economy and Social Dimension

Through all this review there have been analyzed scientific papers and proceedings, all of those from the academia, however, it is necessary to mention initiatives from other stakeholders, in this case from International Organizations, that consider/include social dimension to pave the way to a more inclusive and sustainable global economy (Table 2).

1

Table 3. International reports focus on social aspect of circular economy.

Methodology/Approach	Description	Social dimension	Weakness
Ellen Macarthur Foundation [18]	Approach developed to measure effectiveness of a company in achieving transition from linear to circular models.	It is proposed complementary social issues based on the Global Reporting Initiative (GRI) guidelines.	It is not reported how to measure social issues and how to incorporate these issues into circularity indicators
Towards a greener economy [84]	Initiative developed to understand labor implications in green economies.	This report focusses on employment generation by relocating resources from high carbon to lower carbon economies.	The principal lack of this initiative is that only focus on a single stakeholder and there are missing the community and consumers stakeholders.
Social circular economy opportunities [85]	A report to highlight the opportunities, insights and themes to engage enterprises and society through the creation of social circular enterprises	It is proposed a term of social circular economy, a holistic view in line with UN sustainable goals to accelerate progress to a circular economy	The main criticism of this approach is the lack of indicators and ways to measure how implementation of social circular economy has improved the society
The Circular Economy and Benefits for Society [86]	A Report focused on the social benefits from linear to circular economy	The report aimed to explore employment benefits and CO_2 reductions in Poland and Czech Republic by evaluating circular strategies.	It is only measured employment in terms of economic indicators (jobs generated), it not specified quality issues such as skills and training, involved in circular economy strategies.
Handbook for product social impact assessment [87]	This report describes a methodology to assess social impacts of product and services with focus on life cycle approach	Regarding to CE, this metrics discusses how CE strategies can have potential social impacts on social actors along the product value chain.	The incorporation of CE seems to be ambiguous and no identification is made on how CE-strategies analysis could improve social well-being or equity.

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5. Conclusions and final remarks

This systematic literature review has highlighted that despite being advocated as a tool for Sustainable Development, current CE framework has not clear if it can promote the social well-being for this generation and those to come. In addition, it is uncertain whether the CE can be a more sustainable model than linear economy. Furthermore, social dimension is an important area in the domains of CE and sustainable development. As such, academia, government and firms are increasingly striving to achieve a comprehensive understanding and valid measurement of social dimension to influence the overall implementation of CE as a means for achieving a sustainable development.

From this work, it was built a systematic review to array the existing social dimension within CE and to realise areas covered and areas that present shortage of contributions. This review is composed by there main pillars related with criteria analysed: social aspects, theories and frameworks/methodologies. So, this study has presented an overview of the current debates surrounding the social issues of circularity frameworks from a systematic review perspective. All 60 reviewed scholarly articles + 5 reports claim to incorporate a circularity perspective. We initially examined articles and classified in terms of scope, industry, year of publication and scale. Further, we have undertaken an analysis of aspects. methodologies and theories for performing the social dimension assessment in order to incorporate them into CE within the context of sustainable development.

Our review has shown that there is not yet a consensus to select an appropriate framework or approach that considers all social issues, due to it depends on the scope of the study, data availability, and the priorities of the group of interest involved in the CE under consideration. Contrarily, the reviewed papers have not tried to cover multiple aspects, the studies are really focused on very narrow aspects, where the main efforts have focused on employment. However, the social aspects covered are useful when evaluating the social impacts of a circular economy. After reviewed all papers we outlined that diverse social impacts can be associated with circular economy, particularly, circular economy strategies. These potential impacts are based on the affected stakeholders' groups. i.e. those produced on 1) workers, small-case enterprises and local communities, in the product value chain, and those produced on 2) user of products and services. The distinguish are based on circular economy strategies that are focus on closing material loops (workers, small enterprises and local communities) and using products more efficiently (final users).

Therefore, this review can help CE practitioners by providing directions about the aspects to be considered in the development of a holistic framework to measure the social impacts of circular strategies and to take in account all stakeholders involved in the supply chain. However, future search should begin to analyze the importance of other dimensions that matters CE, such as, governance and cultural aspects, into our understanding these two aspects are crucial to continue research on CE. This may require significant re-examination of much current theory, and lead to a new paradigm of CE. This led us to incorporate a wider win-to-win vision of the CE. Moreover, further studies should define and specify how to measure social indicators and how circular economy practices improve the human well-being of society. Real-world case studies to facilitate the development of a circularity database, particularly for social impacts, of the circular economy need to be implemented. In fact, this could only be comparing social aspects of a linear economy against a circular economy, some years after implementation, sustained with an enough different indicator for circularity. Alternately, the real-world-case could look at two regions where on is circular and other is lineal, although there may be a regional bias on the social aspects considered.

Despite the remaining challenges, considering current social aspects can be an outset point for evaluating the social dimension in the circular economy to inform decision makers about enhancing or preventing social impact derived from circular economy strategies.

Credit author statement

Alejandro Padilla-Rivera: conceptualization, methodology, investigation and writing. Sara Russo-Garrido: writing- review & editing. Nicolas Merveille: Review & editing and supervision.

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