


JUST2CE

A Just Transition to Circular Economy

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Framing Circular Economy in the context of Global Environmental Justice

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PROJECT No. 101003491

JUST2CE will assess the current state of transition towards the circular economy in relevant economic sectors and analyse possible transition scenarios, as well as their outcomes and impacts. It will identify the key factors that can stimulate or hinder this transition. Natural resources are extracted and transformed into products, which are eventually discarded. As many natural resources are finite, it is important to keep materials in circulation for as long as possible. This makes the transition to the circular economy more vital than ever but is a responsible, inclusive, and socially just transition to a circular economy possible or even desirable? What can technical, political, and social factors enable or hamper such transformation? The EU-funded JUST2CE project will answer these questions. It will explore the economic, societal, gender and policy implications of the circular economy paradigm. The project's findings will shed light on how to ensure democratic and participatory mechanisms when designing and managing such technology.

History Chart

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Executive Summary

Building upon JUST2CE's initial assumption that the current understanding of Circular Economy (CE) lacks a proper consideration of Environmental Justice (EJ), this report brings to light and discusses the critical intersections between these two areas of knowledge and practice on both conceptual and empirical levels. The report comprises five sections, plus a reference list and an Appendix. The first section (Introduction) offers a preliminary conceptual toolbox in Environmental Justice theory, which will guide the analysis and discussion of results in the remaining sections. Section 2 (Methodology) explains the criteria adopted in bibliometric and empirical analysis. Section 3 identifies and reviews the available academic literature that explores the intersections of CE and EJ scholarship. Section 4 analyses empirical evidence on EJ conflicts in the Global South, which mobilise CE as an emerging claim, and illustrates the case of waste-pickers in Rio de Janeiro. Section 5 concludes the report by identifying the main research gaps and suggestions for further research.

This report adopts a definition of Global Environmental Justice as the global convergence of struggles against the growth of social metabolism and related environmental costs and of the Global South as a metaphor indicating all the 'sacrifice zones' (and the communities inhabiting them) where the environmental costs of economic growth tend to disproportionately concentrate.

Key findings of this report and their significance for the JUST2CE project

1. EJ research has demonstrated how **the growth of the industrial social metabolism is the primary cause of environmental injustice**, i.e. the unequal distribution of environmental costs across societies and world regions. **To be conducive to global environmental justice, the CE must adopt a degrowth approach**, i.e. dissociate itself from the accelerated increase of energy and material throughput.
2. In their prevalent formulation, CE policies and practices are similar to linear economy policies and practices in their capacity to generate unequal social and territorial impacts - both within countries and globally. **In short, in its current formulations, the CE is a potential new source of global environmental injustice.**
3. Conversely, **when reclaimed by EJ actors, the CE may become a useful tool** to redress environmental and social inequalities
4. **The CE needs to be reformulated as both a response to ecological unsustainability and a form of debt reparation** - i.e. the reparation of climate and ecological debt¹ historically accrued by the Global North

¹ See https://en.wikipedia.org/wiki/Climate_reparations

via resource plundering and waste dumping imposed by its linear economy in the Global South. In short, the Global North owes circularity to the Global South.

5. **The CE must consider workers** (both waged and unwaged) **as primary stakeholders in the transition to a circular economy**; particularly, it must consider the work practices and knowledge of reproductive and subsistence workers in the Global South as crucial forces for a just transition to CE.
6. Considering **distributional justice in the transition to CE requires addressing cost-shifting problems**, i.e. paying attention to who is shouldering the cost of a CE transition and where
7. Considering **procedural and recognition justice in the transition to CE requires paying attention to the inclusivity of decision-making processes**, i.e. whether marginalised groups are adequately represented as subjects of the transition and whether their perspectives have an equal voice.
8. **Evidence from Ecological Distribution Conflicts (EDC) shows that the circular economy means different things to different social actors**, depending on whether it is mobilised by environmental justice organisations (EJOs) and aimed at enhancing local livelihoods and the preservation of local environments, or by State and corporate actors, and aimed at GDP growth and profit maximisation.
9. Waste-picking constitutes a significant branch of repair-reuse-recycle activities on the world scale, especially in the Global South, and provides indispensable yet highly devalued services to the CE; **a just CE transition requires careful consideration of the experience, knowledge, needs and perspective of waste-pickers.**

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List of abbreviations

CE	<i>Circular Economy</i>
EDC	<i>Ecological Distribution Conflicts</i>
EJ	<i>Environmental Justice</i>
EJATLAS	<i>Environmental Justice Atlas</i>
EJO	<i>Environmental Justice Organizations</i>
GEJ	<i>Global Environmental Justice</i>
HERU	<i>Home Energy Recovery Unit</i>
JUST2CE	<i>Just Transition to Circular Economy</i>
WCE	<i>Working Class Environmentalism</i>
WtE	<i>Waste-to-Energy</i>

[1] Introduction

[1.1] Environmental Justice and Circular Economy: same object, different projects

The JUST2CE consortium is built on the idea that any transition to a CE needs to consider justice in all dimensions. JUST2CE's primary goal is to investigate how the CE paradigm can become a valid alternative to the linear economy in terms of both sustainability and social justice. Answering this question demands consideration of Environmental Justice (EJ) research, searching for the existing and potential intersections with CE research.

Although the CE literature is much more extensive than the EJ literature (around 18.000 vs 8.000 entries in Scopus), the latter started 15 years before the former (see Fig.1). The interdisciplinary field of EJ scholarship emerged in the US in the mid-1980 (see section 1.2), approximately at the same time as the emerging field of Ecological Economics. Since then, both EJ and Ecological Economics scholars have developed alternative theories of incommensurable values, metabolic accounting, and institutional analysis to expose the unfair and unsustainable impacts that the increasing flows of material and energy associated with GDP growth upon vulnerable and/or racialised people and their ecosystems (Martinez-Alier, 1987; Bullard, 1990).

It is worth noting that one of the pioneers of Ecological Economics, Kenneth Boulding (1966), wrote a paper titled "The Economics of the Coming Spaceship Earth" that influenced D.W. Pearce and K.R. Turner, who were the first scholars to use the term "circular economy" in their handbook for environmental economists (Pearce & Turner, 1990). Boulding criticised the linear "cowboy economy" and set the basis for developing research on the material balance of the economy (D'Alisa, 2019). Since then, ecological economists have shown that the economy could only be interpreted as a linear system of expansion by ignoring the limits and boundaries the environment set to a sustainable level of extraction and the discard of material and energy (Daly, 1997). At the same time, industrial ecologists and eco-designers in the fields of Environmental Engineering, Innovation, and Technology Studies, started to develop applied research on how to increase the efficiency in material use and extend the life of products as a response to the never-ending demand for new resources, as well as the urgency to reduce the exponential increase of waste the industrial system was generating (Ghisellini et al., 2016).

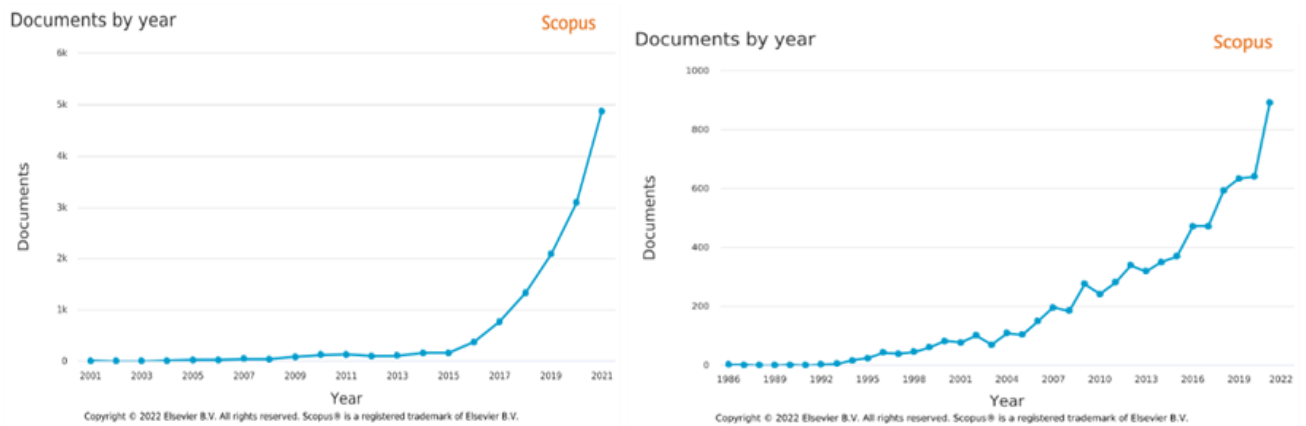


Fig.1 – Search results for “Circular Economy” (left side) and “Environmental Justice” (right side) on the Scopus database (Retrieved in September 2022).

Starting from the early 2000s, a new approach to EJ emerged, later defined as the Ecological Distribution Conflict framework (more details below). It builds on ecological economics, looking at the unequal distribution of the costs and benefits of the linear growing economy (Martinez-Alier, 2002), highlighting primarily the need to address the environmental distributive injustice structurally linked to this model of “take-make-waste society”. Waste has been the primary concern of landmark books for developing an EJ framework that deals with waste conflicts and toxic disposal in poor, vulnerable and racialised spaces worldwide (Pellow, 2002; Pellow, 2007; D’Alisa & Armiero, 2012).

CE and EJ scholarships have two fundamental concerns in common: how to convert the linear path of the economy into a circular one and how to deal with the increasing amount of waste the industrial system generates. Nevertheless, the former pays little attention to the unequal distribution of costs and benefits of both the linear economy and prospective transitions to a CE, e.g. how the transformation of the waste sector will affect the different actors involved in formal and informal waste management worldwide. This partly explains why, even if CE and EJ scholars had many occasions to cross-breed each other, they have ignored their research outcomes reciprocally. Responding to this knowledge gap requires delving into the EJ theory developed over the past three decades and extrapolating the conceptual tools most relevant to CE research and policy.

[1.2] Global Environmental Justice: a conceptual toolbox

Before moving to a detailed analysis of the intersections between CE and EJ, it is worth introducing the EJ scholarship and four key related concepts that are relevant to frame CE in the context of GEJ, namely: 1) social metabolism; 2) ecological distribution conflicts; 3) climate and ecological debt, and 4) working-class environmentalism.

The EJ scholarship originates in the anti-toxic struggles of Black, Latino, and Native American communities in the U.S.A. Since the second half of the 1960s, these racialised communities have been denouncing how toxic waste and hazardous activities tended to concentrate systematically in their neighbourhoods and territories and characterise their working environment (Bullard, 1993; LaDuke, 1999). Some EJ scholars have also shown the connections between waste-related conflicts in the U.S.A. and the Civil Rights movement (Bullard & Johnson, 2002). The concept of EJ embodied community-led expertise that demonstrated the correlation between sites of pollution disposal and exposure, racial discrimination, and poverty. Statistical evidence of the existence of "environmental racism" was thus established via social science research (Bryant & Mohai, 1992), giving rise to a new body of scholarship, which has produced detailed analyses of the unequal distribution of social and environmental costs between different social groups. Moreover, international and global aspects have been highlighted by tracing pollution chains of production and disposal from centres to peripheries of the global economy, through global waste chains, for example, or waste-shifting towards peripheral territories within Europe (D'Alisa & Armiero, 2012), so that it is possible to identify forms of toxic colonialism, and even "garbage imperialism" (Pellow et al., 2001).

Born as both civil society and an academic discipline and initially framed in terms of distributive justice (i.e. focused mainly on the unequal distribution of environmental burdens and benefits), EJ has developed since towards more articulated notions of justice based on recognition, participation, and capabilities (Schlosberg, 2007). Theories of EJ tend to refer mainly to three dimensions of justice: distributive, procedural, and recognition. Distributive justice focuses on the unequal distribution of risks, opportunities and resources among and across communities. In contrast to commutative definitions of justice that only consider arithmetic equality, i.e. ignoring differences between individuals and giving everyone the same share, distributive justice aims to correct pre-existing inequalities (Schlosberg, 2007). Procedural justice is the idea of fairness in the processes used to resolve disputes or allocate resources. Among these processes, contemporary justice thinkers generally attribute a fundamental function to the participation of all actors in decision-making over the allocation of risks and wealth (Rawls, 2009; Nussbaum, 2006). For EJ movements, participation is the key to ensuring a just resolution of social conflicts and recognising oppressed individuals and groups (Schlosberg, 2007). Recognition justice assumes that social or environmental injustice situations do not concern only distributional issues but also a social subordination that prevents certain minority groups from making their voice heard in the decision-making process and having the same legitimacy as other more powerful economic actors (Schlosberg, 2007; Fraser & Honneth, 2001; Fraser, 2008). According to Velicu and Barca (2021), the main limitation of these conventional understandings of EJ is that they accept the pre-defined (unequal) identities of the actors involved, failing to radically question the politico-economic-legal order that created those identities in the first place. This means that more radical demands for social equality remain unaccounted for.

Over the Past decade, the concept of restorative justice has been increasingly discussed by scholars in connection with environmental problems, with a focus on the victims of environmental crimes and on ensuring accountability of those responsible for environmental harm (Biffi and Pali, 2019). Restorative justice aims to

enforce corporate punishment as a legal tool to restoring the damages of the Anthropocene and to stirring capital investments away from carbon-intensive activities (Braithwaite et al., 2019). Waste has also been of interest in early applications of the restorative justice framework, which has shown how the e-waste recycling program in the U.S.A. aimed to relax the huge dumping of e-waste to makeshift hug in the Global South was indeed causing environmental injustices to its inmates and surrenders (Conrad, 2011).

In the remainder of this section, we offer some basic definitions of four key concepts developed in EJ scholarship that are particularly relevant to CE.

[1.2.1] Social Metabolism

The first understanding of the biological concept of metabolism for social systems is attributed to Karl Marx, who, influenced by Liebig and Moleschott, spoke of "metabolism between man and nature as mediated by the work process" (Marx, 1867/2010: 127).

Over the past three decades, this concept has been key to Ecological Economics, a field of research that considers economies as embedded in larger biophysical ecosystems. Here, "social metabolism" refers to the material and energy throughput - as either resource (energy and raw materials) or sink (rivers and oceans, the atmosphere, the soil, etc.) - which are needed to keep any society alive (Martinez-Alier, 1987; Fischer-Kowalski & Haberl, 1993). This approach suggests that the evolution of socioeconomic systems (human societies, economies, companies, households, etc.) depends on biophysical throughputs that can be measured through Material and Energy Flow Accounting (Haberl et al., 2004; Fischer-Kowalski & Haberl, 2007). Several biophysical indicators have been emerging in the last decades to account for the biophysical structure of economies (Weisz, 2006), such as the Human Appropriation of Net Primary Production. The concept of social metabolism is thus fundamental to CE insofar as it allows inscribing the economy in a much larger circuit of matter and energy from which it can never wholly escape.

EJ scholarship, and especially the work of ecological economist Joan Martínez Alier, has demonstrated how 1) GDP growth is inextricably associated with a continuous and accelerated growth of industrial social metabolism and 2) this increase in social metabolism has caused a highly unequal distribution of environmental costs across social groups and across world areas (see also "Climate and ecological debt" below). For Martínez Alier (2012), then, an alliance between degrowth in the Global North and the environmentalism of the poor in the Global South is necessary to eliminate or sensibly reduce these inequalities. In other words, a global environmental perspective has to be forged on the fact that EJ is incompatible with increased social metabolism – thus, with a growing economy.

The CE, on the other hand, is still geared on a vision of prosperity that relies on continuous GDP growth. As Giampietro and Funtowicz (2020) argue,² the circular economy embodies a paradox: on the one hand, it recognizes the economy's dependence on the material world; on the other, it refuses to see the material limits of any growing economy. Adopting a global EJ perspective on social metabolism is thus the first fundamental step towards a just transition to CE (see section 3.2.1).

[1.2.2] Ecological distribution conflicts (EDCs) and “environmentalism of the poor”

The EJ scholarship has also demonstrated how the unequal distribution of the benefits and costs of societal use of the biophysical environment generates social conflicts, arising at the points where different metabolic patterns collide. Following Martínez Alier (2002), some EJ scholars call these social clashes and upheavals “ecological distribution conflicts – hereby EDCs – (Martinez-Alier & O’Connor, 1996), calling for public participatory debates and non-monetary languages of valuation as the most appropriate ways of addressing EDCs’ claims.

The Environmental Justice Atlas (EJAtlas.org) is an essential inventory of EDCs, whose main actors are indigenous communities, self-sufficient rural populations, and informal and marginalised workers, i.e. the main components of the environmentalism of the poor (Martinez-Alier 2002). The EJAtlas classifies conflicts across commodities (e.g. water, oil, waste) and at different stages of social metabolism processes, depending on whether they take place during the extraction of energy carriers and materials, the transportation and production of goods or in the final disposal of waste (Temper et al., 2015). The EJ Atlas has contributed to mapping and making visible a variety of EDCs worldwide, which, according to its authors, are not simple and isolated elements of separate mobilisations from marginalised social groups defending their livelihood and environments from the global expansion of social metabolism, but are plural and convergent components of a Global Environmental Justice (GEJ hereafter) movement to come (Martinez-Alier et al., 2016). The EJAtlas has allowed the tracing of organisational cross-country connections that globalise claims and struggles against corporations and top-down state-led infrastructure programmes, responding to globally connected processes of dispossession, accumulation and contamination (Martinez-Alier, 2020).

As section 4 will show, the EJ Atlas offers evidence of several EDCs generated at the frontiers of the emerging CE. This demonstrates that CE policies and practices are not different from linear economy policies and practices in generating unequal social and territorial impacts within countries and globally. In short, EDCs research shows that CE, in its current formulations, is a potential new source of global environmental injustice.

² Cit. in Passaro, R., Ghisellini, P., Ulgiati, S., Gonodis, D., Chitaka, T., "Comprehensive review of current applications of CE in the international context" (T1.1 of JUST2CE)

[1.2.3] Ecological and Climate Debt

Ecological debt is critical in the GEJ movement vocabulary (Martinez-Alier 2020). It signals the unequal distribution of costs and benefits of the increase in social metabolism between the global North and South, or – more precisely – across historical colonisers and colonised countries. In short, according to this scholarship, the economic growth of colonising countries has been possible through the historical and present plundering of resources and the discharge of waste and other ecological damage onto colonised territories, generating ‘ecological debt’. Additionally, CO₂ emissions produced by the colonisers disproportionately affect the environmental stability of the colonised world - a process which generates ‘climate debt’ (Pickering & Barry, 2012). This historical trend continues today as a cumulative effect of unequal power relations on the global scale.

Ecological and climate debts can be assessed using Material Flow Analysis, where the monetary evaluation of indicators on pollution, depletion, and degradation, together with ecological footprints (the environmental space occupied and used to maintain a particular production) can be calculated to determine local and global impact of global trade, dominated mainly by the Global North (Pigrau et al., 2014). Although several Marxist-inspired and structuralist approaches have conceptualised the unequal and exploitative trade relation between the Global North and the Global South, here the focus is on the ecological and climate dimension of these inequalities and, conversely, on the unequal impact of the climate crisis worldwide - as highlighted by decolonial social movements since the early 1990s (Warlenius et al., 2015)

Ecological and climate debt theory emphasises that the linear economy is not simply ecologically unsustainable but also a cause of poverty, ecological degradation, and climate risk in many parts of the colonised world - or the Global South. More recently, decolonial movements are demanding the reparation of ecological and climate debt from the Global North, aiming to remediate the legacy of colonialism and unequal ecological exchange (Papadopoulos et al. forthcoming). This implies that the CE needs to be reformulated as a response to ecological unsustainability and as a form of debt repayment via climate and ecological reparations - i.e. compensating the Global South for plundering its resources and the dumping of waste practised by the Global North over the past five centuries. Nevertheless, as sections 4 and 5 will show, the CE configures as yet another source of ecological debt, e.g. through ‘double standard’ practices which tend to dump hazardous recycling and remanufacturing activities in poor countries, taking advantage of cost differentials and the availability of cheap labour and resources.

[1.2.4] Working-class environmentalism

From an EJ perspective, the working class can be defined as “those who make a living out of physical work performed in agriculture, industry or service, typically occupying the bottoms of the labour hierarchy, i.e. the

lowest paying, highest risk jobs” (Barca 2012:2). This socio-ecological definition of the working class makes it possible to investigate ecological struggles and practices in various workplaces led by both waged and unwaged workers. Workers and unions are generally seen as defenders of jobs rather than the planet. This is based on the opposition between the defence of employment - which implies decent jobs in large quantities - and the preservation of the planet, which implies limiting the production of waste, goods and greenhouse gases and therefore limiting the quantity of jobs in specific sectors (see also D1.4). The concept of working-class environmentalism (WCE) allows us to think about the environmental agency of workers who struggle to defend the environment and their labour conditions. Historically, it has often taken the form of both struggles for health and safety at work and public and reproductive health in working-class communities (Barca 2014). Industrial pollution thus appears, for example, as a key concern of residents of polluted environments and of workers who suffer the health effects of degraded labour conditions (Cummings, 2014).

WCE investigates the diversity of actors involved in EJ movements across local and global divisions of labour (Barca, 2012; Barca & Leonardi, 2018; Navas et al., 2022). Within working-class communities, for example, sexual and colonial divisions of labour make women and racialised people most exposed to environmental threats but also most active in environmental conflicts. The most important contribution of working-class environmentalism is its emphasis on work as a primary site of environmental injustice. Workers’ bodies, communities, and living environments are often the first and most affected by pollution, waste, and degrading or hazardous conditions. At the same time, WCE also makes visible the distinct forms of environmental agency and subjectivity carried by workers and working-class communities. Furthermore, WCE invites to consider unwaged and informal labour - most of which is carried out by peasant, indigenous, or working-class women and racialised people in the Global South, or else the global meta-industrial labour class - as ecological subjects who re-produce and protect the biophysical conditions for life on earth, thus producing ‘metabolic value’ (Salleh 2010; Barca 2020).

[2] Methodology

Our investigation into EJ and CE intersections follows two distinct paths: 1) bibliometric analysis and literature review of the Scopus database; 2) identifying and analysing empirical data from the EJ Atlas.

[2.1] Bibliometric analysis and literature review

We searched the Scopus database (of around 81 million curated documents) for documents that had “Circular Economy” and “Environmental Justice” in their title, abstract, or keywords. This filter returned only 13 documents which became 11 after an accurate reading of the selected papers. We excluded one for being indeed out of topic (it was an ontological analysis of nature sports and the intersection between circular economy and environmental justice) and another for being a conference review (Proceedings of the International Conference on Resource Sustainability - Sustainable Urbanization in the BRI Era, 2020). Using open-source software

(VosViewer³), we built a bibliometric network to analyse the co-occurrence between items, i.e. the connection between items is determined based on the number of documents in which they occur together. We used the full counting method (which means that each co-occurrence has the same weight). The results show the existence of clusters that can be interpreted as the junction of broader topics they are addressing (see Appendix).

We use keywords, items and links in relation to building a bibliometric network. The most commonly studied types of relations are citation, keyword co-occurrence, and co-authorship. In the case of citation relations, a further distinction between direct citation relations, co-citation relations, and bibliographic coupling relations can be made. Bibliometric networks are usually weighted networks based on the strength of the links. Links indicate not only whether there is or not a relation between two nodes but also the strength of the relation (Van Eck, 2014). We develop a keywords co-occurrence analysis to explore the topic distribution and research trends of CE and EJ research. The keywords (here used as concepts) are an essential part of a research paper, which carries important information about the paper and can lead to subtopics analysis. Since we want to explore two scientific fields that have not been studied together extensively, a systematic analysis of the papers on both topics can help us understand the development trends and points in which subtopics appear together. The results can indicate the extensiveness of a scholarship, and we can come across concepts that have been or can be correlated.

Keywords co-occurrence analysis is often used to analyse the strength of links between different keywords in several documents. By analysing the co-occurrence relationships of the keywords, we can start to understand the internal composition relationship and structure in a certain academic domain and disclose the research frontiers of the discipline.

Our selection criteria are systematised in the table (tab.1) below:

Table 1. Selection criteria

Source	Scopus database (~81million documents available to date)
Filter	Keywords
Search within	Abstract, Title, Keywords
Search field	“Circular Economy” and “Environmental Justice

³ VosViewer version 1.6.18 (Van Eck & Waltman, 2022)

For the co-occurrence analysis, we used the concepts to create a map based on bibliographic data. We aim to get an overview of the authors' concepts and identify subtopics.

1. *Type of analysis: Co-occurrence*
2. *Unit of analysis: Keywords*
3. *Counting method: Full counting (every keyword count has the same weight, regardless of the number of keywords given to a particular paper)*
4. *Threshold (how many times does a keyword have to occur in the dataset to be included in the analysis):*

A link is a connection or the relation between two terms. Each link has a strength, represented by a positive numerical value. The higher this value, the stronger the link. The strength of a link indicates the number of papers in which two keywords appear together in the same list of keywords. The bigger the circle, the more frequently the keyword appears in the keywords of the paper part of the dataset. The keywords are assigned to a cluster (set of items included in the map) based on a computer algorithm. Each cluster has its colour. There are two standard weight attributes: the Occurrences attribute and the Total link strength attribute. The Occurrences attribute indicates the number of documents in which a keyword occurs. The Total link strength indicates the relative importance of that keyword in the total set.

Following our bibliometric analysis, in section 2.2. we will develop an in-depth critical review of the papers thus selected, grouping them qualitatively and analytically against the grain of the conceptual toolbox we have identified in section 1, especially social metabolism, environmental conflicts, and ecological/climate debt. We add the question of working-class environmentalism, which appears only in one paper, to connect with the reflection on labour and gender in WP1 (D1.3 and D1.4). Indeed, labour issues seem to be an invisible and cross-sectional dimension of just transition.

[2.2] Analysis of empirical data

As the theoretical framework of the JUST2CE (D2.1) promotes a decolonial approach to knowledge production, we explored not only scientific literature but also the Environmental Justice Atlas database (<https://ejatlas.org/>), which results are the outcome of an ongoing collaboration between scientists, citizens, and activists. This is a consolidated practice in EJ scholarship (Conde 2014, Martinez-Alier et al. 2014; Temper et al. 2015), which CE scholars have not used so far. At the time of writing, the EJ Atlas contains 3740 cases of documented environmental conflicts. The conflicts are categorised by type of activity (Nuclear; Mineral Ores and Building Materials Extraction; Waste Management; Biomass and Land Conflicts; Fossil Fuels and Climate Justice/Energy; Water Management; Infrastructure and Built Environment; Tourism Recreation; Biodiversity conservation

conflicts and Industrial and Utilities conflicts). It is possible to filter the cases by name; Success level (Success; not sure; failure); Population type (unknown; Urban; Semi-urban; Rural); Country; Region; Description of the conflict (Start and End Date; Intensity; Reaction Stage; Description); Resistance (Mobilizing Groups; Mobilizing Forms; EJOs); Impacts (Environmental; Health; Socio-Economic Impacts); Outcomes (Development of Alternatives; Project Status; Outcome). Another tool found in this atlas is the possibility to browse the maps only by country; company; commodity, or type (sub-categories).

Of the 3741 cases reported so far, only 13 mentioned CE in their description or as a project alternative. The in-depth analysis of case studies helped us to disclose if the narrative behind the circumstances includes CE as a public policy, business criteria or as a proposal from the environmental justice organisations (EJO) or the communities involved. From a methodological point of view, it is essential to note that the EJ Atlas is not taken here as a comprehensive statistical database, but an additional knowledge tool that added nuance and complexity to our understanding of the Justice dimension in CE. As the Atlas, in fact, does reflect representation biases, which leave many relevant cases possibly unaccounted for, we conclude this section with an in-depth discussion of a sample case study that, based on previous research (Meira, 2017), we consider highly relevant to framing the transition to CE as a global EJ problem.

[3] Literature Review

[3.1] Bibliometric analysis

Figure 2 and table 2 summarize the results of our bibliometric search:

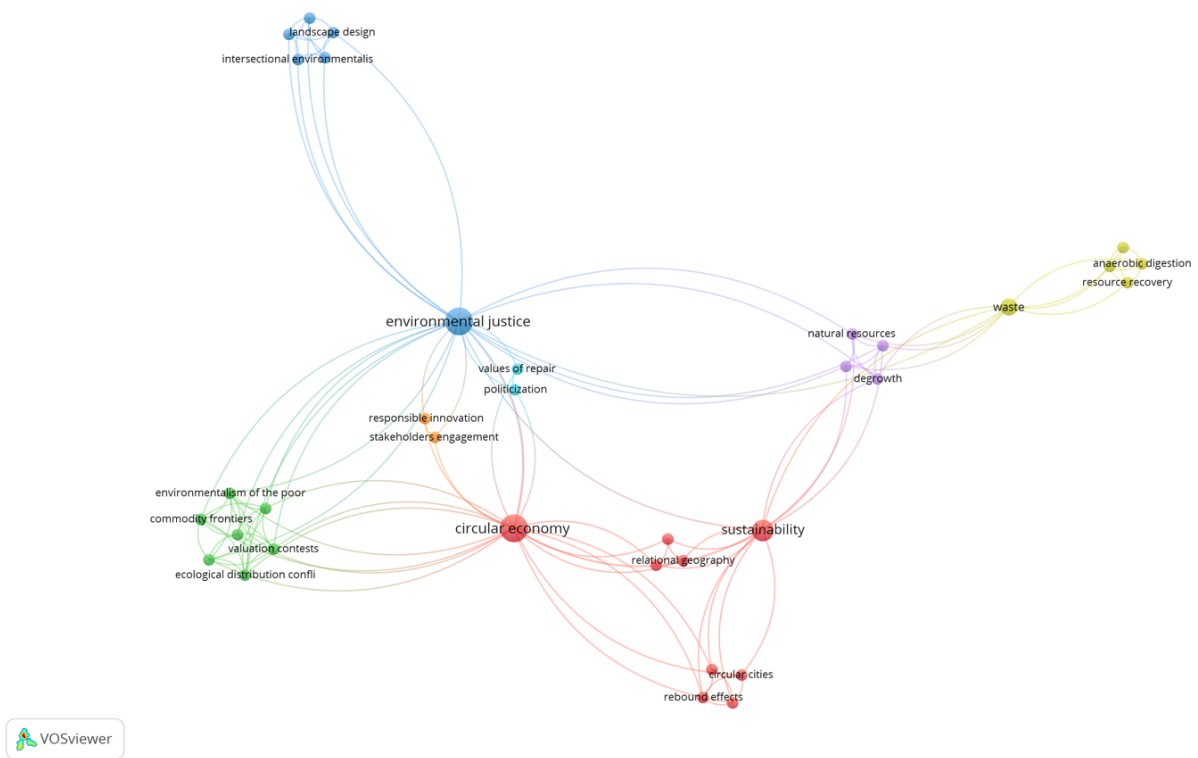


Fig.2 – Bibliometric network based on keywords.

Table 2. Selected papers from Scopus database.

#	Title	Authors	Year	Source
1	“Nobody” matters in circular landscapes	(Wuyts & Marin, 2022)	2022	Local Environment
2	Scientists’ warning against the society of waste	(Marín-Beltrán et al., 2022)	2022	Science of the Total Environment

3	Mapping ecological distribution conflicts: The EJAtlas	(Martinez-Alier, 2021)	2021	Extractive Industries and Society
4	Future-proofing capitalism: The paradox of the circular economy for plastics	(Mah, 2021)	2021	Global Environmental Politics
5	Clarifying rebound effects of the circular economy in the context of sustainable cities	(Chen, 2021)	2021	Sustainable Cities and Society
6	Repair for a broken economy: Lessons for circular economy from an international interview study of repairers	(Niskanen et al., 2021)	2021	Sustainability (Switzerland)
7	Politicising Circular Economy: what can we learn from Responsible Innovation?	(Pansera et al., 2021)	2021	Journal of Responsible Innovation
8	The trilemma of waste-to-energy: A multi-purpose solution	(Malinauskaite & Jouhara, 2019)	2019	Energy Policy
9	Conceptualizing waste as a resource: Urban biosolids processing in the rural landscape	(Mason-Renton & Luginaah, 2018)	2018	Canadian Geographer
10	Interrogating the circular economy: the moral economy of resource recovery in the EU	(Gregson et al., 2015)	2015	Economy and Society
11	Waste Picking as Social Provisioning Constructing a Socially Regenerative Circular Economy	(Velasco et al., 2021)	2021	Academy of Management 81st Annual Meeting (26 July 2021): 1-6.

The encountering between CE and EJ literature has been mainly developing around the following topics: cities; rebound effects; commodity frontiers; territorial approach; recycling and waste; degrowth; politicisation; responsible innovation. However, these common themes indicate fragmentation and dispersion of the literature rather than a common *modus operandi*. First, these articles deal with a wide variety of topics (8 different topics for 11 articles). Second, they are based on very different case studies and sometimes incompatible geographical scales (local, national and global). Finally, they are published in scientific journals in very different fields and therefore mobilise relatively heterogeneous pieces of literature.

The fragmentation of the EJ/CE debate is most evident when we look at it geographically. Four papers adopt the global scale and the perspective of global value chains (Marín-Beltran et al., 2022, Martinez-Alier, 2021; Mah, 2021; Niskanen et al. 2021), but they focus on very different objects (the increase of waste, environmental conflicts, plastic recycling, the work of machine repairers). One paper focuses on the Flemish region of Flanders, i.e. a local scale within a country where the question of interregional relations is sometimes highly complex (Wuyts and Marin, 2022). In this paper the articulation of CE policies with Walloon Belgium is never posed, raising the question of the scales of circularity: can circularity be achieved at a local scale without considering national and global scales? One article is based on the European regional scale (Gregson et al. 2015). One article

is based on sustainable cities but without a more precise geographical determination (Chen 2021). One article is based on the Ontario countryside (Mason-Renton et al. 2018). Finally, three articles have a theoretical or conceptual dimension without reference to specific locations (Pansera et al. 2021; Malinauskaite et al. 2019; Velasco et al. 2021). From the point of view of scales and geographical situations, it seemed impossible to compare these texts, which were too widely scattered. None of these articles share the same geographical basis and topic (cities, waste, repairing, etc.).

Regarding the journals in which papers are published and the literature they mobilize, we can see here also an important fragmentation. We can class them in three different fields. 1) Three papers (Mason-Renton et al. 2018; Mah 2021; Gregson et al. 2015) are published in social science journals, especially geography (Canadian Geographer) and political sciences (Global Environmental Politics, Economy and society), 2) Three papers (Pansera et al. 2021; Malinauskaite et al. 2019; Velasco et al. 2021) are published in management and innovation journals (Journal of Responsible Innovation, Energy Policy, Academy of Management). These papers tend to propose solutions for the transition (rather than simply criticising and showing the contradictions as in social sciences fields). 3) Five articles are published in sustainability and environmental science journals (Local Environment, Science of Total Environment, Extractive industries and society, Sustainability cities, Sustainability), but developed different approaches. For instance, Local Environment combines the approaches of justice and the environment on a local geographical base. On the contrary, Science of Total Environment is an environmental science journal with a global and non-critical perspective. Extractive industries and society, and Sustainability Cities are developing thematic approaches to different topics (extractive industries or sustainable cities). For all of these papers, the literature is based on the methodological requirements of each field and journal (social sciences, innovation and management, environmental sciences). Some articles don't share any references with any other (see, for instance, Wuyts et al. 2022; Marín-Beltrán et al. 2021); meanwhile, others show several common references even if they are not in the same field of investigation (see, for instance, Wuyts et al. 2022; Mah 2021).

Despite the dispersion of these references, one can also look for a certain number of common points to comprehensively analyse. The publication dates show that this encounter emerged relatively recently (2015-). Two selected articles are concerned with the current state of global social metabolism and consumption patterns and how technological strategies may lead towards a wasteless society by including EJ, degrowth, and responsible innovation (Pansera et al. 2021; Marín-Beltrán et al., 2022). A larger number of articles (5) are concerned about how informal CE actors are not being included in the industrial growth-led economy (that most of CE models take for granted) and how their deterritorialization can contribute to the invisibilisation of other forms of circularity (Martinez-Alier, 2021; Mah, 2021; Chen, 2021; Niskanen and Anshelm, 2021; Wuyts and Marin, 2022). Finally, the most common topic across the papers (8 articles) is waste, specifically in relation to the unequal impacts of CE policy-implementation strategies, and to how the expansion of waste disposal frontiers is creating new EDC (Gregson et al., 2015; Mason-Renton and Luginaah, 2018; Malinauskaite and

Jouhara; 2019; Niskanen and Anshelm, 2021; Velasco et al., 2021; Mah, 2021; Marín-Beltrán et al., 2022; Wuyts and Marin, 2022)

Notably, the main topics this literature addresses (Global social metabolism, inclusion/invisibilisation process, unequal impacts of CE policies and Environmental Distribution Conflicts) are directly linked to the conceptual toolbox we presented in the first section.

[3.2] Discussion

In this section, we offer a critical reading of the selected articles, investigating whether and how they use the central concepts of GEJ as defined in the Introduction, intending to contribute to an in-depth and substantial articulation between EJ and CE. Our in-depth review of the few references in CE (n=11) that mention EJ confirms the initial general claim which underpins JUST2CE, i.e. that justice concerns are largely absent from the CE literature; we then offer insights into how social metabolism, ecological debt, ecological conflicts and working-class environmentalism could be integrated within CE debates.

[3.2.1] Social metabolism and circular economy: a contradiction?

As mentioned in section [1.2.1], social metabolism refers to the material and energy throughput a society needs to exchange with the external environment. The fundamental idea is that no society can therefore separate itself from nature and its environment since it depends on it for both its inputs and its outputs. Therefore, based on the laws of entropy and thermodynamics (Georgescu-Roegen, 1971), it can be asserted a priori that a fully circular economy is impossible and that only a reduction of extraction, pollution and waste can be achieved⁴.

This is the main point in Martinez-Alier (2021), who uses environmental conflicts cases of the EJAtlas to illustrate why it is impossible to achieve the circularity of the current industrial metabolism, and how the growth of the linear economy and some attempts to make it circular while guaranteeing its expansion are sources of environmental injustice. The author shows that the current CE discourses and practices do not contradict the goal of economic growth. As the latter relies on an ever-expanding material basis and leads to expanding extraction and waste disposal frontiers, even in a scenario of increased circularity, the final result will be an increase in global environmental injustice. For Martinez-Alier (2021), only a CE based on degrowth can be socially and environmentally just while improving the living conditions of local communities. Any economy based on growth necessarily supposes an increase of the extracted raw materials, of pollution emissions, or waste produced. In an economy already structured by social and environmental inequalities, economic growth can only lead to ecological disasters and social inequalities. Martinez-Alier's essential contribution to the circular

⁴ For a detailed description of the limits of current conceptualizations of CE read Korhonen et al. (2018), and the following webpage: <https://www.lowtechmagazine.com/2018/11/how-circular-is-the-circular-economy.html>

economy debate is that the idea of circularity cannot be detached from EDCs, which aim at restoring equality between communities by fighting against environmental injustice. He concludes that the concept of circularity must be liberated from techno-optimism and rethought from the perspective of subsistence and EDC.

Most CE advocates are convinced that technological and managerial innovations can close the metabolic loop completely. In this respect, labels such as "cradle-to-cradle" and "closing the loop" testify to an ideal economy where nothing is extracted from nature and returns to it (on the limits of this model see Andersen, 2007). This ideal is utopian since human societies only exist because they maintain permanent throughputs of energy and matter within their natural environment (Georgescu-Roegen, 1971). On the contrary, the idea of decoupling from natural processes presupposes a high degree of confidence in the capacity of technical inventions to resolve the ecological crisis. Indeed, developing specific technologies can give the illusion that such a decoupling of the economy and nature is possible.

Nevertheless, only one article of the 11 we selected postulates that new technologies can solve social and environmental crises. Malinauskaite and Jouhara (2019) discuss a recycling project known as waste-to-energy (WtE) and an innovative multifunctional technology to implement it in the European municipal landscape. Waste-to-energy refers to a set of circular processes and technologies that transform waste into reusable energy. These processes limit the amount of waste to be disposed of in the landfills, the extraction of resources necessary for energy production and the emission of CO₂ by limiting the consumption of fossil fuels. These activities are therefore seen as part of the CE. Contrariwise, the US EJ literature has debated WtE since the 1970s as a primary source of environmental injustice and the unequal distribution of environmental risks of waste disposal. In Europe, Ireland's Galway Safe Waste Alliance is an example of EJ adopted to resist the expansion of energy from waste (Davies, 2006), a practice that also the activists of the waste-struggle in Campania, Italy, opposed (D'Alisa and Armiero 2012).

WtE in the context of a just transition is studied using the intersection between three different EU policies essential to establishing a CE: the Waste Framework Directive (WFD) (as an environmental policy that prioritise higher levels of waste prevention, reuse, and recycling), the Energy Union Strategy (as an energy policy that can contribute to the security of energy supply and less dependency on fossil fuels), and air quality/climate change policies (as a climate justice policy that can lower both resource consumption and emissions). It is argued that these policies should not be treated as distinct areas of regulation because several synergies can contribute to EJ (Malinauskaite & Jouhara, 2019). For instance, the WFD promotes the proximity principle for urban waste to be disposed of. It has emerged in response to EJ concerns over the dumping of waste on the people and environments of the Global South (Clapp, 2001). The EU economy continues to rely on recovery via global shifts of low-value manufacturing circular activities, namely Global Recycling Networks that take end-of-life commodities and turn them back into resources in other places and production networks (Crang et al., 2013), which result from the inability to transform waste to resources within the Global North. Further, the authors argue that the implementation of WtE in the North could also reduce the unequal exchange of waste between Northern and Southern countries and thus WtE can have an impact in terms of global environmental justice.

According to the authors, this CE is embodied in advanced technologies such as the patented micro-scale Home Energy Recovery Unit (HERU⁵), which has been invented to process all unwanted domestic materials and generate energy for the household. HERU is a large washing machine with a capacity of 7 kilograms of waste treatment, which means that in a two-person household, the machine should be used on average once every three days.

It seems to us that this technological approach to the ecological crisis and environmental injustices raises more problems than it solves. First, it is obvious that such patented technology with a monopolistic company risks being extremely expensive and therefore mostly reserved for rich households in the northern countries. Rather than reducing social inequalities, this technological solution is likely to make them much worse. Second, if HERU should be used on average once every three days for a two-person household, it should be used almost every day for a four-person household. So, if everyone can process their individual waste, doesn't that risk increasing the amount of post-consumer waste resources rather than limiting it at the production level? This is a classic rebound effect problem. Sometimes called "Jevons' paradox", it implies that the development of more efficient techniques, i.e. those that consume less raw materials or emit less pollution, leads to an increase in the use of this technique, which in turn leads to an increase in the extraction of raw materials and the emission of pollution (Chen, 2021). The concern about the rebound effect of CE in the context of sustainable cities is linked to the deterioration of resource efficiency due to technological improvements and the use of quantitative indexes to measure the impacts. Environmental and social justice dimensions should be considered to broaden the analysis using systems thinking that can give space to alternative solutions (Chen, 2021).

Similarly, Alice Mah (2021) investigates how corporations in the plastic industry use the CE agenda to secure public legitimacy and protect and extend the plastics markets. Through the lens of political economy and a Gramscian approach, she examines two examples of corporate environmental governance, discussing the argument that "social groups gain cultural and ideological hegemony through a combination of "domination" and "intellectual and moral leadership" (Gramsci, 1971:77; Mah, 2021). The author argues that the CE offers a technological fix to "take-make-waste" models of industrial capitalism, without giving up on growth, which can be very appealing to corporations. In fact, while the petrochemical industry discourse commits to CE, it invests in unsustainable projects with environmental injustice and climate change consequences (Mah, 2021).

The social metabolism approach, however, is not only at odds with the CE. It can also point to possible paths for a just transition. One would come from responsible innovation research. Pansera et al. (2021) discuss the consequences of a transition to closed-loop production and consumption systems that do not account for justice and power relations as well as its societal implications. According to the authors, the concept of Responsible Innovation presents an alternative approach to CE because it adds the dimensions of public engagement, anticipation and reflexivity neglected by the mainstream CE literature and practices. These dimensions are

⁵ For more details see the HERU project: <https://gtr.ukri.org/projects?ref=132441> (last access 27th December 2022)

valuable allies for a just transition to a CE because they are related to the issues of democracy, planning, participation, gender inclusion and global justice (see also JUST2CE WP3).

[3.2.2] Definitions of Justice in Circular Economy

The definition of justice as recognition is adopted by the article ““Nobody” matters in circular landscapes” by Wuyts and Marin, (2022). The authors apply an intersectional environmentalist lens to the Circular Economy transition in Flanders, developing a critique of what they call “deterritorialized approach”. Wuyts and Marin build their argument on the concept of “nobodisation” (Rebanks, 2015) the process through which some roles in society are invisibilized. A process, according to the authors, that also CE practices and plans risk fostering (Wuyts and Marin, 2022). The main point of Wuyts and Marin regards the social identities of stakeholders in circular activities and sustainable activities such as repair. According to them, since most CE proponents/leaders are white men from the global North, non-white people cannot be seen as actors of circularity. And, reciprocally, the projects they are fighting for are devalued as subsistence-oriented rather than circularity-oriented (Wuyts and Marin, 2022). For instance, in northern countries, most repairing activities are practised by non-white working-class people - e.g. repairing cars or appliances - (but other activities could be added here, such as mending, collecting and/or re-selling clothes, small furniture, and other objects at flea markets or online platforms), even if these tend not to be seen as CE. Conversely, some examples exist of circular activities in the Global North that actively involve immigrants⁶ (see also D1.4).

Discussing the conventional principles of justice (distributive, procedural and recognition) in energy studies, Malinauskaite and Jouhara (2019) recommend applying a fourth dimension, i.e. restorative justice. This, they argue, would consist in redressing environmental and social costs at each stage of the life-energy cycle, e.g. by decommissioning energy or industrial places, while conducting systematic environmental restoration of the site (Malinauskaite & Jouhara, 2019).

[3.2.3] Ecological and social conflicts in Circular Economy

Most CE literature fails to recognise and analyse social/environmental conflicts. In fact, out of ten references to EJ, only 4 mention the issue of conflicts over access, use and distribution of resources. Yet, as shown in section 1, this is an essential dimension of EJ.

Based on a case study analysis in rural southwestern Ontario, in the article “Conceptualising waste as a resource: Urban biosolids processing in the rural landscape” (Mason-Renton and Luginaah 2018), resident’s perceptions on emerging and contested biosolids recycling are investigated using a relational conception of space, time, and technology. Intending to understand environmental (in)justice in a rural context and locally felt injustice, the

⁶ See for example some cases in Italy: <https://economiecircolare.com/atlante/cooperativa-ruah/#field-group-tab-4>; and <https://rifo-lab.com/en/pages/nei-nostri-panni>

authors shift the discussion around waste to one around valuable resources and global sustainable waste management on a broader scale. The results show that residents felt injustice as waste from urban areas was brought to their location, denouncing a parasitic relationship. Since rural and urban spaces are relational and connected, they involve complex and largely unequal processes due to the increase in urban population that exploit the rural areas. The authors argue for a distributive lens to consider the material relationality and contested disproportionate burdens of urban wastes (Ashwood & MacTavish, 2016).

As argued by Marín-Beltrán et al (2022) in their article “Scientists’ warning against the society of waste”, however, EDCs are not just about waste. They are also about resources, because resource extraction has increased more than the human population, but resources are being consumed mostly by the wealthiest. The paper focuses on technological strategies to improve the management of those resources towards CE, emphasising the importance of managing the existing waste rather than focusing only on post-consumption management. The authors find that a good representation of the social conflicts related to extraction and waste can be found in the Environmental Justice Atlas (Marín-Beltrán et al., 2022) – which will be discussed in detail in section 4.

[3.2.4] Working-class environmentalism and top-down transition

Finally, one article (Niskanen et al., 2021) addresses repair and recycling from a working-class perspective. In the CE mainstream discourse, the authors argue, repair is commonly presented as a consumer activity enabled by technocratic government interventions. These are based on simplified cultural and sociological assumptions about the repair. This framework undermines its goals in terms of supporting environmental transformation and justice. In addition, it is abstracted from social struggles and the history of extractivism. The political dimension of repair appeared in the interviews with a group of repairers (practitioners and experts) who questioned the role of repair in a more extensive system. One repairer in this survey criticized the political economy of the CE’s focus on recycling rather than repair:

“Repair is too complicated [...] it’s easier just to melt and dissolve down and reclaim these materials at high energy cost, automated, as part of the fourth industrial revolution, and get the materials back to the manufacturing plants. I could see that being discussed at seminars in Davos. Whereas this much more situated, repairing, labor intensive [approach]—because of the nonconformity and non-standardization of all these components, activities— [...] doesn’t fit a political economy we have at the moment, but probably is more sustainable” (Niskanen et al., 2021:8).

In short, the emerging literature on CE/EJ intersections depicts the CE as a sustainable business idea that promotes the aspirational idea of “zero waste” through ambitious recycling targets. From a working-class perspective, the problem with this approach is that it tends to either ignore or depreciate the already existing

circularity of autonomous practices that are not for profit and not oriented towards GDP growth - and, more importantly, to replace them with value-oriented repair.

3.2.5 Concluding remarks

This brief review of the available literature in CE/EJ intersections demonstrates the validity of JUST2CE's initial assumption. Authors concur in assessing the limits of the current CE model intended as a market opportunity from a managerial approach that aims to solve the ecological crisis through technical solutions. In this perspective, the CE is *not* seen as a means to redress environmental injustice or the unequal distribution of costs and benefits in the growth of global social metabolism. In short, the CE is not concerned with justice, but with returns on capital investment.

The literature discussed in this section examines some of the consequences of CE in terms of justice. First, most authors agree that current CE models are not in contradiction with (or will actually require) increases in global social metabolism and will continue generating inequalities in the distribution of risks and benefits, which invisibilise the numerous ecological distribution conflict. Second, the CE is shown to function as an ideological incentive towards continuing business as usual via social consensus; consequently, environmental victims are denied, thus preventing the implementation of all forms of justice. Conversely, EJ scholars and activists have highlighted the importance of implementing not only distributional but also procedural, recognitional, reparative and restorative justice as appropriate responses to the environmental harm associated with economic growth. Finally, due to existing racial and sexual divisions of labour worldwide, the association of CE with high-value-added, high-skilled, high-capital-intensive activities prevents several circular activities carried out by working-class men and women, racialised people, or other marginalised social actors from being seen as such (see, for example, the case of waste-pickers considered in section 5.3 below).

[4] Circularity and environmental injustice: evidence from the Global South

This section focuses on how the CE is being mobilised in environmental conflicts globally. We look at CE-related environmental conflicts across the world, as emerging from the Environmental Justice Atlas (for a description of this source, see section 2.2). Scrutinising the map⁷ for those case descriptions that mention “circular economy”, we can learn whether CE practices and policies are conceived as obstacles or enablers of EJ.

⁷ [Retrieved on August 31st, 2022.](#)

[4.1] Circularity in the Environmental Justice Atlas

From the conflicts reported so far in the EJAtlas [1] website, our word (concept) search for “circular economy” in the full data set has resulted in thirteen cases: seven are located in Asia (China), two in Africa (Tunisia and Mozambique), one in Europe (Poland), two in North America (Canada) and one in South America (Argentina). Eight cases are classified as waste management conflicts, two are related to mining conflicts and the remaining three concern fossil fuels extraction conflicts. But if we look inside those categories (type of conflict 1st and 2nd level), we can see that all the conflicts have a direct relation with waste (mining involves landfills, toxic waste treatment, uncontrolled dumpsites; fossil fuels involve emissions). The filtered conflicts date from 2009 to 2020, and only 4 of the 13 have been updated in the past year. Time is an important factor to analyse EJ because it is not uncommon that temporary wins can turn into permanent losses, as the EJOs are able to stall the project for some years, but in the end, it is approved, for e.g. when the movement and protests are turned to other causes, or a new legislation is ratified. For this reason, we will not look into the project outcomes or if the contributor considered the case an EJ success.

We present the main features of the selected cases according to three criteria: 1) if CE is being mentioned as part of a policy goal proposed by public authorities; 2) if it's presented as a business solution, or 3) if it is emerging as an alternative proposed by the communities/EJOs.

Table 3 – Ecological Distribution Conflicts involving “circular economy”

Category	Country	Type of conflict – 1st level	Type of conflict – 2nd level	Start of the conflict	Last update	Type of contributor
Policy Goal	China	Waste management	Domestic Municipal Waste	2009	2017	Individual
			Landfills; toxic waste treatment, uncontrolled dumpsites; chemicals industries; water treatment and access to sanitation; manufacturing activities	2010	2019	Project
			E-waste and other waste import zones	2015	2019	Individual

		Fossil Fuels and Climate Justice/Energy	Coal extraction and processing	2015	2021	Anonymous
Business Solution	China	Waste management	Landfills; toxic waste treatment, uncontrolled dumpsites; uncontrolled dumpsites; Incinerators	2019	2019	Project
		Fossil Fuels and Climate Justice/Energy	Land acquisition conflicts; Water access rights and entitlements; coal extraction and processing	2014	2020	Individual
		Fossil Fuels and Climate Justice/Energy	Coal extraction and processing	2005	2022	Anonymous
	Tunisia	Waste management	Waste privatization conflicts; waste picker access to waste	2011	2019	Individual
Claim by EJOs	Canada	Mineral Ores and Building Materials Extraction	Tailings from mines; Deforestation; Landfills, toxic waste treatment, uncontrolled dump sites; Mineral ore exploration; Mineral processing	2017	2021	EJO
			Pollution related to transport; Tailings from mines; deforestation; Landfills, toxic waste treatment, uncontrolled dumpsites; mineral ore	2018	2021	EJO

			exploration; mineral processing			
	Mozambique	Waste management	Domestic Municipal Waste; E-waste; Wheat	2001	2019	Individual
	Argentina		Waste privatization conflicts; waste picker access to waste	2019	2019	Individual
	Poland		Incinerators	2020	2022	Individual

Source: our elaboration on EJAtlas.org (2022)

We are aware that this result is not a representative sample, for example, the overrepresentation of China cannot be used as a conclusion for how CE practices are more relevant there. Nevertheless, this sample is a useful entry point into the different ways in which CE intersects with EJ mobilizations.

[4.1.1] Circular Economy as a policy goal

All the cases where CE is framed as a policy goal are located in China. This is explained by the fact that China's law forces industrial clusters to organise according to the industrial ecology principles of CE⁸. China has been applying CE models to improve a new economic structure based on resource and energy efficiency (Su et al., 2013). To overcome the consequences of rapid urbanisation accompanied by a change in consumption patterns that affected the composition of waste; increasing disposal rates and landfill overload, incineration was framed as a CE solution. The existence of EDC cases here shows that, when institutionally mandated, CE can create conflicts that encompass environmental injustice.

CE was first adopted as a policy goal by China in 2009 (People's Republic of China, 2008), followed by Germany and Japan, and even if they have similar goals in a general sense (sustainable waste management, design of

⁸ See the Order of the President of the People's Republic of China No.4 in 2008, available in English [here](#).

products, sustainable production and consumption) their implementation methods are very different. While China is more focused on production, creating “eco-industrial parks” and low-carbon cities, Germany is more attentive to waste management and design, creating extended producer responsibilities and a landfill ban. Japan is addressing this policy on many fronts, on the consumption side, by creating recycling fees and regulations on sorting and segregation and by using high technology and focusing on repair and reuse (Ogunmakinde, 2019). A recent review of the Chinese CE policy showed that “the approach has been encompassing energy efficiency from early on and fits into China’s policy style of promoting technological innovation and pursuing an industrial strategy” (Bleischwitz et al., 2022:10). In addition, most official documents describe the success of the CE projects in China, even though many of these projects have been reported as failures (Huang, 2020).

The conflict of “Guiyu National Circular Economy Industrial Park, Guangdong” is an emblematic case since this is one of the official pilot projects of e-waste management, implemented by the Chinese Government to support the formalisation of e-waste recycling companies, both as a guiding principle and as a public policy. It is claimed that the construction of this Industrial Park by the government did not contemplate local demands, particularly the views of the informal recycling sector, which caused a problem of representational justice. Moreover, due to the self-developed industrial model under the policy background, the existing context where the park was located was not considered (previously a self-organised sector). Consequently, this marginalised population was forced to relocate their recycling workshops to less developed countries, such as Thailand and Vietnam, because of the increasing additional cost of their activity (EJOLT, 2019).

In the case of “Asuwei waste incinerator in Changping, Beijing”, a CE public policy was created in the middle of a waste crisis to justify the construction of four incinerators, vehemently opposed by local EJOs with the support of community-based research. The government aims to increase the incineration of disposed waste from 1% in 2002 to 30% in 2030 (EJOLT, 2017a). The anti-incineration protest organised by the residents made national headlines in 2009, and the project was stalled for some years, but it’s under construction nowadays. The lawyer that led the protest was arrested, together with six other residents, under the accusation of causing public disorder.

The case of “Untreated waste water dumped by chemical plants into Tengger Desert, Inner Mongolia-Ningxia-Gansu” refers to several similar projects approved by the government under the CE umbrella. Since September 2014, it has been exposed to the public that some enterprises (manufacturing activities) in Inner Mongolia Alxa League Tengger Industrial Park and Ningxia Zhongwei Industrial Park, as well as Ningxia Zhongwei Mingsheng Dyeing Co., Ltd., and Gansu Wuwei Ronghua Industry and Trade Co., Ltd., have illegally discharged toxic sewage into the desert hinterland through illegally laid underground pipes, causing serious damage to the environment of the Tengger Desert. Due to media exposure, the companies were held accountable, and compensation measures were imposed; however, local EJOs claim that some environmental liabilities are still to be addressed and that not all the financial compensation was used for restoration projects in the area (EJOLT, 2019d).

Lastly, in the case of “Public Interest Litigation against Guizhou Qiangu Tianneng Coking Co. in Liupanshui”, a company with an annual output of 2 million tons of metallurgical coke is presented by the government as a key CE demonstration enterprise. Nevertheless, local complaints denounce excessive emissions of air pollutants and public health impacts. In fact, the publicly available database of the Institute of Public & Environmental Affairs shows that Tianneng Coking Co. had been subject to multiple administrative penalties issued by the Environmental Protection Bureau of Pan County. As part of the negotiation agreement, Tianneng Coking Co. was requested to pay for the environmental compensation costs, which were expected to be used for alternative remediation measures such as rural environment improvement, tree planting, as well as to invest in desulphurisation and denitrification technology to reduce the emission concentration of nitrogen concentrates. However, while the project is still in operation, the use of the funds and investments in environmental improvements is not publicly disclosed (EJOLT, 2017b).

Lastly, in the case of “Protecting Tongpo sacred mountain from coal coking mill, Qinghai province”, a local community opposes three Chinese companies (Qinghai Qinghua Mining, Smelting and Coking Group, and Qinghai Qinghua Coal Chemical Co) which built a coking plant on Mount Tongpo. Although the community has a history of successfully opposing mining projects, this time, they have not succeeded (EJOLT, 2022a). This coal coking mill is located within the “Kingho Coal Chemical Industrial Park”, considered an “important circular economy project” for the Qaidam Prefecture. The municipality created a pilot zone with a Management Committee to assess the extension of the environmental impacts. Still, no attention was paid to cultural and ethnic aspects in EJ terms. CE was used institutionally to legitimise the polluting activity of the three companies.

[4.1.2] Circular Economy as a business solution

We found four cases where CE is presented as a business solution: three are located in China and one in Tunisia.

The conflict “Wastepickers (such as the Barbechas) struggle forth in post-revolution Tunisia” started in 2011, when Tunisia’s formal waste collection and cleaning service underwent a series of disruptions due to strikes in which formal waste workers demanded better conditions and wages. The public disorder following the 2010-11 revolution resulted in the deterioration of cities in terms of health and environmental standards; garbage remained uncollected, illegal dumping sites were used, and mafia structures emerged precisely where municipal waste management fell short.

Barbechas (Tunisian name for waste-pickers) suffer from poor working conditions, no worker’s rights, and no health or social coverage. Particularly women Barbechas are the most vulnerable. In 2015 a partnership between the German foundation GIZ, Tunisia’s National Waste Management Agency (ANGed) and the municipalities of Ettadhamen-Mnihla and La Marsa led to a pilot project called “Structural Integration of the Informal Sector into the Municipal Solid Waste Management in Tunisia”, however, this project only lasted one semester. Four years

later, a public-private partnership established a project which aims to “realise a circular economy” in Tunisia to optimise extended producer responsibility (EJOLT, 2019e). In this case, a consortium of public and private businesses proposes CE as an alternative to informal recycling .

Following the same argumentation line, a CE model is evoked as a possible alternative to existing waste management in the case of the “Chenjiachong landfill site and the proposed waste-to-energy plant in Yangluo, Wuhan, Hubei”. The private company responsible for this project is presented as part of a group “operating a larger CE”, and the operation details are still under negotiation. This project was legitimised because the Chenjiachong Sanitary Landfill in Xinzhou district of Wuhan City exceeded its capacity in 2013. Chenjiachong Sanitary Landfill tried to capture and utilise the landfill gas to reduce methane emission into the atmosphere since the landfill gas was emitted freely into the atmosphere and was not captured for flaring and/or energy production purposes. After residents had complained online about the smell from the Chenjiachong landfill for many years, the local government announced they would be included in the decision-making process and claimed that it was putting thicker plastic films over the waste and installing an air purification system (EJOLT, 2019b). This project is still under negotiation.

The “Illegal coal mining at Muli coalfield in Qinghai” was undertaken by several private firms, with China Kingho Energy Group mining at the largest scale. Kingho Group started to develop the Muli coalfield in 2003. Greenpeace published an investigation report on the illegal coal mining activities of the Muli coalfield in August 2014, based on evidence gathered on seven separate field trips to the remote region between 2012 and 2014, along with satellite images. The report disclosed in detail the pollution and damage to the ecological environment caused by the mining activities, which also violated national and local regulations (EJOLT, 2020a). The location of this project is in a poor province, and the company allegedly is contributing to a “circular economy zone”, which in China means an industrial zone, by providing coal as a source of energy.

[4.1.3] Circular Economy as a claim by Environmental Justice Organizations

Two out of five cases where CE is a claim coming from Environmental Justice Organizations (EJO) are on mining activities in Quebec, Canada, the cases of “Nouveau Monde’s Matawinie graphite mine in Quebec” and “Sayona Mining’s Authier Lithium Project in Québec”. They were mobilised by the same EJO (Coalition pour le Quebec ait meilleure mine), and CE was proposed as a solution to limit the impacts of the transport electrification process in both projects.

In the first case, the Canadian company Nouveau Monde Graphite (NMG) is developing the largest open-pit graphite mine in the American continent within highly valued recreational, tourism areas and ancestral territory of the indigenous group Atikamekw Nation (Quebec). This project will result in the dumping of 100 million tons of mining waste, air pollution, loss of biodiversity through deforestation, disrupting and continuous noise, blasting, and dust. It will also generate a significant increase in greenhouse gas emissions (EJOLT, 2020b). Since the project’s announcement, the local population and various environmental organisations have shown their

opposition to it in light of the multiple socio-environmental impacts it could generate. The local EJO has been raising awareness among citizens (e.g. through public meetings with independent experts), pressuring municipal officials and publicly denouncing the multiple environmental impacts associated with this project. This EJO proposes 5 conditions to limit the impacts of electric cars, one of which is the reduction at source: prioritise investments in recycling and the CE. Unfortunately, the case description gives no information about what the EJO means by CE and how they propose to implement it. The local authorities recommended additional studies on important issues of social acceptability before the project can be authorised. The Atikamekw Nation, who are members of the coalition opposing the project, unilaterally declared its sovereignty over this territory and required its consent for all development and use of resources. They also denounced the government granting a decree to NMG while there is still a lack of social acceptability within the community.

In the lithium mining case, the Authier mining project is located in the Saint-Mathieu-Berry esker which is considered sacred to the population of Abitibi (Quebec). Citizens formed a mass mobilisation effort in an attempt to demonstrate to the Minister that the Authier mining project lacks social acceptability. Before Sayona Mining even submitted its environmental assessment, four scientific organisations, three environmental groups as well as the newly formed Citizens' Committee for the Protection of the Esker, called on the Minister of the Environment to use its power to stop the project. The company now seeks to present its project as "green" on two counts. First, they claim to operate on a supply of renewable hydroelectric power, minimising their carbon footprint at the point of production. Second, they claim that the spodumene that will be produced will contribute to batteries for electric vehicles, thus positioning their company as part of the needed energy transition (EJOLT, 2021). The Coalition "Pour que le Quebec ait meilleure mine", that was also acting as an EJO in the previous case (Canadian company Nouveau Monde Graphite) included Authier mining project in the same report where the claim for CE was made. Further research would be needed in order to understand how this community frames CE.

The other three cases where CE is used as a claim by EJOs are related to waste management and located in three different continents (Africa, Europe and South America)

In the "Hulene Dump Site and waste-pickers protests, Mozambique", the closure of the dumpsite and the relocation of resident families to other parts of the city of Maputo, was proposed shortly after the deadly landslide in February 2018. But the waste-pickers were not integrated into Maputo's formal waste management system or employed in the operation of the new landfill and are still waiting to be resettled (EJOLT, 2019c). CE is mentioned by the local EJO to denounce how the informal workers in the waste sector are key contributors to CE and face disregard and neglect from the authorities.

A similar case happened in Argentina, where the local EJO claims that CE is a term used by informal recyclers as a tool for social inclusion and a generator of employment in the waste management area of the district. In the "Ban on animal-drawn carts, Berazategui" case, the municipality passed an ordinance to ban any animal-drawn carts in the whole district. This ordinance would mainly affect waste-pickers. Taking this ban as a persecution

against them, in 2019 waste pickers appealed the ordinance and won. The success in court was shorter than expected since Municipality's representatives announced that they would fight back. The approval of the ordinance could expose waste pickers and their families to a loss of their livelihoods and the labor rights they have worked so hard to gain. Further, they ask for public recognition of the importance of their work and for an end to criminalization of the recycling activities they carry on. The conflict is ongoing (EJOLT, 2019a).

Finally, in the "Waste incinerator Bielsko – Biala, Silesia, Poland" (the only European case resulting from our search⁹), CE is mentioned by both sides of the controversy, to justify radically different projects. Opposing the projected construction of an incinerator on the outskirts of the city, the EJO "Stop the Waste Incinerator in Bielsko-Biala Initiative" demands to consider the European Green Deal and Circular Economy as sources of alternative solutions. The local government, on the other hand, argues that this project is a key element of a regional closed-loop waste management, a synonym often used for CE, and in addition, the authorities state that a local survey showed the chosen location has the largest social support, although the results of that survey were not made public (EJOLT, 2022b).

Discussion of the empirical evidence

As mentioned before, the EJATLAS has statistical limitations and is not to be taken as an exhaustive list of conflicts; other sources (including published and unpublished research) can help in identifying CE-related conflicts that are not listed in the EJATLAS (see section 4.2 below). Nevertheless, the case studies listed above make it clear that the current applications of the CE are linked in many ways with environmental injustice:

- the CE can appear as a form of resolution of pre-existing environmental conflicts by policy makers or in business-oriented projects (Changping, China). However, when imposed from above to resolve an ecological distributional conflict, the CE may reinforce environmental inequalities rather than limit them.
- the transition to the CE may provoke environmental injustices and, thus, conflicts around risk and wealth sharing by invisibilising certain populations or further casualising precarious workers in the informal economy (Chenjiachong, China; Wastepickers, Tunisia).
- EJO can also use the CE to legitimise their arguments against the inequalities to which they are exposed by industry and the market economy (NMG, Quebec; Maputo, Mozambique; Berazategui, Argentina; Silesia, Poland).

⁹ Note that our sample is not to be considered statistically representative, but merely indicative. In fact, the Taranto Plan case study in this project (WP2) should be also mentioned as a EDC where CE is mentioned by the local EJO as a viable solution to current environmental injustice.

In short, the relationship between the CE and EJ can be ambivalent or even contradictory. When championed by marginalised communities and social actors, and oriented to enhance local livelihoods and the preservation of local environments, the CE can be a theoretical and political tool for advancing EJ; when imposed via undemocratic public policies or corporations, and aimed at GDP growth and for-profit operations, it can, on the contrary, reinforce social inequalities and environmental crises.

4.2. The case of waste-pickers in Rio de Janeiro – Brazil

The study of waste-pickers¹⁰ in the Global South can bring important insights to the discussion about how circular activities already in place are not recognized as such, and how they can be jeopardised by the implementation of CE policies. Waste-pickers are important enablers of sorting, repairing and recycling activities, not to mention the environmental services conveyed by them. In Brazil they represent 1 million workers (MNCR, 2022); in India, this activity represents 1% of the informal sector, which means around 2 million workers; in Ghana, waste-picking is one of the top 5 occupations in the informal sector. Generally speaking, waste-pickers form a numerous workforce in countries where the large majority of workers are informally or self-employed (WIEGO, 2020). In this section, we draw from previous research (Meira, 2017) to offer an overview of a CE-related environmental conflict involving informal waste-pickers (*catadores de lixo*) in Brazil.

In 2010, almost 50 people were killed by a landslide in a waste dumpsite inside Morro dos Prazeres, one of the most dangerous favelas of Rio de Janeiro, Brazil (IAI, 2010; Meira, 2017). This tragic incident was followed by a series of protests drawing attention to the severe risk the location was under, and the potential equivalent episodes that could happen due to the same reasons – the accumulation of huge quantities of solid waste in a number of areas within the favela. In that same year (2010), the Brazilian National Policy on Waste was published and included important changes in the legislation, among which: the formal recognition of waste-pickers as workers; the obligation to include those workers in the municipal waste management plans; and the obligation to shut down all the illegal dumpsites in Brazil (and in Latin America). The new regulatory framework introduced the principle of shared responsibility for the life cycle of products, a CE-like policy, and highlighted the need to

¹⁰ For the purpose of this report we use “waste pickers” as general term to represent the workers in the waste sector as defined by the International Alliance of Waste Pickers: “a) individuals involved in the collection, segregation, sorting, and sale of recyclables in an informal or semi-formal capacity as own-account workers; b) itinerant waste pickers, informal/semi-formal waste collectors engaged in transporting, sorting, and selling recyclables, informal workers informal workers engaged in transporting or sorting within the informal or semi-formal sorting/recovery/recycling sector, or any of the above who are integrated into municipal waste management systems and continue to sort and sell recyclables; c) **Former recyclers** who occupy new roles in their recycling organisations in environmental promotion, caregiving, health programs, gender programs, etc.” (p.1, Globalrec, 2022).

include waste pickers as “agents of change”. Their service and “economic emancipation” should have been considered as a priority in the municipal waste management plans.

The National Movement of Waste-Pickers, founded in 2001, offered fundamental support to the workers impacted by the national policy. In fact, the actions undertaken by the government in implementing the new policy left many waste-pickers behind, either by restraining access to the dumpsites (and therefore the recyclables), or by imposing the high costs of formalisation upon the workers themselves (e.g. health insurance and insalubrity costs), resulting in an insufficient inclusion of these workers in the municipal waste management plans.

In Rio de Janeiro, ¼ of the total population lives in favelas, home of most waste-pickers. In addition to the high population density, dwellers are subject to eviction threats, and to the drug traffickers and paramilitary factions that control the supply of basic services (e.g. electricity and gas). After the 2010 landslide, a women-led movement in the Morro dos Prazeres community founded an organisation called “Reciclação”, which resorted to collective action to encourage the participation of residents in the waste sorting and environmental preservation of the favela. Thanks to financial support from both the state and the private sector, the organisation achieved much higher rates of separation of recyclable materials than the rest of the city (71% against 3%) (Meira & Muradian, 2016).

The uneven distribution of the costs and benefits of public services allows us to characterise favelas as “sacrifice zones” (R. D. Bullard, 1994). As the workforce with the lowest income is concentrated in these territories, the environmental loads tend to be concentrated there (Cunha et al., 2015); in some cases, such as that of the Morro dos Prazeres, this spatial injustice causes the emergence of “working-class environmentalism”. In this case, a women-led, bottom-up model of CE involving waste pickers and local cooperatives was developed - even though it has not been officially recognized as CE.

[5] Conclusion

[5.1] Major research gaps

Both the available literature and empirical evidence point towards two major shortcomings of the current formulations of the CE:

1. The EJ perspective shows how the ongoing transition to CE is likely to generate both benefits and costs associated with the changes in throughput of material and energy. These will be distributed unequally across intersectional dimensions in accordance with several existing power asymmetries. Current CE

policies, programs, and products change the metabolic profile of the society, clashing with the existing one. Thus, if CE policies and programmes do not address the unfair distribution that they could cause and without considering the historical injustice the current linear model has caused, they will cause new Ecological Distribution Conflicts. Unless future CE plans, projects, and products address existing inequalities inherent to the current socio-economic model (with its patriarchal, colonial and class dimensions), they will not lead to a just transition.

2. Most CE policies leave out a number of activities that are indeed circular, but tend not to be qualified as such either by CE theorists or by the actors themselves. These are informal, non-profit or non-value oriented circular activities practised by actors in informal repair, waste picking, unpaid reproductive work in households and communities, or peasant farming. EJ empirical studies have shown how these subjects play an important role in waste reduction and/or circularity. However, they are not typically considered CE actors (i.e. are excluded from CE design, implementation, and policies). For instance, communities that have for centuries reused their domestic waste as fertiliser in agriculture in order to maintain the metabolism between societies and their environment are not seen as circular because they do not apply capital-intensive technologies to do so. This reflects and reproduces top-down colonial knowledge (Girei et Natukunda, 2021; Jimenez et al., 2022) that excludes those myriads of sustainable practices that have never been described in terms of circularity (Martinez-Alier, 2021).

In short: while mainstream business models of the CE (e.g. product use extension and resource recovery) focus on improving resource efficiency and producing value from waste through technocratic projects that enable a more efficient circulation of products and materials, different, non-value-based meanings and practices of circularity can be documented. This means that fundamental aspects of a just transition to CE remain invisible in mainstream definitions of CE, particularly: the world-wide existence of subsistence-oriented CE practices; the free-riding on unpaid, typically feminised, racialized, working-class CE practices; and the marginalisation of work-force that was previously responsible for non-value-based CE practices.

[5.2] Questions for future research in Circular Economy

These findings raise fundamental questions for a just transition to the CE:

- 1) Why is the unequal distribution of environmental costs (waste) and benefits (income) not accounted for in CE debates, and what are the next research and policy steps to take to advance knowledge in this direction?
- 2) Why are so many sustainable practices not seen as “circular activities” both by policy-makers and by scholars? What kind of interactions/knowledge exchanges are needed to move beyond the limits of current applications of the CE?

3) Should these circular practices be integrated into the concept of the CE, which was initially conceived to think of activities with a high economic return in Northern countries?

4) Or should integrating these practices be seen as a new form of knowledge colonialism to impose academic concepts with the aim, in particular, of economically valuing practices that are outside the realm of GDP growth?

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Annex - Co-occurrence methodology

Using the association strength, the similarity between two items i and j is calculated as

$$s_{ij} = \frac{c_{ij}}{w_i w_j} \quad (1)$$

where c_{ij} denotes the number of co-occurrences of items i (Circular Economy) and j (Environmental Justice) and where w_i and w_j denote either the total number of occurrences or the total number of co-occurrences of, respectively, item i and item j . It can be shown that the similarity between items i and j calculated using (1) is proportional to the ratio between on the one hand the observed number of co-occurrences of items i and j and on the other hand the expected number of co-occurrences of items i and j under the assumption that occurrences of items i and j are statistically independent (Van Eck and Waltman, 2021).

The analysis associates with the co-occurrence analysis a mapping technique using the VOSviewer software. It constructs a map based on the similarity matrix obtained in step 1. If n denote the number of items, then the VOS mapping technique depicts a two-dimensional map in which the items $1, \dots, n$ are located in such a way that the distance between any pair of items i and j reflects their similarity s_{ij} as accurately as possible. Items that have a high similarity should be located close to each other, while items that have a low similarity should be located far from each other. The idea of the VOS mapping technique is to minimize a weighted sum of the squared Euclidean distances between all pairs of items. The higher the similarity between two items, the higher the weight of their squared distance in the summation. To avoid trivial maps in which all items have the same location, a constraint is imposed that the average distance between two items must be equal to 1. In mathematical notation, the objective function to be minimized is given by

$$E(\mathbf{x}_1, \dots, \mathbf{x}_n) = \sum_{i < j} s_{ij} \|\mathbf{x}_i - \mathbf{x}_j\|^2 \quad (2)$$

where the vector $\mathbf{x}_i = (x_{i1}, x_{i2})$ denotes the location of item i in a two-dimensional map and where $\|\cdot\|$ denotes the Euclidean norm. Minimization of the objective function is performed subject to the constraint

$$\frac{2}{n(n-1)} \sum_{i < j} \| \mathbf{x}_i - \mathbf{x}_j \| = 1 \quad (3)$$

We note that the distances $\| \mathbf{x}_i - \mathbf{x}_j \|$ in the constraint are not squared. The constrained optimization problem of minimizing is solved numerically in two steps. The constrained optimization problem is first converted into an unconstrained optimization problem. The latter problem is then solved using a so-called majorization algorithm. The majorization algorithm used by VOSviewer is a variant of the SMACOF algorithm described in the multidimensional scaling literature (e.g., (Borg & Groenen, 2005)). To increase the likelihood of finding a globally optimal solution, the majorization algorithm can be run multiple times, each time using a different randomly generated initial solution.



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