

A just transition to a circular economy: Operational framework and indicators



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Contents

List of Tables.....	1
List of Figures.....	1
List of Boxes.....	1
Acknowledgements.....	1
Summary.....	2
1 Introduction.....	4
2 Just transition in the context of circular economy.....	6
2.1 Just transition and the term “justice”.....	6
2.1.1 Just transition: A brief introduction.....	6
2.1.2 "Justice" in the circular economy context.....	7
2.2 “Social justice” and “environmental justice” in the context of just transition.....	9
2.2.1 Environmental justice focuses on distributional aspects.....	10
2.2.2 Social justice focuses on labour and marginalised communities.....	10
2.2.3 Supplementary terms of social aspects.....	10
2.3 Conclusion on the understanding of just transition to circular economy.....	11
3 Social, environmental, and economic aspects of a just transition to a circular economy.....	13
3.1 Workers: towards decent work for all in a circular economy.....	13
3.1.1 Freedom of association and collective bargaining.....	13
3.1.2 Fair salary.....	14
3.1.3 Working hours.....	15
3.1.4 Child labour.....	15
3.1.5 Forced labour.....	16
3.1.6 Equal opportunities and non-discrimination.....	16
3.1.7 Health and safety.....	17
3.1.8 Social protection.....	18
3.2 Local communities: rights and equity in regional circular strategies.....	19
3.2.1 Access to material resources.....	19
3.2.2 Access to immaterial resources.....	20
3.2.3 Delocalisation and migration pressures.....	20
3.2.4 Cultural heritage.....	20
3.2.5 Community engagement.....	21
3.2.6 Safe and healthy living conditions.....	21
3.2.7 Indigenous rights.....	21
3.3 Society: democratising benefits and knowledge in circular economy.....	22
3.3.1 Public commitments to sustainability.....	23
3.3.2 Economic development.....	23

3.3.3	Armed conflicts.....	24
3.3.4	Technology and knowledge transfer	24
3.4	Consumers: equity and agency in a circular economy	24
3.4.1	Consumer health and safety.....	25
3.4.2	Feedback mechanisms.....	25
3.4.3	Consumer privacy	25
3.4.4	Transparency	26
3.4.5	End-of-life responsibility.....	26
3.5	Value chain partners: levelling the playing field in circular supply chains.....	27
3.5.1	Fair competition	27
3.5.2	Social responsibility across value chains	28
3.5.3	Justice in supplier relationships.....	28
3.5.4	Intellectual property rights.....	28
4	Indicators for monitoring a just circular economy.....	30
4.1	Embedding justice in circular economy indicators.....	30
4.1.1	Emerging approaches to embed justice in circular economy indicators.....	30
4.1.2	Operationalising justice in monitoring frameworks	33
4.2	Methodological framework.....	34
4.2.1	Three pillars of justice.....	35
4.2.2	Purpose and scope of indicators	35
4.2.3	Stakeholder involvement.....	36
4.2.4	Impact categories	36
4.2.5	Indicator selection criteria.....	37
4.2.6	Quantitative and qualitative evidence	38
4.2.7	Adaptivity and iterative improvement	39
4.2.8	Interdependencies across value chains.....	39
4.2.9	Decision-usefulness for policy support.....	40
4.3	Overview of the textiles and plastics value chain	40
4.3.1	Textile value chain and key impact categories.....	40
4.4	Set of indicators for monitoring progress towards a just circular economy.....	45
4.4.1	Workers	45
4.4.2	Local communities	48
4.4.3	Value chain actors.....	51
4.4.4	Consumers	53
4.4.5	Society.....	56
4.4.6	Children.....	56
4.5	Conclusion	57
5	Main conclusions and reflections.....	60
	List of abbreviations	62

References..... 64

Annex 1 – Literature review method 76

Annex 2 – Long list of potential indicators..... 77

List of Tables

Table 1 – Selected definitory approaches from literature for “Just Circular Economy”	12
Table 2 – Key impact considerations for workers in a just circular economy	18
Table 3 – Key impact considerations for local communities in a just circular economy.....	22
Table 4 – Key impact considerations for society in a just circular economy.....	24
Table 5 – Key impact considerations for consumers in a just circular economy	27
Table 6 – Key impact considerations on value chain partners in a just circular economy.....	29
Table 7 – Summary of methodological framework for indicator development	34
Table 8 – S-LCA impact categories: scope and sub-categories.....	37
Table 9 – Main characteristics of European textile value chains and their key social impact categories ..	42
Table 10 – Main characteristics of European plastics value chains and their key social impact categories	44
Table 11 – Indicators for workers.....	46
Table 12 – Indicators for local communities	48
Table 13 – Indicators for value chain actors.....	51
Table 14 – Indicators for consumers	54
Table 15 – Indicators for society	56
Table 16 – Indicators for children.....	57

List of Figures

Figure 1 – Dimensions and principles of justice according to the EEA.....	8
Figure 2 – Equality versus equity.....	11
Figure 3 – Representation of activities taking place in a circular textile value chain	41
Figure 4 – The plastic value chain showing life cycle stages or primary and secondary materials.....	43

List of Boxes

Box 1 – Leaving No One Behind in circular transitions.....	6
Box 2 – Historical development of the just transition concept.....	7
Box 3 – The RACER criteria	38
Box 4 – Spotlight indicator: Gender wage gap in circular jobs.....	47
Box 5 - Spotlight indicator: Incorporation of community recommendations in circular economy policies	50
Box 6 – Spotlight indicator: Circular economy education and training for suppliers	53
Box 7 – Spotlight indicator: Change in product price due to circular economy actions.....	55

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Summary

Justice transition in the context of circular economy emerges as a complex and multi-faceted social issue. While circular economy has historically been understood from an ecologic and economic perspective, discourses are slowly shifting to also reflect social implications of a circular transition. The preceding ETC CE report titled “A Just Transition to Circular Economy. Exploring current and potential social implications exemplary for the value chains batteries, plastics, and textiles” (ETC CE, 2025) analysed this development by mapping the understanding of circular economy and just transition, conceptualising an approach to a just circular economy by intertwining both concepts.

The following report translates these conceptual insights into an operational framework and discusses a core set of indicators. The identification and prioritization of indicators serves two purposes: (1) Monitoring progress towards a fair and just circular economy to track the state and trajectory of social implications associated with circular economy activities; (2) Providing transparency and comparable evidence for supporting policymakers in identifying social imbalances and burdens.

- To operationalise a just circular economy, it is essential to understand the wide-ranging effects of the transition on different groups, particularly in vulnerable and marginalized communities. This includes recognizing the distinct needs and experiences of communities in both high- and low-income countries. Addressing these complexities ensures that policies are inclusive, equitable, and garner broad societal support, contributing to a just transition.
- Discussion on the impacts of the circular transition are increasingly reflecting various stakeholders. Women, the labour force, informal waste workers, children, local communities, or Indigenous People are amongst the most reflected societal actors. In addition, discourses also include broader social perspectives of circular economy, such as poverty eradication, inclusion of well-being concepts, and the geographical impacts of the transition, i.e. on low-income countries. This highlights the need to ensure adequate distribution of burdens, meaningful participation, and effective reflection of various worldviews. A special emphasis must be placed on the identification of stakeholders that might possibly be affected by the circular transition, especially from a socio-economic perspective. For stakeholder groups, the following important hot spots have been identified:
 - Workers: unionisation and collective bargaining gaps in emerging circular sectors; wage undervaluation and income insecurity in repair, reuse, and waste management; precarious and irregular working hours, persistent occupational health risks, and systematic exclusion from social protection – with migrants, women, and informal workers disproportionately affected;
 - Local communities: land and water pressures from circular infrastructure and critical-material dynamics; displacement and migration pressures; uneven exposure to pollution near recycling and waste sites; weak access to monitoring data and grievance mechanisms; and limited protection and recognition of cultural heritage and Indigenous rights;
 - Society: reputational and financial gains from sustainability commitments by large institutions; limited deliberative mechanisms; under-recognition of civil society contributions; unequal economic development capacity across territories; and uneven technology and knowledge transfer with epistemic justice concerns;
 - Consumers: unequal exposure to health and safety risks in secondary markets; limited participatory feedback mechanisms; privacy risks from digitalised circular models; transparency divides linked to digital literacy and power over standards; and uneven burdens from end-of-life responsibility;

- Value chain partners: uneven playing fields for SMEs and informal actors due to procurement, funding and standard-setting power; social responsibility gaps across global circular value chains; supplier compliance burdens without support; and intellectual property regimes that constrain right-to-repair and access to circular technologies.
- The analysis of potential indicators reveals that the most well-covered areas are those related to workers' rights and working conditions, reflecting the maturity of existing international datasets (ILO, OECD, Eurostat) and their alignment with distributional and procedural justice. Indicators on wages, occupational safety, training, and employment in circular sectors provide a tangible basis for assessing social outcomes, particularly where data already exist. Similarly, governance indicators for community participation and transparency offer measurable entry points to procedural justice.
- The application of justice-oriented indicators to the textiles and plastics sectors demonstrates that a sector-sensitive approach is indispensable for meaningful monitoring. Each value chain exhibits distinct material flows, labour structures, and governance systems, which determine where and how circular strategies intersect with social justice outcomes. Measuring circularity and justice together therefore requires indicators that are not only generic but tailored to the actual R-strategies being implemented in each sector.
- Indicators capturing informal labour, Indigenous rights, cultural heritage, and social inclusion in decision-making face persistent methodological and data gaps. In addition, many indicators — though relevant to social justice — lack a direct link to circular activities. The challenge is therefore not only to expand social coverage, but to also ensure that indicators clearly reference circular processes such as repair, reuse, collection, and recycling, rather than measuring social outcomes in generic economic terms.
- Data sets and methods are increasingly available to provide some indication of justice-related outcomes but there is no common framework or established indicator set to consistently monitor just resilience at the EU, national, and subnational levels. Indicators that can assess the distributional dimension of adaptation measures are to some extent available as well as certain procedural indicators indicate the extent to which stakeholders have been involved in their development and implementation. However, indicators on recognitional justice aspects are non-existent to date.

1 Introduction

The concept of “just transition” is increasingly entering discussions and research on sustainability, particularly in the context of climate change and the low-carbon energy transition (Schröder et al., 2020). In that context, the concept made its first international appearance in 2015, in the preamble to the Paris Agreement. At COP26, the Just Transition Declaration (*Just Transition Internationally (COP26)*, 2021) set out an ambitious political pledge to ensure that the global shift to a net-zero, climate-resilient economy is fair, inclusive, and equitable, Leaving No One Behind (Box 1). Further, the recent Draghi report “Europe’s sustainable competitiveness future: justice, wellbeing, and innovation” (EC, 2024) stresses that preserving equity and social inclusion is essential to building a competitive, resilient Europe capable of tackling the current global crises. A recent EEA report further highlights that throughout Europe, sustainability policies are increasingly reflecting justice as a key concept to tackle social impacts of transformational processes (EEA, 2024).

With regards to circular economy, however, considerations of potential social implications of that transition have only recently begun to materialize. The preceding ETC report titled “A Just Transition to Circular Economy. Exploring current and potential social implications exemplary for the value chains batteries, plastics, and textiles” (ETC CE, 2025) analysed this development by mapping the understanding of circular economy and just transition, conceptualising an approach to a just circular economy by intertwining both concepts. The respective literature review revealed a growing number of political and scientific documents published in recent years criticizing the merely techno-focused approach to circular economy, as well as the neglect of social aspects alongside the ecological and economic dimensions (ETC CE, 2025). The assessment of the key value chains, textiles, plastics, and batteries, further highlighted severe justice concerns, such as poor labour conditions, health risks, environmental degradation, unequal economic benefits and burden shifting from high- to low-income countries (ETC CE, 2025). The authors concluded that the circular transition has the potential to enhance positive social outcomes – but only if they are clearly identified, actively shaped, and integrated into planning. Positive social implications do not arise by default, as aspects of fairness and equity must be pursued through intentional and well-designed transformation processes (ETC CE, 2025).

The just transition concept outlines how social well-being can be ensured during a transition process, how to avoid novel social injustices, and how to heal old ones (Härri et al., 2023). So, while the conceptual approach towards a just transition to circular economy was essential groundwork, it must be built upon and further elaborated to effectively address crucial shortcomings of previous analyses, including affected stakeholders, specific global implications of the circular transformation, and effects on key value chains (Härri et al., 2023).

Policy interventions and adaptations within the circular economy transition, for instance, can only occur with accurate information in form of data and assessments building on them. Up to date, there is a lack of indicators on circular economy transitions for the comprehensive monitoring of its’ social implications, and there appears to be no holistic framework at present to incorporate social (Coghlan et al., 2021; ETC CE, 2025). Against this background, the following report undertakes first steps to translate conceptual insights into an operational framework for monitoring a just transition to circular economy.

The report is structured as follows. First, the commonly used terms within the context of just transition to circular economy – “just transition”, “environmental justice”, “social justice”, as well as “justice”, “fairness”, “equality” and “equity” – are observed and overlaps and distinctions discussed (Chapter 2). This is followed by an analysis of social, environmental, and economic aspects of a just transition to circular economy (Chapter 3), providing the groundwork to translate the justice dimensions and impacts

categories into an operational indicator framework for monitoring the just transition towards circular economy (Chapter 4).

2 Just transition in the context of circular economy

The commitment of the European Green Deal to Leave No One Behind (see Box 1) and the European Pillar of Social Rights with its goal to build a fairer more inclusive society provides overarching guiding principles for the EU's just sustainability transition (EEA, 2024). While the direction for a just and equitable transition is set, there is a lack of understanding of how justice considerations and environmental sustainability goals can be jointly delivered through effective policy interventions (Avelino et al., 2023 in EEA 2024).

Against this background, it appears crucial to understand the overall goal of just transition in the context of circular economy (see (ETC CE, 2025)) as well as the terms used to refer to social aspects along economic transitions. The latter stems from the growing recognition that social dimensions — such as justice, fairness, equality, and equity — are often underexplored or inconsistently defined within the circular economy discourse. Without a coherent understanding of these terms and their interlinkages, efforts toward a fair and just circular economy risk becoming fragmented or superficial. Even more so, as policymakers, researchers, and practitioners increasingly seek to integrate social considerations into environmental strategies. The following chapter sheds light on the frequently used terms: justice (chapter 2.1), as well as environmental justice, social justice, social inclusion, equality, equity, and fairness (chapter 2.2), and thereby serves to differentiate the terms and putting them into a coherent context when discussing a just transition. The following analysis has been conducted through an extensive literature review (see Annex 1 for the method), screening academic as well as grey literature.

Box 1 – Leaving No One Behind in circular transitions

The principle of Leaving No One Behind (LNOB) stems from the UN sustainable development discourses and is an essential equity-centred pledge of the Agenda 2030, highlighting that sustainable development shall benefit every person and reach those most in need of benefits first. As such, it contains notions of non-discrimination or equitable resource access and burden-sharing. In publications analysed, some propose reflecting the principle of LNOB for producer responsibility systems (Thapa et al., 2024), or negotiations for the Global Plastics Treaty (UN-HABITAT, 2022). LNOB plays a role in just transition debates by going beyond the usual environmental scope of just transition discourse. It explicitly deals with aspects such as poverty alleviation and bringing a human rights-based approach to just transition conceptualisations.

2.1 Just transition and the term “justice”

2.1.1 Just transition: A brief introduction

A just transition in the context of circular economy refers to a re-design of production and consumption patterns to decrease environmental impacts while preventing potential negative social implications of transitional processes (ETC CE, 2025; Pansera et al., 2024). According to the International Labour Organisation (ILO), a just transition should safeguard workers' rights, ensure decent work, and create green jobs to accommodate displaced workers while addressing inequalities (ILO, 2022). Inequalities for workers can emerge on manifold topics. These include working conditions, labour rights (UN-HABITAT, 2022), worker protection, education and skill development (Barrie & Schröder, 2022), job creation, or potential job and economic losses (Härri & Levänen, 2024; Passaro et al., 2024). Some governments are actively addressing worker vulnerabilities as part of sustainability transitions and are working to integrate packages of just transition measures into climate policies to aid affected workers and communities. For instance, Ireland's National Economic and Social Council (NESC) (2020a) has specifically assessed the vulnerability of workers, firms, and sectors arising from the transition to climate neutrality (JTIF Ireland).

Recent publications explicitly dealing with just transition offer a large variety and depth of relevant social issues, covering distributional and recognitional justice, labour and gender issues (Barrie & Schröder, 2022;

UNDP, 2024; Wiese & Culot, 2022), stakeholder inclusion (Amorim de Oliveira, 2021; Meira et al., 2022), the role of marginalised communities, the informal sector, global waste shipments (Singh et al., 2025; Thapa et al., 2024), and poverty and human rights protection. Many published works in this field also elaborate on conceptual foundations of just transition including restorative justice, intergenerational and epistemic justice (Oates & Verveld, 2024), as well as the ethical-political commitment of LNOB (UN-HABITAT, 2022), situating these ideas into the circular economy context.

While core ideas of a just transition have been introduced in the 1970's (see Box 2), its' meaning and interpretation has undergone an increasingly vivid development. The ETC report (2025) "A Just Transition to Circular Economy: Exploring current and potential social implications exemplary for the value chains batteries, plastics, and textiles" (ETC CE, 2025) serves as the theoretical foundation for this report and adopts definitions of core justice principles, while further elaborating them based on current discussions in the literature. The literature analysed for this report, however, captures the most recent understandings.

Box 2 – Historical development of the just transition concept

The creation of the concept of just transition has a long history of ideas and can be traced to a variety of justice-centred theories and scholarship since the 1970's: Rawls' *A Theory of Justice* from 1971 reignited political philosophy debates on justice conceptualisations, especially on distributive dimensions. Beginning in the 1980's, Robert D. Bullard picked up on environmental justice movements and delivered empirical evidence of racially motivated environmental injustices in the 1980's, culminating in his influential 1990 book *Dumping in Dixies*. In the meantime, social justice was very prominently explored by Nancy Fraser, especially in her influential works of the 1990's highlighting redistribution, recognition and representation.

Drawing on Rawls theory of justice, Bullard's pioneering work on environmental justice, Fraser's work on social justice and other influences, David Schlosberg developed a conceptual framework of environmental justice with its core dimensions of distributional justice, procedural justice, recognitional justice, as well as capabilities in his 2004 and 2007 publications.

The term just transition itself emerged in the late 1970's, as the US labour rights movement called for the reflection of socio-economic impacts of economic transformation processes. Just transition mainly referred to the three dimensions distributional justice, procedural justice, and recognitional justice focusing on labour issues in the context of large-scale structural changes. Scholars linked environmental justice and just transition during the 2010's and highlighted the overlaps between both concepts.

In summary, social justice theory laid the foundation for the development of environmental justice theory. Environmental justice has in turn – next to labour movements – influenced just transition conceptualisation. This shows a loose chain of influence, dating back to the 1970's scholarship to shape our current understanding of just transition.

2.1.2 "Justice" in the circular economy context

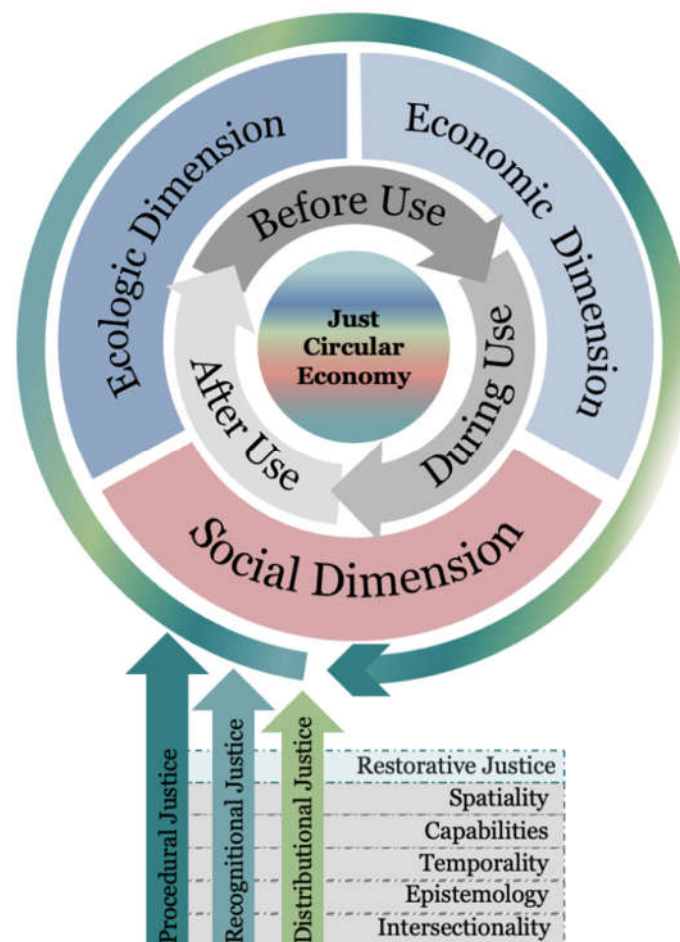
The term "*justice*" addresses the root causes of inequality, issuing systemic barriers that create unequal conditions for certain societal groups (Oates & Verveld, 2024). The previous EEA briefing on justice in a sustainability transition (2024) suggested an understanding of "justice" according to Avelino and colleagues (2023), to "improve the quality of life of current and future generations, both human and non-human, within ecological boundaries while eliminating injustices that are triggered or exacerbated by unsustainability and its underlying causes" (Avelino et al., 2023). In the same briefing, the EEA lists six elements for an effective consideration of justice, stressing the necessity for a systemic transformation to ensure equal access to both tools and opportunities (EEA, 2024):

- the necessity to determine for whom justice is delivered;
- the positionality of policymakers;
- the multi-dimensional nature of justice as a concept;
- the tensions and conflicting trade-offs characterising sustainability transitions;
- the unintended consequences that generate injustice;
- the continuous commitment to deliver justice and assess progress.

The concept of justice in the context of circular economy has been introduced in the preceding ETC report (ETC CE, 2025) resulting in a key conceptual figure illustrating a just transition towards circular economy. As seen in Figure 1, it illustrates the three core dimensions of justice, namely distributional, procedural, and recognitional justice (ETC CE, 2025; (Schlosberg, 2004, 2007), as well as the following justice aspects:

- intersectionality;
- capabilities;
- epistemologies;
- spatiality;
- temporality (EEA, 2024);
- restorative justice is highlighted as an additional aspect of justice.

Figure 1 – Dimensions and principles of justice according to the EEA



Sources: ETC CE, 2025.

While this conceptualisation has been introduced and discussed in the preceding report thoroughly (ETC CE, 2025), the following serves to outline the latest understanding of this discourse.

Distributional justice considers how burdens and benefits are distributed among different actors, including vulnerable and marginalised groups and centres on identifying what must be distributed and how – highlighting its deep interlinkages procedural justice (Benczur et al., 2024; Doing Justice Collective et al., 2024). In the context of a circular economy transition, distributional justice ensures that benefits, such as job creation, wellbeing, and improved health – as well as potential burdens – such as job losses, taxes, or environmental burdens, are carried fairly and are equally distributed among all actors (Denter, 2025; Oates & Verveld, 2024). It is also pertinent to include mechanisms in circularity legislations and regulations that address the distribution of burdens and benefits between different communities, industries, and labour forces (Schröder & Barrie, 2024). Inter- and intragenerational justice also factors into the distributional justice discussion, considering the distribution of burdens and benefits between current and future generations (Liu, 2024).

Procedural justice aims to ensure that decision making processes are designed in a fair and inclusive manner. It is also characterized by the notion that decision-making processes must be developed and implemented to enable the participation and inclusion of those stakeholders who will be affected by any taken decisions (Benczur et al., 2024; UN-HABITAT, 2022). Key elements of procedurally just decision-making processes are transparency, accurate information, the ability to revise decisions as new information emerges, and ensuring fairness of processes (see chapter 2.3) (Benczur et al., 2024; Doing Justice Collective et al., 2024; Gregersen et al., 2025; Oates & Verveld, 2024). In the context of a just transition to circular economy, a range of procedural justice dimensions are explored in the literature: the globalized nature of supply and value chains, with their interdependent networks of stakeholders spanning low- and high-income countries requires that both national and transnational legislative and regulatory frameworks for the circular economy transition are designed to reflect and address these dynamics (Denter, 2025; Härrä & Levänen, 2024). Additionally, researchers note the lack of research into how circular economy transitions affect low-income and lower-middle-income countries, a gap that risks producing regulations and strategies that overlook critical issues affecting stakeholders in low-income countries (Denter, 2025), and may contribute to a global “circularity divide” (Barrie et al., 2022; Martínez, 2024).

Recognitional justice is discussed in the latest literature as the acknowledgement and valuation of diverse perspectives, knowledge systems, identities and cultures, and the resulting heterogenous needs on an individual and collective level (ETC CE, 2025). Recognitional justice literature focusing on the circular economy transition considers marginalised and vulnerable groups, including actors in informal sectors while also stressing that the role of reproductive and care work has been historically overlooked in the existing linear systems (Benczur et al., 2024; Denter, 2025; Pansera et al., 2024; UN-HABITAT, 2022).

These dimensions however, cannot be separated from each other as easily as it seems: Circular justice, as conceptualized by Kirchherr (2021), “recognises that procedural fairness has a direct impact on the fairness of the outcome, suggesting that the transition to circular economy should purposefully incorporate concepts of equity and fairness into all aspects of the system.” (Cerchione et al., 2025).

2.2 “Social justice” and “environmental justice” in the context of just transition

In the literature, various terms are used to refer to social aspects within circularity transitions. Among the most prominent are environmental justice and social justice, alongside the terms *social inclusion*, *equity*, *equality*, and *fairness*.

2.2.1 Environmental justice focuses on distributional aspects

Environmental justice is understood as the principle (as well as activism) aimed at preventing marginalised groups or persons suffering disproportionately from environmental harms caused by human activities while ensuring that they are not disproportionately excluded from possible benefits of those activities (Bullard, 1990; OECD, 2024; UN-HABITAT, 2022).

Environmental justice is mostly conceptualised along the three dimensions distributional, procedural, and recognitional justice. However, literature puts a deeper emphasis on distributional aspects, such as “risks of new ecologic distribution conflicts” arising during the circular transition (Meira et al., 2022) or the “uneven distribution of burdens and benefits to the disadvantage of marginalised communities” (Pansera et al., 2024). The role of marginalised communities is reflected in more detail, especially through demands to include marginalised viewpoints or to enable the engagement of workers in the informal sector (Amorim de Oliveira, 2021; UN-HABITAT, 2022). Environmental justice publications also reflect upon the potential implications on children, waste exposure, impacts on low- and middle-income countries (LMIC) or intersectionality. On a more abstract level, conceptual approaches questioning the overall importance of the economic growth paradigm are also discussed in environmental justice literature (Meira et al., 2022; Mohamed, 2024).

2.2.2 Social justice focuses on labour and marginalised communities

According to a recent study, **social justice** can be understood as “a society that values fairness and equity for all individuals and social groups in all areas of life; that recognizes and respects differing ethnic, cultural, gender, and other identities among citizens; and, most importantly, that affords a dignified and fulfilling existence for all individuals” (Passaro et al., 2024).

In essence, equity, solidarity, and economic security must be ensured for societal progress (United Nations DESA, 2025). Labour issues are prevalent in social justice literature. With job creation, job protection (Von Kolpinski & Kratzer, 2024), worker protection, working conditions, decent work (Circle Economy, 2023) and education, and skill development (Barrie & Schröder, 2022), the range of themes aligns with those of just transition. Social justice is equally supportive of including the role of marginalised communities, especially informal waste pickers (Souza Piao et al., 2023), in circular economy discourses. The principle of “common, but differentiated responsibilities” (CBDR-principle) is discussed in literature on social justice (Circle Economy, 2023), which essentially foresees an equitable distribution of environmental burdens and costs amongst and between countries. Social justice literature – in its core – puts an emphasis on including marginalised groups and on taking differentiated steps to reflect their needs.

2.2.3 Supplementary terms of social aspects

Social inclusion

Social inclusion, as defined by the UNDP (2024) is a “process by which efforts are made to ensure equal opportunities — that everyone, regardless of their background, can achieve their full potential in life” (UNDP, 2024). This calls for community engagement and access to decision-making as well as recognizing structural barriers towards achieving this kind of participation (Castillo-Ospina et al., 2025). Various publications discuss specific labour issues such as job creation, education, and skill development (RREUSE, 2022), worker protection (Schröder & Barrie, 2024), working conditions (Lembachar et al., 2022) as well as informal sector inclusion rather than conceptualisations of justice and its dimensions.

Equality

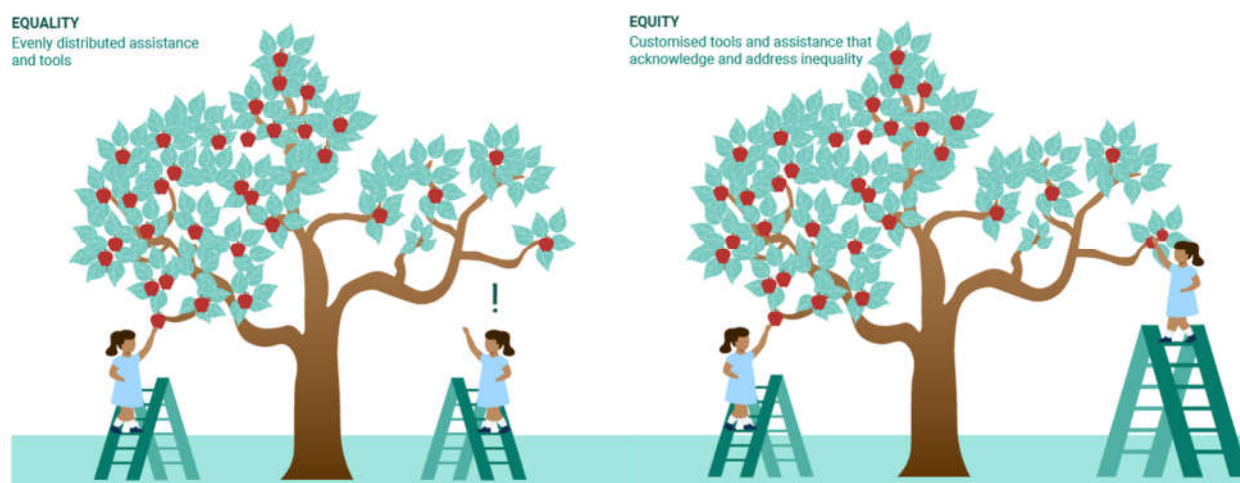
Equality refers to a system in which all members have the same access to resources and benefits (see Figure 2). To achieve equality, assistance and tools are evenly distributed to all members of the system

(EEA, 2024). However, this does not encompass the consideration of potentially different starting points of communities (e.g. resource scarcity). By overlooking existing systemic inequalities, equality might lead to different outcomes throughout societies and groups (Oates & Verveld, 2024).

Equity

Equity (see Figure 2) goes beyond equality by acknowledging unequal starting points and peoples' different needs and circumstances, providing tailored opportunities (Nwadiaru, 2021; Oates & Verveld, 2024). It thereby follows the principle that everyone should have the same opportunities to succeed and/or access resources, regardless of past injustices or systemic discrimination (Passaro et al., 2024). It addresses fairness in the societal distribution of burdens and benefits, across determinants and outcomes (Clark et al., 2022). For instance, environmental equity would describe a world, in which no community would face disadvantages in dealing with environmental hazards or pollution (Bhatnagar, 2025).

Figure 2 – Equality versus equity



Source: EEA, 2024a.

Fairness

Social **fairness** has been declared a key guiding principle for the next European Commission (Von der Leyen, 2024), emphasizing equal opportunities, reducing inequalities, and strengthening regional, i.e. social cohesion as a core goals. This is aligned with John Rawls' (1971) (ETC CE, 2025) understanding of fairness where benefits and costs are spread across countries, sectors, and demographic groups.

2.3 Conclusion on the understanding of just transition to circular economy

The concept of a just transition encompasses a wide range of themes and manifests as a complex, multidimensional issue, making it challenging to fully grasp or define. The multitude of overlapping terms used to describe related social dimensions — such as justice, environmental justice, social justice, fairness, equity, equality, and social inclusion — further complicates efforts to delineate all relevant topics. This complexity is also evident in the variety of approaches found in discussions of a just circular economy. Despite sharing the common aim of integrating social considerations into circular economy discourses, they differ notably in their interpretations and points of emphasis.

Nonetheless, several issues emerge as particularly prominent. Many conceptualisations highlight the importance of the three core dimensions of justice — distributional, procedural, and recognitional. Together, these dimensions aim to ensure that benefits and burdens are shared equitably among stakeholders, that meaningful participation is enabled, and that stakeholders' voices are fully

acknowledged. While potential gains and losses for workers are often foregrounded, increasing attention is given to the impacts on other marginalised groups, including informal workers, women, children, and communities in low-income countries.

A just transition to a circular economy can be defined as a process that shifts linear production and consumption patterns toward circular ones, while simultaneously incorporating safeguards that ensure all stakeholders at risk are recognized, able to participate, and positioned to benefit from the transition—regardless of their geographical location or their role within the product or service value chain. Against the analysis of terms within the sphere of just transition, the authors suggest equity and fairness to be a central aspect of circular governance and policy, ensuring marginalised actors benefit from the promises of the circular transition (Fernández et al., 2025; Mohamed, 2024). As stated by Chryzler et al. (2024): "Justice in transition is more about principles than definitions — it's about procedural fairness."

Table 1 – Selected definitory approaches from literature for “Just Circular Economy”

Definition

The Green Economy Coalition approaches a just circular economy as follows: “A just transition to circularity must address deeper societal, policy and geopolitical challenges to ensure that it benefits everyone.” (Martínez, 2024)

Otlhogile & Ehirley emphasise the need to include the interests of affected and marginalised stakeholders when designing “trade and monetary practices, and policies that support and encourage sustainable resource extraction, waste management, recycling, and repair throughout new low carbon ‘supply loops’.” (Otlhogile & Shirley, 2023)

Purvis et al. approach a just circular economy as follows: “A just transition to a CE refers to the process of shifting to a sustainable and equitable economic system where the needs and rights of all stakeholders are taken into account.” (Purvis et al., 2023)

Source: own elaboration.

3 Social, environmental, and economic aspects of a just transition to a circular economy

In this section, we link our analysis to the stakeholder categories and impact subcategories outlined in the UNEP Guidelines for Social Life Cycle Assessment (S-LCA), which offer a structured framework to assess how circular economy strategies might affect different social groups. This approach allows us to identify both hot spots and blind spots of justice related implications. The relevance of this framework is supported by Luthin et al. (2023), who demonstrate that a circular transition generates both positive and negative impacts across stakeholder groups, while social aspects remain sufficiently addressed.

The following section is structured according to the stakeholder categories defined in the UNEP S-LCA Guidelines (2020a): workers (3.1), local communities (3.2), society (3.3), consumers (3.4), and value chain partners (3.5). For each stakeholder category, the respective UNEP S-LCA impact subcategories are discussed through the analytical lens of distributional, procedural, and recognitional justice. The summaries for each stakeholder group are provided in tables.

3.1 Workers: towards decent work for all in a circular economy

The UNEP Social Life Cycle Assessment (S-LCA) guidelines (UNEP, 2020a) identify eight key impact categories for assessing social and socio-economic impacts on workers across supply chains and broader production systems. These categories provide a framework for analysing social impacts across diverse economic contexts, with particular attention to working conditions and rights. The eight impact categories include freedom of association and collective bargaining, fair salary, working hours, child labour, forced labour, equal opportunities and non-discrimination, health and safety, and social benefits or social security. Importantly, this section considers both formal and informal workers.

Across these eight impact categories, a review of academic and policy literature reveals multiple justice related concerns:

- Distributional justice issues are prevalent in the form of unequal pay, insecure contracts, unsafe working conditions, and persistent exclusion from social protection – particularly affecting migrants, women, informal workers, and marginalised groups.
- Procedural justice deficits are widespread, as workers are often excluded from decisions on wages, working hours, occupational health and safety, and labour governance, especially in non-unionised or informal settings.
- Recognitional justice is at stake when the contributions of informal, precarious, or socially stigmatised workers go unacknowledged in policy and reporting frameworks.

3.1.1 Freedom of association and collective bargaining

In advancing a just circular economy, it is essential to consider how organisational and value chain changes affect worker inclusion, rights, and working conditions. Trade unions have played an important role in bringing just transition principles onto the circular economy policy agenda (Fairbrother & Banks, 2023). Yet, freedom of association and collective bargaining are often compromised during the circular transition, especially within emerging sectors such as repair services and waste management. Many circular jobs in these sectors are found in newly formed enterprises that remain largely non-unionised, limiting the capacity of workers to negotiate fair wages, decent working conditions, and stable contracts (Circle Economy, 2021; Fairbrother & Banks, 2023).

This has direct implications for *distributional* justice, as the benefits and burdens of circular transitions are unequally shared. For instance, in Germany's waste management sector, Eastern European migrant workers – who often lack union representation – are disproportionately exposed to low wages and precarious working conditions in roles that German workers increasingly avoid (CISL, 2023). The lack of worker organisation in such cases not only aggravates distributional injustices but also weakens workers' ability to participate in decision making processes affecting their livelihoods, thereby undermining procedural justice.

Indeed, *procedural* justice is challenged when workers are not formally consulted or engaged in shaping policies and practices, particularly in non-unionised contexts. This exclusion from decision-making is for example visible in Montréal's e-waste sector where informal workers such as waste pickers were left out of consultations on Extended Producer Responsibility (EPR) reforms, despite being directly affected (Leclerc & Badami, 2023). A similar pattern has been documented in Hull, UK, where self-employed repairers and workers in social enterprises are not formally recognised in municipal circular economy strategies, limiting their voice in policymaking processes (Deutz et al., 2024). Finally, *recognition* justice is also at stake when labour contributions of informal or marginalised workers are not acknowledged as legitimate forms of employment. In many low-income countries, informal recycling networks continue to face criminalisation, despite their central role in circular resource flows and environmental stewardship (Thapa et al., 2023).

3.1.2 Fair salary

A just circular economy demands that the economic, social, and environmental value generated by circular labour is fairly compensated. However, in practice, workers engaged in repair, reuse, and waste recovery often experience systematic underpayment and income insecurity. This stems from the fact that these activities are frequently regarded as low-value, informal, or even charitable, a perception used to justify minimal remuneration. As a result, workers – especially in the repair economy and in social enterprises – often depend on a patchwork of grants, unpaid volunteering, or short-term, precarious contracts, rather than enjoying access to stable and sustainable incomes (Deutz et al., 2024).

From a *distributional* justice perspective, this reflects a failure to ensure that circular labour markets equitably share economic benefits. In industrialised economies, for instance, textile remanufacturing and waste sorting are typically carried out by low-paid workers – often women and immigrants – who are overrepresented in part-time, minimum-wage jobs. These groups frequently earn less than their male counterparts for comparable work, pointing to intersecting wage and gender inequalities in these forms of circular employment (CISL, 2023).

Unfair remuneration is not only a matter of distribution but also raises *recognition* justice concerns. When the economic, environmental, and social contributions of workers in circular roles are systematically undervalued or deemed marginal, this reflects a deeper failure to acknowledge their importance in the transition (ETC CE, 2025). The fact that these jobs are framed as peripheral or inherently low-skilled reinforces social hierarchies and stigmatises particular forms of labour. However, income inequalities are frequently reproduced, especially where redistributive mechanisms such as wage standards, subsidies, or social protections are absent (Lebrón, 2025; Surchat et al., 2024). Without such mechanisms, circularity may deepen rather than reduce socio-economic divides.

Finally, *procedural* justice should also be taken into consideration. In many circular sectors, especially those involving informal or non-standard work arrangements, there is no transparent or participatory mechanism for determining wages. Workers have a limited voice in how compensation structures are set or adjusted.

3.1.3 Working hours

Working hours rarely receive attention in circular economy debates. Yet time is a critical element in labour justice: how long people work, under what conditions, and with what control over their schedules can significantly determine their well-being and inclusion in the workforce. Some circular economy initiatives do offer potential improvements. For instance, localised repair, reuse, and remanufacturing activities may allow for shorter commutes, better integration of work and family life, or more flexible working patterns when embedded in supportive labour frameworks (Lebrón, 2025; Van Opstal, Borms, et al., 2024). Evidence on reuse also points to organisational enablers that shape working time experiences, including inclusive work environments that support continuous learning and more adaptable, collaborative workplace organisation (Miliute-Plepiene et al., 2025).

However, these opportunities are not realised by default. Without accompanying labour protections, some circular jobs are marked by instability and irregular schedules (Leclerc & Badami, 2023). *Distributional* injustices arise when circular employment offers no guarantee of dignified working hours, leading to income insecurity, unpredictability, and difficulty balancing work with caregiving responsibilities. These effects disproportionately impact single parents (often mothers) and migrants, who may already face barriers to decent work. The rise of for-profit enterprises in second-hand clothing markets in high-income countries, for example, has reportedly led to shorter contracts and reduced working hours (Persson & Hinton, 2023). Similarly, self-employed repairers often depend on inconsistent customer demand, resulting in unpredictable and fluctuating hours that challenge economic security (Deutz et al., 2024). In the informal waste management sector, the situation is even more acute: waste pickers and e-waste dismantlers frequently work long, irregular hours without rest periods, occupational protections, or any legal *recognition* – both in low-income countries and marginalised contexts in high-income regions (EEA, 2024; Leclerc & Badami, 2023).

In such marginalised settings of circular work, *procedural* justice is also compromised. Workers – particularly in informal, casualised, or platform-mediated roles – are rarely consulted in setting working time arrangements. They are often treated as passive labour inputs, with little or no agency to influence their schedules or advocate for better conditions (Pansera et al., 2024).

3.1.4 Child labour

Eliminating child labour remains a foundational requirement for a just transition – yet this issue receives limited attention in circular economy discourse. While circularity is often presented as an inherently sustainable and ethical alternative to linear production, its value chains may still involve harmful and exploitative labour practices. A large-scale survey among fashion industry value chain actors revealed strong support for mandatory regulations to eliminate child labour (Manshoven & Van Opstal, 2022). Despite this growing consensus, child labour risks remain widespread in low-income countries – especially in informal and poorly regulated segments of circular supply chains. Sectors such as e-waste recycling, low-cost remanufacturing, and second-hand textile reuse have been documented as areas where children are actively engaged in hazardous or exploitative forms of work (Awino & Apitz, 2024; Irvine, 2023; Maalouf & Agamuthu, 2023).

This situation also presents a clear violation of *distributional* justice. While consumers and companies in high-income countries benefit from circular models that promise cost savings, environmental gains, or ethical branding, these advantages may come at the direct expense of children’s health, education, and long-term development in low-income countries (Thapa et al., 2023). The governance and enforcement gaps that allow child labour to persist in outsourced and informal segments of circular supply chains also reflect serious *procedural* justice failures. Regulatory oversight often does not extend far enough into outsourced or informal parts of circular supply chains. Governments, brands, and industry platforms may implement traceability or due diligence measures for primary suppliers, but these rarely capture the

complex, decentralised networks where child labour frequently occurs. At the same time, *recognitional* justice is undermined by the invisibility of child labour in mainstream circular economy narratives. Official documents and policy strategies often focus on innovation, efficiency, and carbon reduction, while neglecting the social realities in the supply chains that support circular production. This is especially true in contexts where children work within family-run informal businesses (Cook et al., 2024).

3.1.5 Forced labour

Forced labour remains a critical concern in global supply chains and must be explicitly addressed in circular economy policies. Although circular strategies are often praised for reducing dependency on extractive industries and improving labour conditions (Ashraf et al., 2024; Circle Economy, 2022; Sovacool et al., 2020), this positive potential cannot be taken for granted. A just circular economy requires careful scrutiny of how circular value is created, by whom, under what conditions, and with what protections. Without such attention, circular models risk reproducing the same exploitative labour relations that characterise the linear economy (Liu, 2025).

From a *distributional* justice standpoint, circular value chains can perpetuate highly unequal working conditions. Activities such as waste sorting and dismantling frequently rely on low-paid, dangerous, or degrading labour. These roles are often filled by vulnerable workers, including migrants, informal recyclers, people with disabilities, former convicts, or refugees – groups that typically are exposed to greater risks of exploitation (Liu, 2025; Velis, 2017). In some cases, these practices amount to forced labour, especially where individuals have no viable alternatives or are compelled to work under coercive conditions. Even in sectors where circular sourcing is intended to reduce harm – such as through the recovery of lithium and cobalt from used batteries – exploitation may persist. If circular sourcing merely replaces primary extraction with secondary extraction from the same regions, while maintaining the same abusive conditions, the justice outcomes do not improve (Cerchione et al., 2025). This reflects failures of both *distributional* and *recognitional* justice, as the value generated by vulnerable workers remains invisible in sustainability metrics, and their voices remain excluded from discussions about how circular value chains should be governed, leading to *procedural* injustices.

The absence of robust human rights due diligence mechanisms within circular governance structures is a recurring critique (Purvis et al., 2023), especially for imported circular materials. Many circular economy strategies do not sufficiently distinguish between secondary materials sourced under fair conditions and those extracted through exploitative or coercive labour. This creates ethical blind spots in global circular value chains, where forced labour risks go unaddressed because the materials are classified as "recycled" or "sustainable". Addressing *recognitional* justice in this context requires the development of circular economy indicators and monitoring frameworks that explicitly incorporate forced labour risks, as discussed in chapter 4. Without such tools, the lived realities of coerced or marginalised workers remain hidden from view, and circularity goals may be achieved at the expense of fundamental human rights.

3.1.6 Equal opportunities and non-discrimination

Ensuring equal opportunities and combating discrimination are central pillars of a just circular economy. Circular jobs are often believed to offer meaningful training and employment pathways for groups that are traditionally marginalised in the labour market. These include people with disabilities or psychosocial difficulties, elderly workers, migrants, refugees, and marginalised communities (Clube, 2022; Ziegler et al., 2023). Work Integration Social Enterprises (WISEs) are frequently cited as key actors in linking social inclusion with circular innovation. WISEs facilitate labour market and social reintegration for unemployed people at risk of long-term exclusion by organising productive activities and tailored support that match tasks to individual capabilities (Van Opstal, 2025b). Their role has been formally acknowledged in both the EU's Circular Economy Action Plan (CEAP) and Social Economy Action Plan (SEAP) (European Commission,

2020, 2021). Yet a circular transition does not automatically translate into job gains in WISEs for vulnerable groups, since this outcome depends on organisational capabilities to sense, seize, and transform opportunities, and many WISEs still operate within largely linear supply chains (Van Opstal, Borms, et al., 2024).

Without targeted measures, circular labour markets may replicate or even deepen race, ethnicity, gender, disability, and class-based inequalities. For instance, *distributional* injustice is visible in the persistent gender pay gap and the underrepresentation of women in sectors such as construction, electronics, and waste – fields that remain male-dominated despite their growing strategic importance in a circular economy (Foster et al., 2024). At the same time, positive examples of circular enterprises actively countering exclusion exist. Some companies deliberately hire single mothers, individuals with disabilities, or people who have experienced incarceration. These practices contribute to *recognitional* justice by valuing overlooked capacities and identities, while also enhancing *distributional* justice by enabling access to stable, meaningful work (Lebrón, 2025).

Yet from a *procedural* justice perspective, most circular economy policies and strategies do not include explicit equity targets or inclusive hiring guidelines. There is limited formal recognition of how intersectional disadvantages – such as those faced by informal workers, ethnic minorities, and migrants - limit access to decent work in circular sectors (CISL, 2023).

3.1.7 Health and safety

Health and safety issues are among the most consistently cited concerns of workers engaged in circular economy activities (ETC CE, 2025). While circular strategies are often promoted for their environmental benefits, they do not automatically ensure safe and healthy working conditions. *Distributional* justice is clearly at stake when the burdens associated with circular work are unequally borne by vulnerable groups. Informal and low-paid workers are disproportionately exposed to hazardous substances, poor ergonomics, and unsafe environments (ILO, 2024). In low-income countries, open burning and acid leaching at informal e-waste recycling sites exposes workers to toxic chemicals without any protective measures (ETC CE, 2025). In Europe, workers in informal construction and demolition recycling may handle asbestos or heavy debris without proper safety equipment or training (Cook et al., 2022). Further examples include electronics repairers without access to personal protective equipment (Leclerc & Badami, 2023), textile workers exposed to contaminated second-hand clothing (Lucas et al., 2022), and women in waste collection who report sexual harassment on the job (CISL, 2023).

Procedural injustices arise when these workers are excluded from the institutions that safeguard health and safety, including the absence of health and safety representatives or committees. Informal workers in circular sectors often operate outside formal health systems, are not covered by certification or inspection schemes, and rarely benefit from training in occupational safety or access to safer technologies (Velis et al., 2022). Circular economy policies and monitoring tools tend to reduce health and safety to minimal compliance metrics, overlooking broader aspects such as physical wellbeing or psychosocial stress (Purvis et al., 2025).

Recognitional justice is lacking where vulnerable workers, often migrants, youth, or former convicts, are viewed as marginal or invisible rather than as essential contributors to circular economy (Liu, 2025). Nevertheless, some positive examples exist. Community-based initiatives can improve psychological safety and work-life balance (Liu, 2025), and proposals for "ultimate producer responsibility" call for formal sector actors to extend protections to informal recyclers (Thapa et al., 2023).

3.1.8 Social protection

Social protection plays a critical role in ensuring that circular jobs are socially secure. Without access to social protections such as unemployment benefits, healthcare, or pensions, workers remain vulnerable to shocks and instability. From a *distributional* justice perspective, serious concerns arise when the economic value generated by circular labour is not matched by social rights. Workers in repair cafés, second-hand shops, waste recovery initiatives, or small reuse enterprises often operate under precarious contracts, if any, and fall outside of formal employment systems (Van Opstal, Pals, et al., 2025).

Even in regions where laws formally recognise these types of labour, many workers still face *procedural* injustices. In some low-income countries, for instance, legal frameworks do not guarantee real or meaningful access to social benefits. Barriers such as administrative complexity, lack of identity documentation, geographic isolation, or discrimination continue to prevent workers from claiming entitlements (Valencia et al., 2024).

Recognitional justice is also at stake when survival strategies such as waste picking or textile repair are not acknowledged as work deserving protection. Women are particularly affected, facing overlapping barriers such as the absence of childcare, inadequate access to safe public transport, and a lack of gender-responsive social policies (Vijayarasa & Liu, 2022). The following table synthesises the patterns discussed and maps key justice hotspots across the S-LCA worker impact categories.

Table 2 – Key impact considerations for workers in a just circular economy

Impact categories	Distributional justice	Procedural justice	Recognitional justice
Freedom of association and collective bargaining	Workers in some circular sectors (e.g. waste management) lack collective bargaining power, resulting in low wages and poor working conditions.	Lack of involvement in policy design; absence of social dialogue mechanisms; exclusion from circular economy planning processes at local and national levels.	Informal workers are often not acknowledged as legitimate labour actors; lack of visibility in labour statistics or circular economy discourse.
Fair salary	Low and unstable incomes in circular sectors (repair, reuse, waste); undervaluation of community-based or feminised labour.	Limited voice in wage-setting processes; non-transparent funding or pricing models for repair, waste, and service work.	Contributions seen as low-value or charitable; circular labour framed as peripheral
Working hours	Insecure, irregular, or extended working hours without rest protections, particularly in informal or gig-like arrangements.	Little or no agency to influence working time arrangements.	Flexible or unstable work of circular workers framed as individual choice.
Child labour	Exposure of children to hazardous waste in e-waste and textile reuse in low-income countries.	Weak regulation and enforcement; absence of child labour safeguards in circular economy governance frameworks.	Circular activities carried out by children are not visible in the official data; social norms obscure exploitative practices in some contexts.
Forced labour	Coercive working conditions in recycling and secondary extraction sectors.	Lack of due diligence and weak enforcement.	Lack of human rights due diligence may hide forced labour behind “recycled” or “sustainable” labels.
Equal opportunities and non-discrimination	Underrepresentation of vulnerable socio-economic groups in high-value circular economy sectors.	Absence of inclusive hiring targets or procedures in circular economy policies.	Failure to value diverse capacities; marginalised groups not seen as key contributors.
Health and safety	Exposure to toxins, poor ergonomics, or unsafe settings (esp. informal workers and migrants).	Absence of health and safety representatives or committees.	Invisible risks (e.g. chronic illness, mental health) overlooked; safety framed narrowly in technical or physical terms.
Social protection	Exclusion from health insurance, pensions, and unemployment protections, particularly for informal and self-employed workers.	Informal or self-employed circular workers excluded from social dialogue on benefit structures or eligibility frameworks.	Lack of recognition for informal work – such as informal waste picking or textile repair – as work deserving protection.

Source: own elaboration.

3.2 Local communities: rights and equity in regional circular strategies

Local communities are essential stakeholders in a just circular economy, as they often bear the direct consequences of industrial activities including resource use and waste management. The UNEP S-LCA guidelines (UNEP, 2020a) identify seven key impact categories for local communities. These include access to material resources (such as water and land) and immaterial resources (such as education and cultural heritage); delocalisation and migration; the preservation of cultural heritage; meaningful community engagement; safe and healthy living conditions; and respect of Indigenous rights. In this section, we examine how circular practices may affect these domains, recognising the importance of local communities in a just circular economy.

Across these impact categories, multiple justice concerns emerge:

- Distributional justice issues arise where circular economy activities limit access to resources, displace communities, or expose them to health and environmental burdens without fair compensation.
- Procedural justice is compromised when communities – especially those in rural, informal or disadvantaged settings – are excluded from decision-making, monitoring or planning processes.
- Recognitional justice gaps persist where diverse community values, traditional practices or cultural identities are marginalised in dominant circular economy narratives.

3.2.1 Access to material resources

A just circular economy safeguards access to resources such as land and water by reducing waste otherwise destined for landfills, which are often situated in poorer communities (DeVoy et al., 2021; Tong et al., 2023). At the same time, ensuring access to these resources also requires addressing land pressures linked to the extraction of critical materials such as lithium, cobalt, and nickel (ETC CE, 2025).

While circular strategies can reduce some forms of environmental harm, they also create new *distributional* justice concerns related to land and resource access. The construction of circular or renewable infrastructure – such as recycling hubs, composting facilities, or waste-to-energy plants – can compete with existing land uses, particularly in contexts marked by weak governance, poverty, or land tenure insecurity. This has been documented in countries like Kenya and India, where such infrastructure has displaced rural populations or increased land pressures (Aliakbari et al., 2025; Cerchione et al., 2025). In several cases, circular initiatives have been layered onto pre-existing extractivist dynamics, replicating patterns of resource dispossession. In low-income countries, Indigenous and peasant communities have found themselves in direct conflict with state or corporate actors seeking to develop projects without local consent or benefit-sharing (Lebrón, 2025; Valencia et al., 2024). Large-scale material flows also raise cross-border justice issues. For instance, Ghana receives massive volumes of second-hand goods – up to 30 million used garments every fortnight – of which up to 40 % are deemed worthless on arrival and end up in landfills, aggravating land scarcity and waste burdens (ETC CE, 2025). Similar issues arise with plastic exports, where differences in treatment standards and enforcement can increase the risks of leakage and environmental degradation (Ashraf et al., 2024).

Procedural justice is compromised when land use decisions related to circular infrastructure are made without meaningful consultation or participation of affected communities (Dumitrescu-Popa et al., 2024; Lebrón, 2025). *Recognitional* justice is also at risk when circular economy frameworks ignore communal or non-market-based understandings of land and water rights. Such rights are not acknowledged in formal circular economy policies, which tend to prioritise investor-led or technocratic definitions of land use (Liu, 2025; McCauley, 2025).

3.2.2 Access to immaterial resources

Access to immaterial resources, such as education, knowledge, and cultural expression is essential for enabling broad and inclusive participation in circular economy activities. From a justice perspective, ensuring that all individuals and communities can acquire the skills and knowledge needed to engage with circular practices is critical to making the transition truly just.

Distributional injustices may emerge when rural, informal, or low-income communities are excluded from circular economy training opportunities. In both industrialised and necessity-driven contexts, such as Europe’s remanufacturing sector and e-waste recycling in low-income countries, many workers face barriers to accessing education and skills development (Derks et al., 2024; Dumitrescu-Popa et al., 2024; Malcolm et al., 2024). At the *procedural* level, circular economy policies often do not invest in participatory knowledge-building or public infrastructure for skills development (Pansera et al., 2021). Consequently, workers and communities lack a voice in shaping education and training agendas aligned with local needs. To address this, some scholars call for the creation of accessible knowledge hubs that support the practical implementation of sustainable and circular design principles (Coscieme et al., 2022).

Recognitional justice is compromised when non-formal education, such as intergenerational knowledge-sharing, or traditional craft and repair skills, are undervalued or unaccounted for (Lundberg et al., 2024; Purvis et al., 2023). Despite growing calls for “skills for the green transition” (CEDEFOP, 2024), the integration of cultural and informal forms of knowledge remains limited in practice. Moreover, the cultural dimensions of the circular economy are frequently overlooked. Cultural norms, values, and symbolic meanings influence how people engage with circular behaviours – such as sharing, repairing, or buying second-hand – and may explain persistent attitude-behaviour gaps in both high- and low-income countries (Carranza et al., 2023). Recognising and integrating local perspectives into circular strategies can enhance their relevance, legitimacy, and effectiveness (Lebrón, 2025).

3.2.3 Delocalisation and migration pressures

While circular strategies may reduce the demand for virgin material extraction in resource-rich regions (Wolters & Brusselaers, 2024), a just circular economy must also actively avoid the creation of new sacrifice zones (Pansera et al., 2024), causing delocalization and migration pressures. This is a recurring concern in circular infrastructure development, especially in low-income countries (ETC CE, 2025).

Distributional injustices arise when the establishment and expansion of circular infrastructure and secondary-material supply chains disrupt livelihoods without adequate compensation or alternatives (Aliakbari et al., 2025; Cerchione et al., 2025). Urban-rural divides can widen when circular economy hubs are built without regard for existing residency patterns, intensifying inequalities (Lebrón, 2025; Valencia et al., 2024). Further, while circular jobs are often more geographically dispersed, communities dependent on extractive or energy-intensive sectors are rarely offered novel job opportunities (Circle Economy, 2024). *Procedural* justice is also at stake: local actors are frequently excluded from planning processes around relocation or reindustrialisation. Finally, *recognitional* injustices persist when narratives ignore forced resettlement caused by land repurposing or treat migrants merely as a labour reserve rather than rights-holding residents.

3.2.4 Cultural heritage

Cultural heritage remains one of the least studied impact categories of a circular economy (Foster et al., 2024) even though circular economy initiatives can either revitalise or undermine cultural heritage, depending on their governance and orientation (Van Opstal, Bocken, et al., 2025). Circular strategies could, for instance, extend the lifespan of buildings and sites whilst maintaining cultural heritage (Foster, 2020;

Foster & Kreinin, 2020). This can link economic regeneration with cultural recovery, environmental restoration, and empowerment of historically excluded populations (Lebrón, 2025), creating positive impacts for the community, environment, and the local economy (De Gregorio et al., 2020; Gravagnuolo et al., 2021). Regarding intangible cultural heritage, practices of circular craft, repair, and reuse can revitalise community identity and social cohesion (Purvis et al., 2025).

However, *procedural* justice is often lacking when cultural actors – such as artisans, elders, or cultural organisations – are excluded from decision-making processes or denied access to funding. *Recognitional* justice is also at risk when circular narratives elevate only technical or economic innovation, overlooking deeper cultural values, practices, and knowledges tied to memory, care, and stewardship (Manieson & Ferrero-Regis, 2023).

3.2.5 Community engagement

Genuine community engagement is important for a just circular economy, yet current circular governance practices often fall short of achieving this. From a *distributional* justice perspective, communities located near circular economy projects frequently do not profit from resulting benefits – such as access to value creation, jobs, improved infrastructure, or better environmental quality (Deutz et al., 2024; Leclerc & Badami, 2023).

Social enterprise workers and repairers are sometimes structurally excluded from relevant policies and planning (Deutz et al., 2024). Informal repair, reuse, and recycling activities, are in some cases criminalised instead of being recognised and supported (Leclerc & Badami, 2023). *Procedural* justice is compromised when circular strategies are implemented through top-down processes that lack meaningful consultation and participation. *Recognitional* justice suffers when the roles and perspectives of informal actors, care workers, or community-led repair initiatives are ignored in favour of corporate or municipal stakeholders (Lebrón, 2025; Liu, 2025). Although scholars call for inclusive governance models (Eiselein & Langenus, 2025), many circular policy documents still fail to define mechanisms for shared decision-making or community-based monitoring.

3.2.6 Safe and healthy living conditions

A just circular economy must ensure that circular practices contribute to safe and healthy living environments. However, *distributional* injustices are particularly visible in informal settlements and low-income neighbourhoods located near polluting recycling infrastructure (Aliakbari et al., 2025; Garg et al., 2025). In low-income countries, unsafe working conditions in e-waste dismantling and informal recycling persist, even as international investment in circular economy projects increases (Cerchione et al., 2025; Liu, 2025). In regions such as Latin America and Eastern Europe, waste sites and processing plants have sometimes been found to lack environmental impact assessments, exposing marginalised communities to noise, odour, and toxic materials (Dumitrescu-Popa et al., 2024; Valencia et al., 2024). From a *procedural* justice perspective, these communities often lack access to basic safeguards such as air and water quality data, health monitoring, or grievance mechanisms. *Recognitional* justice is also at stake when exposure to physical harm is justified in policy narratives as an acceptable trade-off for employment or economic growth.

3.2.7 Indigenous rights

Respect for Indigenous rights remains one of the most overlooked dimensions in circular economy literature. However, including Indigenous perspectives in the discourse and practices of circular economy is crucial for a holistic approach to sustainability (Valencia et al., 2023). From a *distributional* justice

perspective, this involves taking Indigenous lands for recycling or reuse facilities without benefit-sharing or respect for customary governance (Pansera et al., 2024). In Latin America, circular economy narratives have at times reinforced extractivist logics under green branding, sidelining Indigenous worldviews (Lebrón, 2025; Valencia et al., 2024). *Recognitional* justice is further compromised when policies ignore Indigenous ecological knowledge systems that could enrich or challenge Eurocentric models of circularity (Cerchione et al., 2025; Dewick et al., 2022; McCauley, 2025). The following table synthesises the patterns discussed and maps key justice hotspots across the UNEP impact categories for local communities.

Table 3 – Key impact considerations for local communities in a just circular economy

Impact category	Distributional justice	Procedural justice	Recognitional justice
Access to material resources	Land or water use by circular economy facilities may restrict local access to essential resources.	Local communities often not consulted when making decisions for waste or recycling infrastructure.	Traditional land use or communal resource rights ignored in favour of technocratic resource planning.
Access to immaterial resources	Educational or innovation hubs often located in urban or well-resourced areas, increasing rural disparities.	Communities excluded from designing or managing local circular economy knowledge and training programmes.	Local knowledge systems and cultural values overlooked in skill-building and innovation design.
Delocalisation and migration	Relocation due to circular economy infrastructure or urban regeneration can disrupt community cohesion.	No involvement of communities in transition planning or urban renewal linked to circular strategies.	Displacement impacts not recognised; forced mobility of vulnerable groups normalised as "progress."
Cultural heritage	Circular economy interventions may affect culturally significant infrastructure, landscapes or practices.	Little or no formal mechanisms for heritage protection in circular economy project implementation.	Cultural values seen as obstacles rather than contributions to sustainability.
Community engagement	Unequal participation in circular economy benefits across neighbourhoods or regions.	Lack of transparent and inclusive mechanisms for dialogue or decision-making.	Grassroots or informal community action undervalued or excluded from circular economy narratives and strategies.
Safe and healthy living conditions	Communities near informal or unregulated circular economy activities face exposure to pollutants or unsafe conditions.	No access to monitoring tools or decision-making power to challenge environmental risks from circular economy projects.	Experiences of environmental harm not always acknowledged in official circular economy narratives.
Indigenous rights	Circular economy activities (e.g. biomass, mineral reuse) may invade on Indigenous territories or customary rights.	Indigenous Peoples often excluded from circular economy governance or regulatory consultations.	Indigenous worldviews and relational values excluded from dominant circular economy logic.

Source: own elaboration.

3.3 Society: democratising benefits and knowledge in circular economy

The UNEP S-LCA guidelines (UNEP, 2020a) defines society as the broader public and societal institutions indirectly affected by organisational activities across value chains. The impact categories for assessing effects on society include public commitments to sustainability issues; contribution to economic development; prevention and mitigation of armed conflicts; and the transfer of technology and knowledge from organisations to society. These categories allow for the evaluation of how organisations assume societal responsibility beyond their immediate operations.

In the context of a circular economy, public commitments may involve aligning corporate strategies with national climate and circular economy goals, through e.g. transparent reporting or sustainability certifications. Economic development can be supported through inclusive business models that create employment and infrastructure in under-served regions. In conflict-prone areas or resource-intensive sectors, responsible sourcing policies help mitigate risks of fuelling armed conflict. Finally, technology development includes the sharing of knowledge and innovation, through for instance open-source repair manuals, public research investments, or social enterprises that train marginalised groups in circular skills.

Significant justice concerns emerge for society as a stakeholder group:

- Distributional justice issues arise when the benefits of a circular economy - such as reputational gains, funding, or innovation access - are concentrated in powerful institutions or regions, while marginalised communities bear the costs or remain excluded.
- Procedural justice gaps persist where societal actors, especially civil society groups, Indigenous communities, or rural populations, are not meaningfully involved in circular policy and innovation processes.
- Recognitional justice is lacking where non-mainstream knowledge systems, grassroots practices, or community-based contributions are excluded from sustainability narratives.

3.3.1 Public commitments to sustainability

Distributional justice issues emerge where sustainability commitments translate into visible gains for governments and corporations, such as reputational capital, subsidies, or preferential procurement, but deliver fewer tangible benefits for communities, civil society, or socially marginalised groups. While circular policies sometimes refer to job creation, the benefits are concentrated in regions or sectors with strong industrial or institutional capacity, such as Northern and Western Europe (Nademi & Sedaghat Kalmarzi, 2025; Repp et al., 2021). Technical circular economy solutions would be more effective and broadly accepted by society if social justice topics, such as equitable access to new and emerging technologies, would be incorporated in policies (Oates & Verveld, 2024).

Procedurally, top-down commitments rarely include deliberative mechanisms to involve affected communities, particularly informal workers, ethnic minorities, and rural citizens (Eiselein & Langenus, 2025; Leclerc & Badami, 2023). Research on rural actors in Scotland revealed distrust toward technocratic sustainability narratives disconnected from their lived realities (Malcolm et al., 2024). The literature reveals that *recognitional* justice is frequently lacking in sustainability commitments: circularity is framed through resource-efficiency or innovation logic, marginalising alternative values such as social care, reciprocity, or rights-based sustainability (Lebrón, 2025; Liu, 2025; McCauley, 2025). Moreover, civil society efforts, such as repair cafés or reuse networks, are often absent from national reporting frameworks and taken for granted instead of being recognised as valid expressions of public sustainability commitment (Van Opstal, Pals, et al., 2025).

3.3.2 Economic development

A circular economy also raises *distributional* justice concerns linked to economic development. Smaller municipalities often lack fiscal and administrative capacity, including staff time and technical expertise for project design, co-financing and reporting. These constraints can reduce access to EU-funded programmes that channel investment into local infrastructure, services, and innovation, which can support local economic development. This capacity gap therefore reinforces territorial inequalities and underlines the need for regional support policies (Dumitrescu-Popa et al., 2024). Similarly, Deutz et al. (2024) show that job creation in circular sectors disproportionately benefited skilled professionals and contractors in the UK, while low-income communities remained marginalised. In other cases, small- and medium- sized enterprises (SMEs), startups, or social enterprises are deliberately linking circular strategies with local job creation, but their ability to up-scale remains limited by access to knowledge, finance, and infrastructure (Lebrón, 2025; Van Opstal & Borms, 2024).

Procedurally, circular economy investments sometimes fail to incorporate public deliberation on economic priorities (Eiselein & Langenus, 2025). *Recognitional* justice is also at stake; informal and community-based economic contributions, such as those made by repair workers, waste pickers, and social enterprises, are often omitted from circular economy accounting frameworks (Liu, 2025). Current indicators prioritise resource efficiency, economic activity, job creation, or start-up success, overlooking non-monetary value creation and democratic governance of resources (Clube & Tennant, 2023; Lundberg et al., 2024).

3.3.3 Armed conflicts

Though rarely put forward in circular economy discourses, there is growing attention to the relationship between circular transitions and armed conflicts. The expansion of circular and renewable supply chains into regions with extractive histories, risks reproducing colonial patterns of dispossession (Aliakbari et al., 2025; Wolters & Brusselaers, 2024). *Procedurally*, conflict prevention mechanisms, such as consent-based land acquisition or shared environmental governance, are rarely embedded in circular or renewable strategies (Cerchione et al., 2025). *Recognitional* justice is particularly thin: the structural roots of conflict, such as colonial legacies, militarisation, or state-corporate collusion, are often unacknowledged (Layden et al., 2025). The circular economy literature rarely integrates Indigenous peace protocols, local governance mechanisms, or community-led dispute resolution.

3.3.4 Technology and knowledge transfer

Distributional justice in technology and knowledge transfer is a contested theme in circular economy literature. High-income countries dominate patents, R&D investments, and the global circular economy discourse, while low- and middle-income countries disproportionately host the dirty, dangerous, or low-paid segments of circular value chains (Liu, 2025; McCauley, 2025). Knowledge often flows one-way, from central institutions to communities, rather than being co-produced (Eiselein & Langenus, 2025; Lebrón, 2025). *Procedurally*, many circular innovations are developed without inclusive participation or public transparency. For example, Purvis et al. (2025) report how community repair groups possess technical and social knowledge that is shared on a volunteer-to-visitor basis but is rarely consulted in policy design. *Recognitional* justice issues emerge from the prioritisation of technocratic and Western scientific knowledge, marginalising lived experiences or Indigenous ecological worldviews (Lebrón, 2025; McCauley, 2025). Mainstream circular economy narratives remain largely blind to *epistemic* justice: who produces valid knowledge, who is listened to, and whose models are scaled (Pansera et al., 2021). The following table synthesises the main justice hotspots across the four S-LCA impact categories for society.

Table 4 – Key impact considerations for society in a just circular economy

Impact category	Distributional justice	Procedural justice	Recognitional justice
Public commitments to sustainability	Reputational and financial gains accrue to corporations and governments; marginalised groups receive few benefits.	Limited deliberative mechanisms; affected communities excluded from target-setting and accountability processes.	Alternative values (e.g. care, reciprocity, local engagement) and civil society contributions (e.g. repair cafés) ignored.
Economic development	Circular economy investments favour urban, industrialised, or high-capacity regions; low-income areas lack equal opportunities.	Economic priorities often outlined without public input; informal and small-scale actors excluded from planning.	Community-based enterprises and informal contributions unrecognised in indicators; non-monetary value creation omitted.
Armed conflicts	Resource extraction for circular economy inputs may reinforce patterns of dispossession and conflict in extractive regions.	No embedded conflict prevention or consent-based mechanisms in circular economy strategies; governance failures in frontier zones.	Colonial legacies, Indigenous rights, and peace protocols unacknowledged; state-corporate violence obscured.
Technology and knowledge transfer	Unequal access to circular economy innovation and infrastructure; low-income regions bear risks while high-income regions profit.	Innovation processes lack transparency or participation; community knowledge undervalued in technology design.	Technocratic and Western knowledge privileged; lived experience, Indigenous ecologies, and grassroots knowledge devalued.

Source: own elaboration.

3.4 Consumers: equity and agency in a circular economy

In a just circular economy, consumers are not merely end-users but active participants whose rights, expectations, and vulnerabilities must be addressed. The UNEP S-LCA guidelines (UNEP, 2020) identify five

key impact categories to evaluate how consumers are affected by products and services throughout their life cycle. These categories include health and safety; feedback mechanisms; privacy; transparency; and end-of-life (EOL) responsibility. Together, they provide a broad set of perspectives for assessing how consumers are affected by a circular transition.

Across these impact categories, justice concerns emerge not only in relation to access and affordability but also in how circular systems are designed, governed, and communicated:

- Distributional justice issues arise when low-income or digitally excluded consumers face increased risks, limited information, or greater burdens in circular systems.
- Procedural justice gaps appear in the limited influence consumers have on circular product and service design, safety standards, or data governance.
- Recognitional justice concerns are widespread: consumer contributions to circularity (e.g. through reuse or repair) are often undervalued and marginalised user needs are frequently overlooked in policies and metrics.

3.4.1 Consumer health and safety

Consumer health and safety within circular economy is mostly framed in terms of product reuse, toxic material content, and standards in second-hand markets. From a *distributional* justice perspective risks are inequitably shared: low-income consumers often rely more on reused or remanufactured goods (e.g. electronics, textiles, or household appliances). In settings with weak testing, quality controls, or chemical oversight in secondary markets, this reliance can translate into greater exposure to health and safety risks (Liu, 2025). Used clothing imports present potential hygiene concerns, but often little infrastructure exists for inspection (Hur, 2020). Likewise, unregulated reuse of food packaging raises safety concerns (Noëth et al., 2024). *Procedurally*, consumers are rarely consulted in the development of circular product standards or safety testing for secondary markets, even though they bear the risks of substandard repairs or exposure to toxins (Lundberg et al., 2024). *Recognitional* justice is violated when safety concerns from vulnerable groups, such as children, are not accounted for in circular policies.

3.4.2 Feedback mechanisms

Feedback mechanisms for consumers in circular economy systems still require further development. From a *distributional* justice perspective, consumers with digital access, literacy, and purchasing power have more opportunity to voice concerns or influence product design, leading to circular value propositions that are less adapted to specific consumer groups, such as older adults (Van Opstal, 2025a). Initiatives like repair cafés and sharing schemes generate valuable consumer knowledge but are not integrated into formal policy or market feedback loops (Purvis et al., 2025). *Procedurally*, circular economy governance mostly lacks participatory structures for consumers to co-create product-service systems, warranties, or take-back schemes (Dokter et al., 2023; Strupeit et al., 2024). Most feedback remains one-directional (e.g. ratings or surveys), without mechanisms for deliberation or influence. Little attention is given to feedback from repair users, low-income second-hand buyers, or consumers participating in informal or community-based circular systems (Bradley & Persson, 2022; Parajuly et al., 2024). *Recognitional* injustices appear in the neglect of consumers with non-standard needs or practices, such as people with disabilities or limited mobility.

3.4.3 Consumer privacy

Digitalisation may enable circular business models and support circular strategies. However, advancing digitalisation also introduces growing concerns around consumer privacy, particularly in relation to

tracking devices, digital platforms for reuse, and smart repair technologies. *Distributional* justice concerns emerge when digital tools disproportionately affect technologically dependent users, such as those using rental models that monitor usage (Meena et al., 2025). *Procedurally*, data governance remains underdeveloped: users are often unaware of how their repair data, consumption patterns, or geo-location are used by circular service providers (Hoyng, 2023). For example, platform-based sharing schemes or appliance tracking apps do not always disclose how behavioural data is monetised or stored (Lutz et al., 2018; Tunn et al., 2026). *Recognitional* justice is compromised when privacy concerns from digitally marginalised groups, such as elderly or rural populations, are not considered.

3.4.4 Transparency

Transparency in circular economy often refers to information on product composition, origin, and environmental impact. The EU Digital Product Passport (DPP), introduced under the Ecodesign for Sustainable Products Regulation (ESPR), aims to make such product information accessible in a standardised digital format to support sustainability, circularity, and legal compliance. Informational asymmetries on product design, second-life product qualities, and user behaviour in product-as-a-service and sharing models have been acknowledged as important barriers to circular economy (Grafström & Aasma, 2021; Siderius & Zink, 2023). From a just transition perspective, informational asymmetries are even more challenging to monitor than environmental and social impacts along globalized supply chains (Manshoven & Van Opstal, 2022). Therefore, Götz et al. (2022) argue that Digital Product Passports need to cover social and labour standards alongside climate and circularity to support a just transition.

From a *distributional* justice perspective, access to meaningful product information tends to favour affluent or digitally literate consumers (CEDEFOP, 2024). This digital and informational divide limits equitable participation in circular practices such as repair, reuse, and conscious purchasing (Hur, 2020; Wang et al., 2021). *Procedural* injustices arise when large corporations dominate the design of labelling standards and certification schemes, leaving SMEs with little influence (Thakker & Sun, 2023; Todeschini et al., 2017). *Recognitional* justice is compromised when transparency is treated merely as an informational problem, overlooking power dynamics in how and what information is disclosed (Carranza et al., 2023).

3.4.5 End-of-life responsibility

End-of-life responsibility in circular economy places increasing moral and logistical burdens on consumers without guaranteeing fair support structures. *Distributional* justice concerns are clear where take-back schemes, disposal rules, or EPR systems require active participation but offer few benefits to low-income or rural consumers, who may lack transport, information, or access to collection points (Thapa et al., 2023). *Procedurally*, circular policies rarely involve consumers in designing end-of-life logistics or redistribution mechanisms, leading to split incentives to implement circular value chains (Van Opstal, Smeets, et al., 2024). In many countries of the world the informal sector, the actual handler of discarded products, is excluded from circular governance, distorting the true picture of end-of-life practices (ETC CE, 2025). *Recognitional* injustice is visible when consumer contributions to reuse or repair are unacknowledged in circular economy indicators (Van Opstal, Pals, et al., 2025) and when people relying on second-hand items are stigmatised (Hur, 2020). The following table synthesises justice hotspots across the five consumer-related S-LCA impact categories.

Table 5 – Key impact considerations for consumers in a just circular economy

Impact category	Distributional justice	Procedural justice	Recognitional justice
<i>Consumer health and safety</i>	Low-income consumers face greater risks from unregulated reused/remanufactured goods or packaging.	Consumers excluded from safety standard development for second-hand or repaired goods.	Safety risks affecting vulnerable users (e.g. children, older adults) often unrecognised in circular economy policy.
<i>Feedback mechanisms</i>	Digitally literate consumers more able to influence circular economy models; marginalised groups have fewer feedback opportunities.	Lack of participatory structures to develop warranties, service models, or reuse schemes.	Non-standard users (e.g. older adults, people with disabilities) often neglected in design and consultation.
<i>Consumer privacy</i>	Vulnerable consumers more exposed to monitoring (e.g. in rental models); less able to opt-out of tracking.	Little transparency on data use, consent, or ownership in circular digital systems.	Privacy concerns from digitally excluded groups (e.g. elderly users) rarely addressed.
<i>Transparency</i>	Affluent and digitally literate consumers have greater access to relevant product information.	Certification and labelling schemes shaped by dominant actors; limited SME influence.	Transparency framed as a technical fix, overlooking power asymmetries in information governance.
<i>End-of-life responsibility</i>	Take-back systems often inaccessible to rural or low-income users; burdens of disposal are unevenly distributed.	Consumers rarely involved in shaping collection or redistribution infrastructure.	Informal and second-hand consumer practices omitted from circular economy indicators; stigma around reuse persists.

Source: own elaboration.

3.5 Value chain partners: levelling the playing field in circular supply chains

Value chain partners, such as suppliers, manufacturers, logistics providers, and service contractors, play an essential role in enabling and sustaining circular business models. The UNEP S-LCA guidelines (UNEP, 2020a) identifies the following four impact categories for value chain partners: fair competition; promoting social responsibility; supplier relationships; and respect for intellectual property rights. These categories provide a lens to evaluate whether partnerships in circular value chains are equitable, transparent, and supportive of sustainable development.

Across the four impact categories for value chain partners, justice concerns highlight the uneven playing field within a circular economy:

- Distributional justice is challenged when SMEs, actors from low-income countries, and informal partners face barriers to market access, funding, or technology.
- Procedural justice issues arise from top-down governance of standards, certifications, and supplier relationships that exclude smaller or non-mainstream actors.
- Recognitional justice is compromised when alternative economic models, informal repairers, or non-Western knowledge systems are overlooked in favour of efficiency-driven, compliance-oriented frameworks.

3.5.1 Fair competition

A major barrier to implementing circular strategies is a lack of fair competition as linear business models often do not internalise the social and environmental externalities along the product life cycle (Grafström & Aasma, 2021). This puts the use of recycled content, repair services, and reuse markets at a competitive disadvantage (Deutz et al., 2024; Van Opstal, Pals, et al., 2025). From a *distributional* justice perspective, the development of circular value chains is undermined when access to markets, funding, or innovation opportunities are unevenly distributed compared to conventional business models. Moreover, power imbalances may result in unequal access to procurement, subsidies, or supply chains, aggravating a lack of fair competition (Eiselein & Langenus, 2025). Germany’s National Circular Economy Strategy, for instance, promotes multi-stakeholder partnerships to improve fair access to markets and to reduce the technology

gap (German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection, 2024).

From *procedural* and *recognitional* justice perspectives, policymaking on circular economy competitiveness tends to exclude actors in the informal economy and community-based organisations. *Recognitional* justice is undermined when alternative economic forms are marginalised as inefficient or unscalable, despite their social and environmental contributions (Liu, 2025; McCauley, 2025). The dominance of for-profit competition can shift attention toward cost-cutting and market growth, even in second-hand markets, undermining the inclusive and labour-supportive missions of community-based circular initiatives (Persson & Hinton, 2023). Public procurement practices that prioritise lowest-price bids further deepen these injustices, reducing the space for bidders committed to social and circular value creation (CISL, 2023).

3.5.2 Social responsibility across value chains

While the circular economy promises environmental gains, it has yet to deliver consistent social responsibility across value chains. As mentioned earlier, *distributional* injustices persist when workers in circular systems, such as informal recycling or remanufacturing, remains underpaid, unsafe, or excluded from benefits like fair compensation and social protection (Mair et al., 2018). From a *procedural* justice perspective, marginalised actors – particularly in low-income countries – are rarely involved in shaping corporate responsibility standards or circular economy policy frameworks, despite bearing most of the environmental and economic impacts (Dumitrescu-Popa et al., 2024; Lebrón, 2025). *Recognitional* justice is compromised when social responsibility is reduced to certification or compliance checklists, ignoring local norms, gendered labour dynamics, or informal innovation networks (Purvis et al., 2023; Vijayarasa & Liu, 2022). The ongoing negotiations of the Global Plastics Treaty similarly highlight these justice gaps, as calls for fair labour standards and inclusion of informal waste workers remain contested in global policy frameworks (O’Hare & Nøklebye, 2024).

3.5.3 Justice in supplier relationships

Achieving justice in supplier relationships is another aspect of a socially fair circular economy. Circular strategies such as product take-back schemes, eco-design, and material recovery offer potential for long-term, transparent supply chain partnerships. These strategies can also support localisation and reduce social burdens, especially when paired with inclusive sourcing and capacity-building initiatives (Cerchione et al., 2025; Martin & Herlaar, 2021). However, *distributional* justice may be challenged when SMEs and suppliers from low-income countries are expected to comply with new circular economy requirements without sufficient technical or financial support (Dumitrescu-Popa et al., 2024).

From a *procedural* justice perspective, supplier relationships are often governed by top-down dynamics that marginalise the voices of smaller, artisanal, or informal actors. In Colombia, for instance, circular entrepreneurs reported that key supply chain decisions were dictated by intermediaries and funders rather than being co-developed with suppliers and users (Lebrón, 2025). *Recognitional* injustice occurs when supplier contributions are undervalued in favour of scale, digital compliance, or brand prestige, silencing alternative models of circularity (Gachenga, 2022).

3.5.4 Intellectual property rights

Intellectual property (IP) rights can allow circular companies to benefit from their innovations, yet they may also create tensions with the company’s circularity ambitions (Capponi et al., 2025). From a *distributional* justice perspective, access to technologies and data, for repair, refurbishing, and recycling,

is often restricted by IP protections, placing SMEs, community initiatives, and actors from low-income countries at a systemic disadvantage (Van Opstal, Pals, et al., 2025). Warranty and IP regimes may further constrain informal repair networks, stressing the need to adapt regulatory frameworks in support of legal and fair reuse practices (Calboli, 2024; Jourdain & Lamah, 2024).

From a *procedural* justice perspective, patent law and overlapping IP rights can make the right-to-repair ineffective, especially when repairs are classified as re-manufacturing or blocked by control over spare parts (Kur & Calboli, 2023). *Recognitional* justice is compromised when informal repairers and traditional craftspeople are excluded as legitimate innovators or rights holders. Dominant legal frameworks often reflect a utility-maximisation logic instead of socially desirable innovation, whereas more inclusive legal paradigms could better align IP regimes with the goals of a sustainable and just circular economy (Ballardini et al., 2021). The following table outlines the key concerns across the four S-LCA impact categories for value chain partners.

Table 6 – Key impact considerations on value chain partners in a just circular economy

Impact category	Distributional justice	Procedural justice	Recognitional justice
<i>Fair competition</i>	SMEs and informal actors face disadvantages in funding, procurement, and market access.	Informal and community-based actors excluded from competitiveness policy design.	Alternative models framed as inefficient or marginal; social enterprise bids ignored in lowest-cost procurement models.
<i>Social responsibility across value chains</i>	Informal and low-income country labour injustices remain invisible to end-consumers; social burdens remain externalised.	Local actors not included in developing corporate circular economy responsibility frameworks.	Local norms, gender dynamics, and informal networks often ignored in favour of top-down standards.
<i>Justice in supplier relationships</i>	New circular economy obligations burden small suppliers with compliance costs without adequate support or redistribution.	Decision-making concentrated in large firms or intermediaries; limited co-development with smaller or regional partners.	Supplier contributions de-valued in favour of scale, brand prestige, or tech-oriented models of circularity.
<i>Intellectual property rights</i>	Access to repair and reuse technologies is blocked by restrictive IP protections; disadvantage for SMEs and informal repair.	Patent regimes hinder democratic access to repair or circular innovation; limited voice for small actors.	Informal and traditional repairers excluded as innovators or rightsholders; prevailing IP logic ignores social value.

Source: own elaboration.

4 Indicators for monitoring a just circular economy

This chapter builds on the conceptual foundation established in Chapters 2 and 3, which define the justice dimensions and the social impact categories relevant to conceptualising and assessing a just transition within circular economy. It attempts to make first steps to translate conceptual insights into an operational framework for monitoring the just transition and proposes a core set of indicators that can be used to track progress over time. The chapter presents a methodology for identifying and selecting indicators that can track how circular transitions distribute benefits and burdens across social groups, geographies, and value chains. Drawing on the most recent scientific literature, it integrates justice-oriented monitoring approaches — including ICAT’s Just Transition Monitoring Guide, UNEP’s Social Life Cycle Assessment (S-LCA) framework, the Bellagio Principles for circular economy monitoring, and the RACER quality-assessment method — to build an inclusive, coherent, and policy-relevant foundation for indicator design. The framework is illustrated through its application to two priority sectors of the EU Circular Economy Action Plan, textiles and plastics, which serve as representative value chains for testing the relevance and feasibility of justice-sensitive indicators.

The following chapter is structured as follows. Chapter 4.1. provides a review of key literature and existing frameworks that inform indicator design for a just circular transition, while 4.2 presents the conceptual and methodological approach underpinning indicator selection. Chapter 4.3 provides an overview of the textiles and plastics value chains, identifying relevant impact categories and social hotspots, followed by chapter 4.4 that provides an overview of potential indicators across stakeholder categories and social impact categories, for future monitoring frameworks. Finally, chapter 4.5 discusses data and methodological limitations and future directions for refining just transition monitoring in circular systems.

4.1 Embedding justice in circular economy indicators

4.1.1 Emerging approaches to embed justice in circular economy indicators

Across the reviewed literature, a strong consensus emerges that current circular economy indicators primarily capture how efficiently materials circulate but largely fail to assess how equitably the benefits and burdens of circularity are distributed across society. While material flow, recycling rates, and economic value creation are increasingly well measured, questions of who gains, who loses, and who remains excluded from circular transitions remain weakly addressed. To bridge this gap, it appears necessary to create territorially grounded, participatory, and intersectional indicator frameworks that integrate labour conditions, gender relations, governance quality, and informal economy dynamics alongside conventional material and economic metrics. This shift reflects a growing recognition that circular economy monitoring is not merely a technical exercise, but a political and normative process that actively shapes transition pathways and their social outcomes.

Over the past decade, literature on circular economy monitoring has grown substantially, yet most frameworks remain environmentally and economically centred, only marginally addressing social and justice dimensions. In fact, reviews of circular economy indicators reveal a persistent methodological bias towards efficiency and material throughput metrics, while neglecting equity, governance, and inclusion (Avdiushchenko & Zajac, 2019; Calzolari et al., 2022; Pansera et al., 2024; UNECE, 2024; WBCSD, 2023). Scholars increasingly argue that indicators are not neutral tools but “normative artefacts” that reflect and reproduce power relations and social values (Casazza, 2024; Purvis, Calzolari, et al., 2025). Purvis and Genovese (2023) emphasise that circular economy indicators reflect political assumptions about whose priorities are valued. Improving circular economy monitoring is therefore not only about making indicators

better, but also about designing them to be reflective and transformative, considering both justice issues and the effects of the monitoring framework itself.

A comprehensive review of 203 studies by Calzolari et al. (2022) shows that more than 80 % of circular economy indicator frameworks exclude social aspects altogether, and that only 15 % integrate environmental, economic, and social indicators in a holistic manner (Calzolari et al., 2022). In cases where social indicators are included, they usually only measure the number of jobs created, disregarding job quality, occupational safety, or inequality along global value chains. The authors warn that this reductionism leads to a misrepresentation of trade-offs and produces composite indices that conceal who benefits and who bears the burdens of circular economy transitions. Complementing this, the JRC (2024) review of 33 EU circular economy policy impact assessments reveals that employment dominates social-impact coverage ($\approx 40\%$), while health, wellbeing, and distributional effects remain only marginally addressed ($< 20\%$). It introduces a typology of socio-economic impacts to improve policy evaluation and urges alignment with the European Pillar of Social Rights, recommending that circular economy policies report both positive and negative social outcomes (European Commission: Joint Research Centre, 2024).

At the corporate and operational level, recent work by the World Business Council for Sustainable Development (WBCSD, 2023) marks a significant shift by extending the *Circular Transition Indicators (CTI)* framework to include social dimensions. The *CTI – Social Impact Guide* connects circular performance with human-rights and inclusivity metrics through three analytical components:

- a social-maturity assessment of governance readiness;
- social-risk mapping across value chains;
- a quality-jobs analysis based on ILO decent-work criteria.

A major novelty of this framework is the inclusion of informal workers— waste pickers, repairers, sorters — as essential actors in circular systems, with guidance on evaluating exposure, remuneration, and formal-recognition mechanisms. By embedding human-rights due diligence (UN Guiding Principles; OECD Guidelines; EU Corporate Sustainability Reporting Directive) into circular economy metrics, CTI aims to bridge corporate social responsibility and circular performance monitoring (WBCSD, 2023).

Recent empirical studies emphasise that circular transitions are spatially and socially embedded processes. Deutz et al. (2024) argue that “place” mediates how circular economy benefits and burdens are distributed: industrial and urban centres often capture economic gains, while rural and peripheral regions face job losses or limited access to infrastructure. They identify three justice gaps — spatial, procedural, and recognitional — and recommend territorial indicators such as employment diversification, access to secondary materials, and regional resilience (Deutz et al., 2024). Similarly, Van der Werf et al. (2025) catalogue 379 existing circular economy indicators and conclude that most exhibit scale bias, focusing on national material flows and neglecting local and social impacts. Their participatory *PARDI*¹ method demonstrates that co-design with stakeholders improves contextual relevance and social legitimacy of indicators (van der Werf et al., 2025).

Eiselein and Langenus (2025) also advocate a principle-based approach to ensure justice in circular economy transitions, arguing that redistribution must be complemented by inclusive governance, empowerment of marginalised actors, and cross-sectoral partnerships. They recommend developing relational indicators that measure cooperation quality, social dialogue, and participation in decision-making, alongside conventional environmental and economic metrics (Eiselein & Langenus, 2025). Pansera et al. (2024) criticise circular economy policies for reproducing colonial and patriarchal divisions of labour,

¹ PARDI stands for Problem, Actors, Resources, Dynamics, and Interactions. It is a structured analytical framework designed to help stakeholders jointly understand a complex system before designing interventions.

especially across global supply chains. They propose intersectional indicators linking environmental gains to empowerment and equality outcomes, particularly in feminised and informal sectors (Pansera et al., 2024). Institutional initiatives are beginning to acknowledge social aspects but remain dominated by environmental indicators. The UNECE & OECD (2024) *Guidelines for Measuring the Circular Economy* propose a harmonised framework built around four pillars:

- material life cycle;
- environmental interactions;
- socio-economic opportunities;
- policy responses.

While the framework explicitly refers to ensuring “positive outcomes for society,” most indicators remain material or macroeconomic (e.g. DMC, recycling rate, circular economy employment), leaving justice elements underdeveloped (UNECE, 2024). The Oeko-Institut (2021) broadens this agenda through its *Just Transition Indicator Paper*, identifying three domains where social and environmental monitoring intersect:

- environmental benefits and burdens;
- participation and consumption opportunities for vulnerable groups;
- employment and regional cohesion.

It finds that existing datasets are rarely disaggregated by social group, limiting their suitability for environmental-justice analysis. The study calls for baskets of disaggregated indicators and new metrics for mobility and food justice, as well as expenditure indicators tracing EU Just Transition Fund and ETS revenue allocations (Oeko-Institut, 2021).

At the national level, Nuss et al. (2021) apply the RACER framework to Germany’s resource-use monitoring, linking resource efficiency to social cohesion, and employment stability. Their multi-layer system integrates material, water, land, and emission indicators while advocating social-footprint metrics to reveal global supply-chain effects and prevent burden shifting between regions and income groups (Nuss et al., 2021).

Further, Luthin et al. (2023) provide the first comprehensive systematic review of Social Life Cycle Assessment (S-LCA) applications within circular economy contexts, synthesising 97 studies published between 2008 and 2022. Their work establishes a critical reference point for linking life-cycle methodologies — traditionally used for environmental and economic analysis — with social dimensions of circularity. The review identifies 104 distinct single indicators and nine composite indices used to measure social impacts across various circular economy strategies, such as recycling, remanufacturing, reuse, and product-service systems (Luthin et al., 2023).

The analysis reveals that S-LCA studies in circular economy are strongly dominated by labour- and employment-related indicators, with nearly 70 % of metrics focused on direct employment creation, job retention, and worker safety. About half of the impacts reported across studies are positive — typically associated with new jobs, income opportunities, or training in recycling and refurbishment sectors — while the other half reflect negative or trade-off effects, including job losses due to automation, wage suppression, and the need for re-skilling in more technologically intensive sectors (Luthin et al., 2023).

The authors find that social impact coverage is uneven across stakeholder categories. Indicators referring to *workers* and *consumers* are relatively common, but those addressing *local communities*, *value-chain*

actors, and *society at large* remain rare. Equity-related aspects — such as access to resources, income distribution, gender balance, and cultural recognition — are largely absent. As a result, most S-LCA studies still frame “social performance” in terms of employment quantity, rather than social quality, well-being, or justice. To address these limitations, Luthin et al. (2023) propose several methodological recommendations directly relevant for the development of just-transition monitoring frameworks:

- Harmonisation of social-circularity subcategories under a shared taxonomy that aligns S-LCA impact categories (e.g. human rights, health and safety, governance) with circular economy value-chain stages;
- Integration of qualitative data (e.g. stakeholder interviews, participatory approaches) to contextualise quantitative indicators and capture dimensions of procedural and recognitional justice;
- Inclusion of life-cycle thinking across both upstream and downstream circular economy activities, ensuring that labour and community impacts are assessed globally rather than confined to the site level;
- Operational linkage to policy frameworks, such as the European Green Deal’s Just Transition Mechanism, to ensure indicators are relevant for governance and accountability.

Attention to informality is another emerging theme in circular economy scholarship. Van Opstal et al. (2025) provide the first quantitative assessment of the informal circular economy within an industrialised region (Flanders, Belgium), revealing that informal repair, reuse, and sharing activities make substantial contributions to value retention but remain statistically invisible in official circular economy monitoring. They argue that informality is both a burden, due to precarious labour, and an opportunity for innovation, inclusion, and social cohesion. The study calls for indicators capturing informal contributions such as unpaid working hours, repair-network density, and participation in sharing initiatives to complement formal economic statistics (Van Opstal, Pals, et al., 2025).

4.1.2 Operationalising justice in monitoring frameworks

While most of the academic literature has so far focused on conceptualising justice in circular transitions, relatively few initiatives provide applied methodologies for translating these concepts into operational monitoring systems. The Initiative for Climate Action Transparency (ICAT, 2025) fills this methodological gap by proposing a comprehensive framework for designing, implementing and institutionalising indicators that “monitor the justice-related aspects of low-carbon, resilient transitions”. As such, the ICAT guide represents an attempt to codify justice-based monitoring practices across policy sectors (e.g. energy, industry, agriculture) with lessons directly relevant to the circular economy.

The ICAT Guide, which centres on the three justice dimensions of distributional justice, procedural justice and restorative (or recognitional) justice, proposes a five-step methodology:

1. define objectives and scope of the transition being monitored, including affected sectors, populations, and temporal boundaries;
2. identify indicators that reflect distributional procedural, and restorative dimensions, drawing from existing data where possible;
3. establish institutional arrangements for data collection, coordination, and quality control;
4. analyse and interpret results to assess progress, identify barriers, and enable corrective action;
5. communicate findings and feedback to stakeholders, ensuring that monitoring informs decision-making and adaptive governance.

This cyclical process embodies the principle of learning-by-monitoring, emphasising that indicator systems should evolve over time as knowledge, participation, and data availability improve (ICAT, 2025). A core contribution of ICAT is its recognition that justice-oriented monitoring must be embedded in governance structures, not confined to data collection. The framework explicitly requires mapping institutional roles, responsibilities, and stakeholder participation mechanisms to ensure legitimacy and accountability. In practical terms, ICAT demonstrates how justice-oriented monitoring can be built even under data constraints, by combining quantitative indicators with qualitative assessments and progressively strengthening institutional capacity.

The emphasis on governance resonates strongly with the *Bellagio Principles for Circular Economy Monitoring* (EEA & ISPRA, 2021), which emerged from a collaborative process led by the European Environment Agency, ISPRA and EU stakeholders as a benchmark for what constitutes “good” circular economy monitoring. They articulate seven foundational principles: i) holistic coverage of material flows, ii) coherence across scales, iii) inclusion of policy/process/behaviour indicators, iv) transparency, v) multilevel monitoring, vi) link to targets and vii) clarity of communication. Particularly relevant is the Bellagio’s proposition that monitoring must not solely focus on material flows and environmental outcomes, but also economic and social impact indicators. The principles also explicitly call for indicator selection that echoes the RACER (Relevance, Acceptance, Credibility, Ease, Robustness) criteria and for exploiting a wide mix of data sources, including official statistics, private data, new digital sources, and qualitative insights. Finally, as already seen in chapter 3, the UNEP S-LCA guidelines provide a structured methodology for assessing social impacts across products’ life cycles or organisational boundaries. They define stakeholder groups, impact sub-categories, and inventory vs. impact assessment methods, as well as strategies for handling data gaps, quantitative indicators, and uncertainty.

4.2 Methodological framework

The methodological framework presented here defines the foundation for identifying and prioritising indicators to effectively monitor a just transition to circular economy in the textiles and plastics sectors. It builds directly on the analytical framework developed in chapter 3 and aims to translate the outlined justice dimensions and impact categories into an operational indicator framework. In the following, a detailed overview of the methodological pillars considered in this framework will be provided, while a summary can be seen in Table 7.

Table 7 – Summary of methodological framework for indicator development

Methodological pillar	Description	Relevance and feasibility for current report
<i>Three pillars of justice</i>	Embed the framework in the three dimensions of justice: distributional, procedural and recognitional.	Indicators are grouped and analysed according to these three justice pillars to ensure balanced coverage of justice outcomes.
<i>Purpose and scope</i>	Define what indicators are meant to monitor, for whom, and within which boundaries.	The scope focuses on the textiles and plastics sectors, with a European core perspective and recognition of global interdependencies. Indicators aim to cover short-term and long-term outcomes, across both formal and informal sectors.
<i>Stakeholder involvement</i>	Integrate participatory and expert-based methods to enhance legitimacy, ownership, and contextual accuracy of indicators.	Full participatory validation is not possible in this phase due to time constraints. Partial expert consultations informed indicator screening, while broader stakeholder engagement is foreseen in the next phase.
<i>Impact categories</i>	Adopt internationally recognised social domains to ensure coherence and comparability across sectors, scales, and geographies.	Six domains from the UNEP S-LCA Guidelines (2020) are applied: human rights, working conditions, health & safety, cultural heritage, governance, and socio-economic repercussions.
<i>Indicator selection criteria</i>	Evaluate indicators using the RACER framework to ensure methodological soundness and policy usability.	Each indicator is scored across the five dimensions using a structured matrix.

Methodological pillar	Description	Relevance and feasibility for current report
<i>Quantitative and qualitative evidence</i>	Integrate quantitative metrics with qualitative validation to capture the full spectrum of justice dimensions, particularly procedural and recognitional aspects.	The main focus is on quantitative indicators, which are currently not complemented by qualitative approaches. A deeper mixed-method integration is planned for subsequent iterations.
<i>Adaptivity and iterative improvement</i>	Embed opportunities to periodically review and refine indicators as new data, priorities and policy frameworks emerge.	Adaptivity is proposed to be institutionalised through regular review cycles and the integration of validated indicators in the EEA's Circular Metrics Lab (CML) database.
<i>Interdependencies across value chains</i>	Capture systemic linkages within and beyond European value chains to reflect how circular transitions produce global social effects.	Indicators address both internal (EU) and external (global) social impacts, such as waste exports, resource dependencies, and labour conditions in supplier regions, ensuring a systemic, and equitable perspective.
<i>Decision usefulness for policy support</i>	Ensure indicators provide a useful and methodologically grounded support for policy-making across governance levels and stakeholder groups.	Indicators are evaluated for their policy relevance, communication clarity, and capacity to support decision-making.

Source: own elaboration.

4.2.1 Three pillars of justice

The framework is anchored in the three core dimensions of justice: distributional justice, procedural justice, and recognitional justice. Each indicator is classified under one or more of these pillars to ensure balanced coverage of outcomes.

4.2.2 Purpose and scope of indicators

Defining the purpose and scope of the indicators clarifies their intended function, their analytical boundaries, and their relevance for decision-making. In the context of a just circular economy, indicators should enable policymakers and stakeholders to assess whether circular transitions are generating equitable social outcomes — such as decent employment, inclusive participation, and fair distribution of benefits and burdens — and to identify where corrective measures may be needed. In this framework, indicators serve two interlinked purposes:

- *Monitoring progress towards a just circular economy:* indicators track the state and trajectory of social outcomes associated with circular economy measures. They help determine whether changes in production, consumption, and resource management align with the principles of justice defined in chapter 2. This function fulfils a monitoring role by providing transparent and comparable evidence of progress across time, regions and policy domains.
- *Supporting policymakers in the identification of social imbalances and burdens:* beyond tracking trends, indicators are designed to inform decisions. For example, assessing whether circular economy policies are improving job quality, protecting vulnerable workers, or ensuring equal access to benefits and participation. This role links monitoring to decision-making support in governance processes and policy design.

The scope of the indicators is defined along four dimensions — sectoral, geographical, temporal, and systemic — to capture the complexity of European value chains and their global interconnections:

- *Sectoral scope: textiles and plastics*

The framework is applied to two resource-intensive and socially sensitive sectors identified in the EU Circular Economy Action Plan: textiles and plastics. These sectors exemplify both the opportunities and challenges of circular transitions, ranging from high labour intensity and globalised supply chains to significant waste generation and pollution.

- *Geographical scope: European focus with global interdependencies*

Indicators primarily assess outcomes within Europe but also account for externalised social effects linked to European consumption and trade. These include dependencies on high-risk regions for raw materials (e.g. oil and chemical feedstocks for plastics, cotton or synthetic fibres for textiles) and the export of waste or end-of-life materials to low-income countries. Addressing both internal and external dimensions ensures that European circular transitions do not displace environmental or social burdens abroad.

- *Temporal scope: short-term and long-term dimensions*

The framework distinguishes between short-term operational indicators (e.g. job creation, occupational safety, access to training) and long-term structural indicators (e.g. wage convergence, social inclusion in governance, regional resilience). This dual perspective enables the framework and indicators within to capture not only immediate effects but also the durability and distribution of benefits over time.

- *Systemic scope: integration of both formal and informal sectors*

Circular economy increasingly involves both formal and informal actors, from regulated manufacturing and recycling facilities to community-based repair networks and informal waste collectors. Recognising both spheres is essential to prevent exclusion or invisibility of informal workers, particularly in recycling and reuse phases. Indicators therefore address labour rights, health and safety, and economic recognition across the full spectrum of circular activities, formal and informal alike.

4.2.3 Stakeholder involvement

Participatory indicator development is widely recognised as best practice to ensure legitimacy, ownership, and contextual relevance. Inclusive design processes allow indicators to capture the perspectives of those most affected by circular transitions, increasing their acceptance and interpretability. Studies such as Purvis et al. (2025) demonstrate that participatory methods — Delphi panels, expert co-design workshops, and stakeholder consultations — enhance the quality and legitimacy of justice-oriented indicators by reconciling technical feasibility with social meaning.

In this task, stakeholder involvement forms part of the methodological framework but could only be partially implemented due to time constraints. The current process for identifying and selecting indicators therefore primarily draws on desk research and scientific literature, complemented by internal expert review within the ETC network. A broader participatory validation — involving policymakers, businesses, and community representatives — is foreseen in the next project phase. This iterative process aligns with ICAT’s learning-by monitoring principle, ensuring that future indicator refinement is informed by stakeholder feedback and grounded in real-world governance contexts.

4.2.4 Impact categories

To ensure coherence, comparability, and methodological alignment with established approaches, and as articulated in chapter 3, the framework adopts the impact categories defined in the UNEP Guidelines for Social Life Cycle Assessment (UNEP, 2020a). These categories represent an internationally recognised taxonomy for assessing social performance across products and organisational life cycles and have been increasingly applied in sustainability assessments for resource-intensive sectors.

The six categories— human rights, working conditions, health and safety, cultural heritage, governance and socio-economic repercussions — serve as the organisational structure for the identification and presentation of relevant indicators. Each category encompasses a set of subcategories that collectively provide a comprehensive lens for analysing the social dimensions of circular transitions, as presented in the table below.

Table 8 – S-LCA impact categories: scope and sub-categories

Impact Category	Scope	Example sub-categories
<i>Human Rights</i>	Covers fundamental rights and freedoms that apply across all stakeholder groups.	Freedom of association, non-discrimination fair treatment, elimination of forced and child labour, access to essential resources, respect for Indigenous rights, protection of vulnerable groups.
<i>Working Conditions</i>	Captures the quality and security of jobs.	Employment relationships, fair wages, working hours, social protection, occupational safety, equal opportunities.
<i>Health and Safety</i>	Focuses on the physical and psychological wellbeing of workers, consumers and communities.	Exposure to hazardous substances, accident rates, safe living and working environments.
<i>Cultural Heritage</i>	Covers the preservation of cultural identity, traditional practices, collective memory, and the rights of communities to maintain, transmit and protect their knowledge systems.	Respect for local traditions, cultural identity and the protection of community values and Indigenous knowledge systems.
<i>Governance</i>	Encompasses the systems, rules, and institutional arrangements that shape responsible business conduct.	Supplier relationships, prevention of corruption, transparency, participation, fair competition, accountability.
<i>Socio-economic repercussions</i>	Captures broader socio-economic dimension at the macro level, with a focus on structural and distributional effects.	Wealth distribution, contribution to economic development, technology transfer, poverty alleviation, local employment, regional cohesion.

Source: own elaboration.

Each impact category is therefore associated with multiple subcategories, which can be operationalised through quantitative and qualitative indicators depending on data availability and policy relevance. The integration of impact categories into a justice-oriented framework ensures that indicators do not only assess compliance or burden, but also capture distributional, procedural, and recognitional justice dimensions. Based on the UNEP S-LCA framework, this methodological framework is built on a stakeholder-based logic; Potential impacts are classified according to *who* is affected (stakeholder categories) and *how they are affected* (impact categories and subcategories). As seen in chapter 3, stakeholder categories include:

- workers;
- local communities;
- value chain actors;
- consumers;
- society;
- children.

Combining the stakeholder categories and impact categories, the framework provides an indicator matrix, which structures indicators by both stakeholder group and impact category.

4.2.5 Indicator selection criteria

To ensure transparency, quality, and policy relevance, the framework applies the RACER evaluation method, an established tool developed for assessing the suitability of indicators in policy monitoring and evaluation. RACER stands for *Relevance, Acceptance, Credibility, Ease and Robustness* (see Box 3), and provides a systematic approach to screening, comparing, and prioritising indicators before inclusion in the monitoring framework. Each “candidate” indicator (see Annex 2) is assessed against these five RACER criteria using a three-point scale (1=low, 3=high), allowing both quantitative and qualitative judgement of indicator quality and fit.

Box 3 – The RACER criteria

The RACER criteria provide a structured approach for evaluating the quality and policy relevance of indicators:

- **Relevance:** the indicator must directly capture how circular transitions affect social equity and wellbeing, identifying both burdens (e.g. job displacement, inequality) and benefits (e.g. job creation, inclusion, empowerment). Relevance also requires that the indicator clearly links to at least one of the three justice dimensions (distributional, procedural, or recognitional) and one of the six impact categories.
- **Acceptance:** the indicator should be understandable and legitimate to policymakers, businesses, researchers, and civil society. It must reflect stakeholder priorities and be communicable across different audiences, supporting inclusivity and transparency in the monitoring process.
- **Credibility:** the indicator must rely on transparent methodologies and verifiable data sources. Data quality and methodological clarity are essential to ensure comparability across sectors and Member States, as well as trust among stakeholders.
- **Ease of monitoring:** the indicator should be feasible to measure with existing datasets and reporting systems or require only limited additional data collection. Indicators that can be integrated into existing EEA databases (i.e. Circular Metrics Lab) are priorities to facilitate long-term usability.
- **Robustness:** the indicator must provide consistent and meaningful insights over time, remaining valid under changing socio-economic or policy conditions. It should also demonstrate resilience to methodological uncertainty and data variability.

Applying the RACER methodology aligns with the Bellagio Principles for circular economy monitoring, which emphasise transparency, multi-level coherence, and a balance between scientific grounding and policy relevance.

4.2.6 Quantitative and qualitative evidence

Quantitative indicators are essential for tracking measurable progress in the just circular transition. However, many dimensions of justice, particularly procedural and recognitional justice, cannot be adequately captured through quantitative data alone. Recent literature (ICAT, 2025; Purvis, Calzolari, et al., 2025; van der Werf et al., 2025) emphasises that justice-oriented monitoring requires triangulation between quantitative and qualitative evidence to ensure both analytical rigour and social legitimacy. Indicators should therefore be accompanied by qualitative validation mechanisms that capture context, lived experience, and governance quality.

In practice, this means complementing statistical indicators with qualitative data sources such as stakeholder interviews, participatory assessment, case studies, and process evaluations. For instance, while a quantitative indicator may measure the proportion of workers covered by collective agreements, qualitative evidence can reveal how effectively workers' voices influence decision-making or whether participation mechanisms are truly inclusive.

The ICAT Just Transition Monitoring Guide (2025) explicitly embeds this mixed-method approach within its' methodology, recommending that quantitative indicators be contextualised through participatory dialogue and stakeholder review. Similarly, UNEP S-LCA Guidelines (2020) recognise the value of combining life-cycle inventory data with qualitative stakeholder engagement to interpret social impacts in a culturally and regionally appropriate way.

Although extensive qualitative engagement could not be undertaken in this phase of the work, the framework is designed to accommodate such methods in subsequent iterations. Future work should include mixed-method validation processes, ensuring that quantitative trends are interpreted in light of real-world experiences and that indicator results remain grounded in stakeholder realities.

4.2.7 Adaptivity and iterative improvement

As already highlighted above, indicators are not static instruments but dynamic components of a governance and learning process. As circular economy transitions evolve and new social challenges, datasets, or policy priorities emerge, indicators must be periodically reviewed and refined. This principle of adaptivity — rooted in the “learning by monitoring” logic of ICAT (2025) and the Bellagio Principles for Circular Economy Monitoring (EEA & ISPRA, 2021) — ensures that the framework remains relevant, evidence-based, and responsive to changing contexts. Adaptive monitoring recognises that both data systems and societal values evolve over time. Emerging data streams and extrapolation methods can progressively expand the evidence base for justice-related indicators. Likewise, shifts in social priorities, such as growing attention to gender equity or informal work, may require updating indicator definitions, thresholds, or weighting.

In this framework, adaptivity is embedded through an iterative review process. Each indicator is intended to undergo regular validation against the RACER criteria, integrating feedback from data users and data providers. In the context of the task, the proposed long- and short-list of indicators represent an initial iteration that should be revised in subsequent cycles. The review should also assess the feasibility and usefulness of integrating validated indicators into the EEA’s Circularity Metrics Lab (CML)². By institutionalising review and revision, the framework strengthens its credibility, transparency, and long-term relevance in tracking progress towards a just circular transition.

4.2.8 Interdependencies across value chains

Circular transitions unfold within complex, interconnected systems that span multiple geographies and governance levels. Changes at one stage of a value chain — such as sourcing, design, or recycling — can generate ripple effects across others, both within Europe and globally. For instance, increased recycling targets in Europe can shift material flows and create labour or environmental burdens in exporting regions, while eco-design innovations may influence upstream resource extraction, trade dependencies, and employment in supplier countries.

To capture these systemic linkages, the framework embeds an interdependency lens across all indicator domains. Each indicator is designed to reflect both internal (EU-level) and external (global) social effects, acknowledging that many social outcomes of circularity — such as informal labour in recycling, exposure to waste imports, or access to secondary materials — mostly occur outside Europe’s borders. This methodology enables monitoring not only European developments but also the occurrence of externalised social burdens linked to global value chains, such as dependence on high-risk supplier regions or uneven access to recycling markets.

This approach aligns with the Bellagio Principles, which call for multi-scale coherence and transparency in circular economy monitoring, and with the ICAT (2025) principle of tracking both direct and indirect justice impacts. It also reflects the recognition in recent circular economy scholarship that justice cannot be

² The EEA’s Circularity Metrics Lab (CML) uses a range of sources such as European datasets, national statistics, surveys, and novel dataflows to provide insights on progress towards the development of the circular economy: <https://www.eea.europa.eu/en/circularity>.

delinked from geography, as distributional and procedural inequities often mirror global trade asymmetries (Deutz et al., 2024; McCauley, 2025).

Operationally, mapping interdependencies means linking social indicators to material and economic data. For example, connecting employment and safety indicators to waste-export destinations, or associating equity indicators with supply-chain resilience metrics. This aims to prevent a narrow, Eurocentric assessment and ensures that the monitoring framework comprehensively captures the justice-related effects of circular transitions across interconnected value chains.

4.2.9 Decision-usefulness for policy support

Beyond tracking progress, indicators are meant to inform better decisions and guide policies towards outcomes that enhance equity and fairness. The principle of decision-usefulness therefore acts as a cross-cutting criterion throughout the framework. Decision-usefulness is understood here in both technical and normative terms. From a technical perspective, indicators must deliver clear, interpretable, and actionable information to policymakers and practitioners. From a normative one, indicators must be able to provide data to support design interventions to improve the justice dimensions of a circular transition. Each proposed indicator is therefore evaluated for its policy relevance and potential to support concrete action.

4.3 Overview of the textiles and plastics value chain

This section applies the justice-oriented indicator framework developed for the textiles and plastics value chains as illustrative case studies. The framework is designed to be sector-agnostic and is intended to support monitoring of just circular economy transition across different value chains. Textiles and plastics are selected due to their strategic relevance under the EU Circular Economy Action Plan (CEAP), their high material intensity, and the well-documented social and environmental justice challenges. The previous ETC report (ETC CE, 2025) examined plastics and textiles value chains to identify justice-related burdens, social impact hotspots, as well as distributional, procedural, and recognitional challenges arising along global circular value chains. The analysis focused on how circular economy strategies may reshape labour conditions, community impacts and burden shifting between EU and non-EU countries.

Against this background, an overview of the main stages, stakeholder and social impact categories in the textiles and plastics value chains will be provided in the following sections to demonstrate how the proposed indicators can be operationalised in practice. To keep the assessment general yet realistic, an “average” European value chain is considered, covering upstream, midstream, and downstream stages. Since the focus of this report is on just transition, the application of the indicators explicitly considers both the prevailing linear configuration of these value chains and the emerging circular configurations. This makes it possible to assess how justice implications evolve through the transition, to identify shifting and newly emerging social impact hotspots, and to capture changes in stakeholder roles, exposure to risks and access to benefits across the value chain.

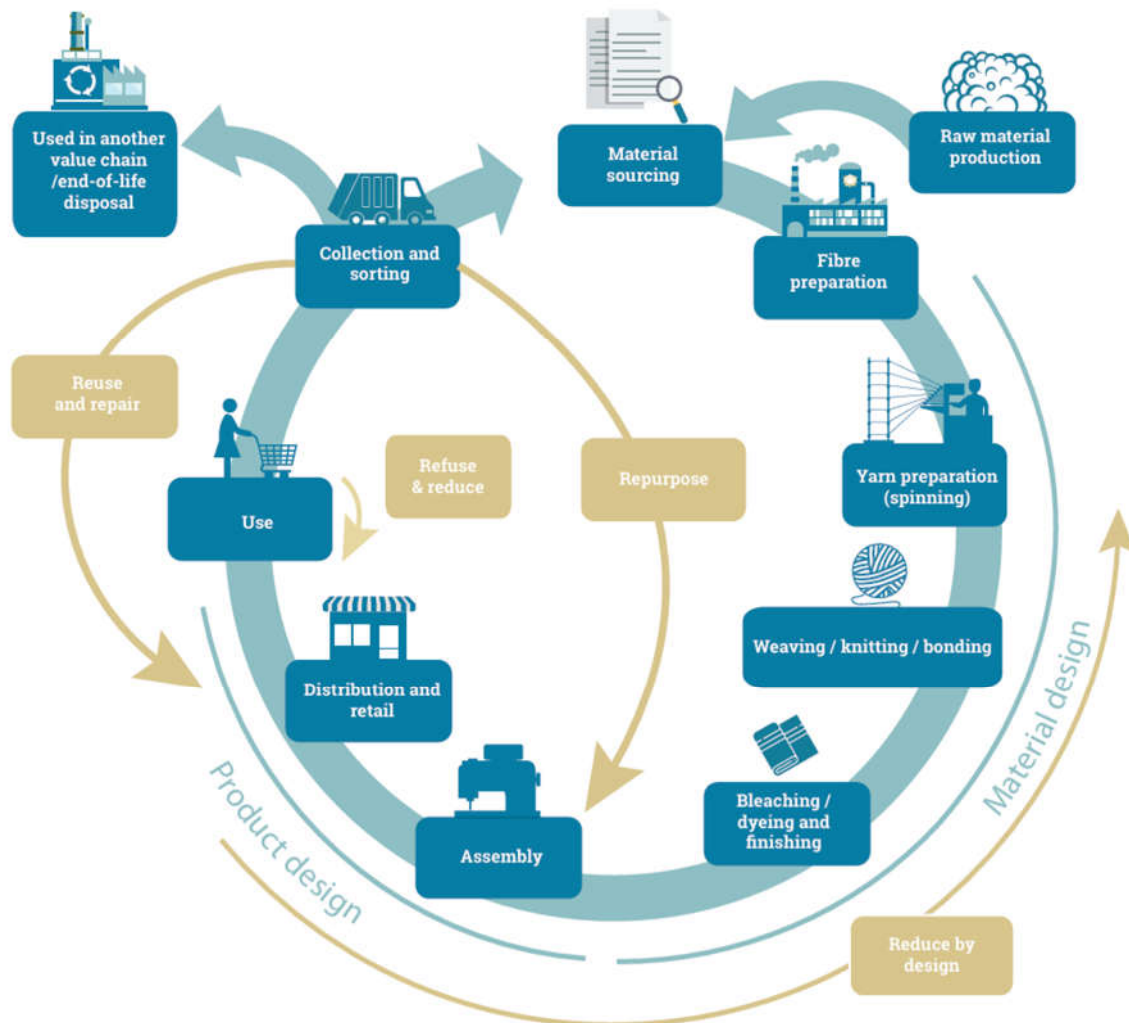
4.3.1 Textile value chain and key impact categories

The textile value chain is one of the most globally dispersed industrial systems, characterised by extensive outsourcing, high labour intensity, and complex cross-border interdependencies. According to UNEP (2020), over 60 % of the world’s textiles are produced in Asia, while downstream activities such as design, marketing, logistics, and post-use management are concentrated in the European Union (UNEP, 2020). In 2022, Europeans consumed an average of 19 kilograms of textiles per person. The export of used textiles from the EU has almost doubled between 2005 and 2015 and have since remained stable at around 1.4 million tonnes until 2023, corresponding to an average of 3.1 kilograms per person in Europe in 2023 (EEA,

2025). These global interlinkages make Europe simultaneously a driver of demand and a key node of circular transition strategies.

The sector’s structure is represented through typical value chain stages in the following figure.

Figure 3 – Representation of activities taking place in a circular textile value chain



Source: UNEP, 2020b.

Each of these stages corresponds to social and environmental outcomes. Fibre cultivation and textile processing, for instance, are the most resource and labour-intensive, accounting for over 70 % of total water use and most occupational health risks in the value chain (UNEP, 2020a). Empirical evidence confirms that social outcomes vary systematically across stages and reflect structural governance asymmetries. Global apparel production systems are governed by buyer-driven models, where a limited number of European and North American brands dictate production standards, lead times, and prices (Muñoz-Torres et al., 2023). This concentration of power shifts economic and social burdens downstream, as suppliers operate with thin margins, limited unionisation, and weak enforcement of labour standards.

Building on ETC CE (2025), this asymmetry represents a distributional-justice imbalance: while value capture is concentrated at the top of the chain (design, retail), social and environmental burdens are externalised to low- and middle-income producing countries. Upstream actors face structural barriers to fair compensation, social protection, and safe working conditions, while downstream actors in Europe (e.g. waste sorters, repair workers) remain undervalued despite contributing to circularity outcomes.

The table below summarises the structural features of the European textile value chain and key social impact categories.

Table 9 – Main characteristics of European textile value chains and their key social impact categories

Stage	Main characteristics	Key social impact categories
<i>Raw material extraction and fibre preparation</i>	Global sourcing (e.g. cotton, synthetics, wool) and high resource intensity.	Labour rights violations, low wages, child and forced labour risks in cotton cultivation (UNEP, 2020).
<i>Fabric formation and finishing</i>	Energy- and chemical-intensive; regional clusters in Asia and Eastern Europe.	Occupational health and safety, exposure to hazardous substances, gender segmentation of tasks (Muñoz-Torres et al., 2023).
<i>Garment manufacturing</i>	Labour-intensive; widespread subcontracted production for EU brands.	Informality, wage inequality, excessive working hours, lack of social protection (GIZ, 2021; UNEP, 2020).
<i>Distribution and retail</i>	Dominated by large European brands and retailers.	Governance asymmetry, supplier pressure, and limited transparency on sourcing (Luthin et al., 2023).
<i>Post-use (collection, repair, recycling)</i>	Growing but fragmented circular market.	Informal work, unsafe manual sorting, limited training and recognition (Van Opstal et al., 2025).

Source: own elaboration.

Despite the diffusion of sustainability commitments, production remains largely linear, with circular loops — such as fibre-to-fibre recycling or product repair — accounting for a small fraction of total material flows (Gözet & Wilts, 2022; UNEP, 2020a). Circular initiatives are expanding in Europe but often rely on informal or temporary labour for collection and sorting, reproducing social inequalities within the transition process (ETC CE, 2025). Ensuring that circular measures consider potential social implications are therefore essential for a truly just transition. From a justice perspective, ETC CE (2025) underline that distributional imbalances along the textile value chain intersect with procedural and recognitional justice concerns. This includes workers’ limited representation, exclusion of informal sectors from decision-making, and the lack of voice for affected communities in producer countries.

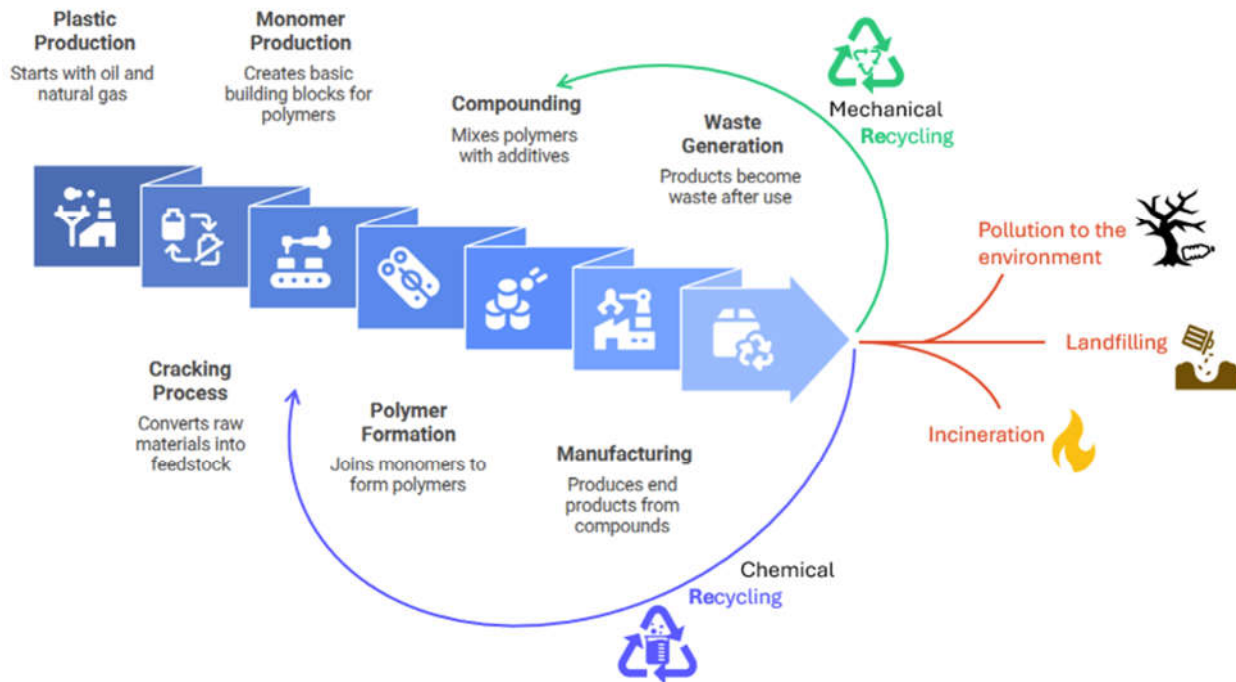
Based on the textile value chain analysis, several impact categories emerge as relevant for monitoring, including:

- employment quality and fair wages, particularly in fabric production and recycling;
- health and safety, with burdens concentrated in dyeing and finishing stages;
- social protection and access to training, especially for informal and small-scale actors;
- community wellbeing, addressing environmental and health impacts near production sites.

4.3.2. Plastics value chain and key impact categories

The plastics value chain represents one of the most complex and globalised industrial systems, spanning extraction of fossil feedstocks to the management of post-consumer waste. It combines capital-intensive upstream production with highly fragmented downstream activities, creating significant disparities in both economic value and social conditions (ETC CE, 2025; UNECE, 2024). The structure of the value chain is presented in the following figure.

Figure 4 – The plastic value chain showing life cycle stages or primary and secondary materials.



Source: Adapted from Hsu et al., 2022.

In Europe (which represents 15 % of the global plastic production) the upstream production of polymers and resins is dominated by a small number of multinational petrochemical firms concentrated in Belgium, Germany, and the Netherlands. These operations are technologically advanced but provide limited local employment and generate significant environmental pressures for surrounding communities. Midstream, the conversion of polymers into products involves thousands of enterprises across Europe, supplying packaging, automotive, construction, and electronics industries. Downstream, waste collection and recycling are labour-intensive and remain highly dependent on global supply chains, partly due to a lack of capacity to process all plastics within Europe (Romson et al., 2024). Informal workers, both within and outside Europe, play a vital role in maintaining material circulation, yet remain largely invisible in monitoring frameworks and social protection systems (Barford & Ahmad, 2021; ETC CE, 2025).

The plastics system exhibits strong vertical upstream integration characterised by large companies controlling several of the early stages of the value chain, forming strong partnerships and joint ventures. Downstream, the landscape is rather fragmented among many smaller, independent businesses. Governance is often concentrated in a few large producers and brand owners who influence product design and resin composition, which impacts products' recyclability. By contrast, converters, recyclers, and waste handlers operate under volatile market conditions, tight margins, and fragmented regulations (PRI Association, 2019; UNECE, 2024).

At the end of their life cycle, plastics follow diverse pathways depending on their type, composition, and use. For example, single-use packaging (often made from lightweight, flexible plastics) is usually incinerated, landfilled, or, in some cases, mechanically recycled. In contrast, durable plastics used in automotive, construction, or electronics may undergo longer use phases, followed by chemical or mechanical recycling (sometimes even downcycling into lower-value products). Thermoset plastics (plastics which characteristically cannot be remelted and remoulded) are rarely recycled and often end up incinerated or in landfills. Finally, bioplastics may be composted or anaerobically digested in specific environments. These varied fates of plastics are influenced not only by the technical feasibility but also by economic incentives, regulatory frameworks, and the presence of informal or formal recycling systems.

These asymmetries result in clear distributional-justice imbalances: value creation and decision power remain concentrated in industrial hubs, while social and environmental burdens — such as toxic exposure, occupational hazards, and waste mismanagement — are disproportionately borne by workers in polymer production and waste management as well as local communities (ETC CE, 2025; Van Opstal, Pals, et al., 2025).

Table 10 – Main characteristics of European plastics value chains and their key social impact categories

Stage	Main characteristics	Key social impact categories
<i>Feedstock extraction and polymer production</i>	Highly concentrated, capital-intensive, dominated by a few multinational firms	Health and safety risks for local communities; limited local employment; weak benefit-sharing mechanisms (ETC CE, 2025).
<i>Conversion and product manufacturing</i>	Large number of SMEs and corporates converting polymers into packaging, construction, automotive, electronics, furniture, and other components.	Exposure to chemicals; job insecurity; gender and wage gaps in production (Javed, 2025; UNECE, 2024).
<i>Distribution and use</i>	Brand owners and retailers define design and recyclability requirements.	Governance asymmetry; lack of transparency on chemical content; uneven producer responsibility (PRI, 2019).
<i>Waste collection and sorting</i>	Consumers and a mix of public, private and informal actors critical for circularity outcomes.	Informal and precarious labour, unsafe working conditions, limited access to social protection (Barford & Ahmad, 2021)
<i>Recycling and disposal</i>	Includes mechanical and chemical recycling, incineration, and landfill.	Exposure to toxic substances; unequal access to circular markets; unrecognised contribution of informal recyclers (ETC CE, 2025).

Source: own elaboration.

Circularity strategies in the plastics sector — such as mechanical and chemical recycling, reuse models, and material substitution — can reduce environmental impacts but may also reproduce existing inequalities. Recycling and sorting activities often depend on hazardous work, while communities near incineration or chemical-recycling facilities face increased exposure to pollutants (ETC CE, 2025).

From a distributional perspective, circularity benefits are unevenly shared: upstream actors capture most of the value, while downstream workers and recyclers face precarious conditions and limited recognition. Procedurally, governance remains fragmented across Member States and between industrial and waste-management stakeholders, with limited inclusion of informal and community-based actors in policy processes.

Recognitional justice issues are also evident for plastics still being exported outside the EU. The knowledge and perspectives of many informal workers and micro-enterprises operating in secondary-material markets — particularly in non-EU countries that process European plastic waste — remain excluded from formal certification, policymaking, financing, or due-diligence mechanisms (Barford & Ahmad, 2021; PRI Association, 2019).

Based on the methodological framework (Section 4.2) and the literature reviewed, the following impact categories are identified as priorities for monitoring justice in circular plastics transitions:

- **human and workers’ rights:** ensuring freedom of association, fair remuneration, and elimination of forced or child labour across manufacturing and recycling;
- **health and safety:** reducing exposure to hazardous chemicals for workers and surrounding communities;
- **social protection and inclusion:** extending insurance and formalisation to informal and subcontracted workers;
- **sustainable livelihoods:** enabling fair participation and income stability for SMEs and recyclers;

- **gender equality and vulnerable groups:** addressing the overrepresentation of women and migrants in unsafe and low-paid jobs;
- **governance and transparency:** improving accountability and traceability in waste trade and producer responsibility systems;
- **community wellbeing:** mitigating pollution and infrastructure burdens in local areas;
- **policy and financial mechanisms:** ensuring that EPR, green procurement, and circular finance contribute to fair outcomes rather than exclusion.

4.4 Set of indicators for monitoring progress towards a just circular economy

This section translates the methodological framework into a practical set of indicators that may be used to monitor the justice dimensions of the circular transition. The proposed indicators operationalise the three pillars of justice — distributional, procedural, and recognitional — across the main stakeholder categories identified in the UNEP’s S-LCA framework: workers (4.4.1), local communities (4.4.2), value-chain actors (4.4.3), consumers (4.4.4), society (4.4.5), and children (4.4.6). They are further aligned with the impact categories highlighted above: human rights, working conditions, health & safety, cultural heritage, governance, and socio-economic repercussions.

The selection of indicators builds on an extensive review of scientific and policy literature, international monitoring frameworks, and existing datasets at EU and global levels. Indicators were first screened for conceptual alignment with the framework presented above (see Annex 2). In a second step, a RACER assessment was applied to identify those indicators with the highest potential for operationalisation within the scope of the current research. This expert-based review, conducted jointly by the authors and EEA reviewers, provides an initial approximation of indicator readiness and helps prioritise metrics that are both methodologically grounded and relevant.

In the following, indicators applicable to different stakeholder categories are presented separately, with an indication of the respective impact category, subcategory and justice dimensions. Each indicator is described through a table containing the following elements:

- **impact category:** the thematic area of social performance;
- **subcategory:** the specific dimension within a certain impact category;
- **indicator:** the measurable variable or proxy describing a justice-relevant outcome;
- **justice dimension(s):** indicates whether the indicator reflects distributional, procedural, or recognitional justice, or a combination thereof.

4.4.1 Workers

Workers are at the centre of the just circular transition. The selected indicators under this stakeholder group capture the justice dimensions most directly affected by the transition to circular economy: employment quality, equality, safety, and representation. The indicators are grouped into two main impact categories (see Table 11): *Human Rights and Working Conditions*.

Table 11 – Indicators for workers

Impact Category	Subcategory	Indicator	Justice Dimension
Human Rights	Freedom of association and collective bargaining	Existence of law to allow freedom of association/unions	Procedural
		Number/percentage of informal workers in circular jobs who gain access to formal employment (SLCA, 2021)	Distributional; Recognitional
	Equal opportunity	Number/percentage of informal workers joining cooperatives/labour associations (SLCA, 2021)	Procedural
		Gender employment gap in circular jobs/Number of women employed in circular jobs	Distributional; Recognitional
		Gender wage gap in circular jobs (adapted from ICAT, 2025)	Distributional; Recognitional
Working Conditions	Job creation	Number of workers in circular sector (European Labour Force Study, Eurostat 2024, ICAT 2025)	Distributional
	Job displacement	Number of employment opportunities shifted from one place to another (Purvis et al., 2025)	Distributional
		Compensation for those who cannot be resettled into new circular jobs because of the transition (amount committed/disbursed) (adapted from ICAT, 2025)	Distributional
	Quality of jobs	Fair income/Earning (ILO, OECD): Average earnings (ILO/OECD)	Distributional
		Job security (ILO/OECD): Number of temporary vs permanent jobs OR the share of full-time jobs created in new circular industries as a proportion of total jobs (ICAT 2025).	Distributional
	Personal development	Average hours of circular economy training/reskilling provided for workers per year (Purvis et al, 2025, Luthin et al. 2023)	Recognitional; Procedural
		Number of people engaged in education or training to transition into circular jobs (adapted from ICAT, 2025)	Recognitional; Procedural
	Safe working conditions (ILO & OECD)	Number of accidents/Number of work damages related to circular economy activities (Purvis et al., 2025, Luthin et al, 2023)	Recognitional; Procedural
	Informal sector job recognition	Informal employment rate (ILO)	Distributional
		Presence of informal recycler associations	Procedural; Recognitional
	Child labour	Percentage of children under the legal age or 15 years old (14 years old for developing economies) working in circular activities (SLCA, Method. Sheets, 2021)	Distributional; Recognitional

Source: own elaboration.

Human rights

This impact category focuses on the enabling conditions that determine whether workers can meaningfully participate in and benefit from circular transitions:

- **Freedom of association and collective bargaining** indicators assess whether workers can organise and negotiate fair conditions as production models evolve. Although legislation differs widely across countries, its existence remains a key *procedural justice* proxy, influencing the capacity of workers to shape transition outcomes.
- **Equal opportunity** indicators, including the formalisation of informal workers and gender employment gaps, address *distributional and recognitional justice*. They capture whether the shift toward reuse, repair, and recycling creates inclusive opportunities or reinforces inequalities. In the circular economy, informal workers — particularly in recycling and repair — often lack social protection, while women remain overrepresented in low-paid or unsafe jobs. Tracking their access to formal employment, cooperative membership, and equitable participation is therefore central to a just transition. The indicator gender wage gap in circular jobs is further described in Box 4.

Box 4 – Spotlight indicator: Gender wage gap in circular jobs

This indicator measures the average difference in earnings between men and women employed in circular economy activities, such as repair, reuse, recycling, or remanufacturing. It captures distributional and recognitional justice dimensions by revealing whether the economic benefits of the circular transition are shared equitably across genders. Persistent wage disparities would indicate that new “circular” jobs risk reproducing existing inequalities rather than correcting them.

Policy relevance

Monitoring the gender wage gap in circular sectors allows policymakers to assess whether labour-market policies and training scheme mechanisms are effectively supporting equal pay and fair participation. For example, the indicator can inform the design of gender-responsive employment programmes under the EU Green Deal Industrial Plan or Circular Economy Action Plan, helping ensure that circular jobs contribute to both sustainability and gender equality objectives. Disaggregated analysis by occupation, sector (e.g. textiles vs. waste management), and contract type can further guide targeted interventions.

Data availability and challenges

Data on gender wage differentials are available from Eurostat’s Structure of Earnings Survey (SES) and the OECD Gender Wage Gap Database, but these do not yet classify employment according to circular-economy activities. Linking such datasets with emerging classifications of “circular jobs” (e.g. Circle Economy, ILO, and WBG, 2024) is necessary to operationalise the indicator. A key methodological challenge lies in defining circular jobs consistently across countries and distinguishing genuinely circular activities from traditional waste-management or manufacturing work. Data on informal employment, especially in repair and recycling, remain scarce and often gender-blind.

Circular linkages

The indicator is most relevant for circular activities in repair, reuse, recycling, and remanufacturing, where women are often concentrated in low-wage, precarious, or informal positions (e.g. manual sorting in textile recycling or packaging reuse). Tracking wage equality within these sectors can reveal whether the transition to circularity delivers fairer income distribution and contributes to a more inclusive labour market.

Working conditions

This impact category captures how the quality, security, and distribution of jobs evolve as sectors become more circular:

- **Job creation and displacement indicators** provide a first measure of distributional outcomes, showing where employment opportunities are emerging or declining along circular value chains. However, they require a harmonised definition of “circular jobs” to ensure data comparability across countries and sectors.
- **Quality of jobs indicators**, such as fair income and job security, link directly to *distributional justice*. They measure whether new forms of employment are stable, adequately paid, and aligned with decent work standards.
- **Personal development and safe working conditions** indicators connect to *recognitional and procedural justice* by examining access to training, occupational safety, and re-skilling opportunities for emerging circular tasks such as remanufacturing and advanced sorting.
- **Informal sector recognition and child labour indicators** capture the intersection between formal and informal labour systems — a key governance and justice challenge identified by ETC CE (2025) and Van Opstal et al. (2025). Recognising and integrating informal recyclers, while eliminating child labour in upstream supply chains, ensures that circularity improves rather than exacerbates labour conditions globally.

Relevance for the textiles and plastics sector

In the textile sector, informal employment and gender inequality represent structural challenges in production and post-use management, while occupational health and safety risks persist in dyeing, finishing, and chemical treatments. In the plastics sector, justice concerns are concentrated in recycling and waste management, where precarious and unsafe working conditions are widespread. Monitoring fair income, safety, and formalisation of informal recyclers is central to ensuring that circularity benefits are equitably distributed. In both sectors, job-creation indicators must be interpreted alongside those on displacement and training to assess whether circular transitions create sustainable, inclusive employment or merely shift risks along global value chains.

4.4.2 Local communities

Local communities are among the most directly affected stakeholder groups in the transition to circular economy. They experience both the benefits of local employment, innovation, cleaner production, and the burdens of pollution, waste trade, or exclusion from decision-making. The indicators selected for this stakeholder group aim to capture these diverse outcomes through four impact categories: *Health and Safety*, *Cultural Heritage*, *Governance*, and *Socio-Economic Repercussions* (see Table 12). Together, they operationalise the community dimension of distributional, procedural, and recognitional justice within circular transitions.

Table 12 – Indicators for local communities

Impact Category	Subcategory	Indicator	Justice Dimension
<i>Health and Safety</i>	Living conditions	Number of circular economy related accidents/malfunctions leading to increased emissions (Luthin et al, 2023)	Distributional
		Percentage of exported waste (e.g. plastic, e-waste, ...) that can be traced to verified environmentally sound recycling destination (adapted from Baker et al. 2023)	Distributional
<i>Cultural Heritage</i>	Inclusion of cultural aspects in circular activities	Presence of policies or management plans in place to protect and or support cultural heritage (SLCA Method. Sheets, 2021)	Recognitional; Procedural
		Presence of relevant organizational information to community members in their spoken language (SLCA Method. Sheets, 2021)	Procedural
<i>Governance</i>	Active Community Involvement	Existence of formal participatory mechanisms in decision making process related to circular activities	Procedural
		Percentage of community recommendations that were meaningfully incorporated into final circular economy regulations, policies or decisions (adapted from Baker et al. 2023)	Recognitional
		Representation/Existence of workers/civil society/small businesses/communities on advisory and decision-making bodies related to circular economy (adapted from ICAT 2025 & Baker et al. 2023)	Recognitional; Procedural
	Respect for Indigenous Rights	Number of community engagement events related to circular jobs (Based on SLCA Method. Sheets, 2021)	Recognitional; Procedural
		Presence of policies to protect the rights of Indigenous community member (Based on SLCA Method. Sheets, 2021)	Recognitional; Procedural
		Number of annual meetings with Indigenous community members (Based on SLCA Method. Sheets, 2021)	Recognitional; Procedural
<i>Socio-economic repercussions</i>	Community Impact and Reaction	Budget available to preserve cultural heritage (van der Welf, 2025)	Procedural
		Number of local initiatives promoting circular economy (Luthin et al., 2023)	Procedural
		Number of circular economy policies/actions that address historic injustices (adapted from ICAT, 2025)	Restorative; Recognitional; Procedural
		Number of jobs created that involve circular economy activities (Luthin et al., 2023)	Distributional
		Number of job losses due to circular activities (Based on Luthin et al., 2023)	Distributional
		Percentage of total population of the community with a NIMBY attitude (Luthin et al., 2023)	-
	Number of campaigns to enhance social acceptance (Luthin et al., 2023)	Procedural	

Source: own elaboration.

Health and safety

This domain focuses on the physical and environmental wellbeing of communities exposed to circular-economy activities:

- **Indicators of living-conditions**, such as the number of circular-economy-related accidents or malfunctions leading to increased emissions, highlight *distributional justice* concerns — who bears the environmental and health risks of circular production systems. These measures capture potential rebound effects when poorly regulated recycling or repair processes release pollutants.
- The indicator on **traceability of exported waste** addresses the global dimension of justice by monitoring whether materials leaving the EU are managed in verified, environmentally sound facilities abroad (adapted from Baker et al., 2023). This reflects a core insight from the ETC CE (2025) report: circular transitions must not externalise burdens to vulnerable communities in low-income countries.

Cultural heritage

Cultural and historical dimensions are integral to community identity and social cohesion:

- Indicators on **policies or management plans protecting cultural heritage** and **availability of organisational information in local languages** (UNEP, 2021) assess whether circular initiatives respect and integrate community values and cultural continuity.
- **Including cultural aspects in circular programmes** also strengthens *recognitional justice* by acknowledging different knowledge systems, traditional repair practices, and craftsmanship that often predate formal circular-economy frameworks.

These metrics are particularly relevant where circular interventions — such as urban regeneration or industrial transformation — risk displacing traditional livelihoods or eroding local heritage.

Governance

Governance indicators assess how communities are represented and empowered in decision-making processes that shape circular policies and infrastructure:

- **Community-engagement indicators** (e.g. existence of participatory mechanisms, inclusion of recommendations in policy outcomes, and representation on advisory bodies) directly reflect *procedural justice*. They measure whether decision-making is transparent, inclusive, and responsive. The indicator on the incorporation of community recommendations in circular economy policies is further described in Box 5.
- **Indigenous-rights indicators**, such as the presence of dedicated protection policies, consultation meetings, and heritage-preservation budgets, expand this lens to *recognitional justice*, acknowledging specific groups historically marginalised in environmental governance (ICAT, 2025; van der Werf et al., 2025).

These indicators help ensure that the governance of circular transitions does not reproduce existing power asymmetries between industrial actors and local populations.

Socio-economic repercussions

This category links circularity to community wellbeing and economic inclusion:

- **Engagement and employment indicators** (e.g. number of local circular initiatives, jobs created or lost due to circular activities) provide insights into the distributional effects of circular transitions at local level — whether communities gain economic opportunities or face job displacement.

- **Indicators on social acceptance** (“Not in my Backyard” (NIMBY) attitudes, awareness campaigns) assess the legitimacy and social uptake of circular infrastructure, reflecting *procedural justice* dimensions of participation and dialogue.
- The **indicator on circular-economy policies addressing historical injustices** (adapted from ICAT, 2025) connects to *restorative justice*, measuring whether new policy frameworks actively correct past inequities in exposure, access, or recognition.

Relevance for the textiles and plastics sector

For textiles, community-level justice issues arise primarily in production and post-use stages — including chemical exposure near dyeing and finishing plants, land and water pollution, and displacement of traditional crafts. Indicators on living conditions, cultural heritage, and community engagement therefore help monitor whether circular textile strategies (e.g. local repair hubs, recycling) contribute to community regeneration or perpetuate environmental burdens.

For plastics, local impacts concentrate around waste management, recycling infrastructure, and transboundary trade of recyclates. Traceability of exported waste, safety of local recycling operations, and public participation in facility siting are key justice dimensions. In both sectors, community-based indicators provide early warning signals for unfair burden-shifting and support inclusive governance models that link environmental integrity with social wellbeing.

Box 5 - Spotlight indicator: Incorporation of community recommendations in circular economy policies

This indicator measures the percentage of community recommendations that are meaningfully incorporated into final circular economy regulations, policies, or decisions. It directly reflects procedural justice, assessing whether communities have a genuine voice in shaping the circular transition. Beyond mere consultation, this indicator evaluates the quality and influence of participation, assessing whether local knowledge and priorities are actually translated into policy outcomes. High incorporation rates signal stronger democratic legitimacy, while low rates point to top-down processes.

Policy relevance

The indicator provides policymakers with a tangible measure of participatory governance in circular economy decision-making. It can reveal whether engagement processes—such as local consultations on waste management, product reuse, or urban circularity plans—result in concrete policy changes. Tracking this metric over time helps assess institutional responsiveness and can strengthen social acceptance of circular policies, particularly in regions affected by new infrastructure, land-use changes, or shifts in employment patterns. It also supports alignment with the Aarhus Convention and the EU’s principles of citizen participation and just transition.

Data availability and challenges

At present, there are no standardised datasets systematically capturing this indicator. Data would typically need to be gathered through policy process analysis, stakeholder surveys, or content review of public consultations and circular economy strategies at local, national, or EU level. Establishing a common methodology to determine what constitutes a “meaningfully incorporated” recommendation (e.g. partial vs. full adoption) remains a key challenge. Qualitative coding frameworks and participatory evaluation methods could provide valuable templates.

Circular linkages

This indicator is particularly relevant in community-level circular initiatives such as local repair hubs, waste-sorting schemes, or industrial symbiosis zones. Communities often hold critical contextual knowledge on land use, cultural practices, and social needs that affect the success of circular policies. By measuring whether their input shapes regulatory design, this indicator bridges the gap between local participation and systemic change, ensuring that the transition to circularity enhances not only environmental outcomes but also local empowerment and fairness.

4.4.3 Value chain actors

Value chain actors — such as suppliers, manufacturers, distributors, and business partners — play an important role in determining whether circular economy transitions deliver fair, inclusive, and sustainable outcomes. Their decisions influence how materials circulate, how benefits are distributed, and how responsibility is shared across sectors and regions. The indicators under this stakeholder group focus on two impact categories, *Governance* and *Socio-Economic Repercussions* (see Table 13), which together assess the extent to which companies and institutions integrate social responsibility, transparency, and innovation into their circular practices.

Table 13 – Indicators for value chain actors

Impact Category	Subcategory	Indicator	Justice Dimension
<i>Governance</i>	Transparency	Circular government purchases for the region (Luthin et al., 2023)	Distributional
		Presence of policies or management plans in place to protect and or support cultural heritage (SLCA Method. Sheets, 2021)	Recognitional; Procedural
<i>Socio-Economic Repercussions</i>	Promoting social responsibility	Number of circular economy educative workshops for suppliers (Luthin et al., 2023)	Procedural
		Number of participants to circular economy educative workshops for suppliers (Luthin et al., 2023)	Procedural
		Number of managers commitments to green supply chain management (Luthin et al., 2023)	Procedural
		Number of patents related to innovative technologies (Luthin et al., 2023)	Procedural
		Number of circular economy related meetings with stakeholders of the value chain. (Luthin et al., 2023)	Recognitional; Procedural

Source: own elaboration.

Governance

Governance indicators address the *procedural justice* dimension of circular transitions, examining whether transparency and accountability mechanisms are in place across value chains:

- **Circular government purchases for the region** (Luthin et al., 2023) is a key proxy for institutional commitment to sustainability-oriented procurement. By tracking the share or number of public purchases that explicitly integrate circularity principles, this indicator measures the degree to which regional governance frameworks use their purchasing power to influence upstream suppliers and promote equitable market access. Public procurement acts as a lever for redistributing economic opportunities — favouring businesses that comply with social and environmental standards — and thereby serves as a direct link between governance quality and distributional justice across value-chain actors.

Socio-economic repercussions

This domain captures how businesses and suppliers operationalise circularity through collaboration, capacity-building, and innovation. These indicators combine *distributional* and *recognitional justice* elements by assessing whether all actors — especially smaller enterprises — benefit from knowledge transfer and participation in circular markets:

- **Promoting social responsibility** indicators, such as the *number of circular economy educative workshops for suppliers* and *participants involved* (Luthin et al., 2023), track knowledge dissemination and inclusion within the supply chain. They assess whether circular business models create opportunities for smaller firms to build capacity, access new markets, and comply with sustainability standards (see Box 6).

- **Management commitment indicators**, including the *number of managers committed to green supply chain management*, capture leadership engagement in implementing and maintaining responsible procurement practices. High engagement levels indicate internal accountability and the embedding of circular principles into organisational culture.
- **Innovation indicators**, such as the *number of patents related to circular or resource-efficient technologies*, measure technological readiness and distribution of innovation benefits. However, patents alone do not necessarily reflect justice outcomes, as innovation ownership is often highly geographically concentrated in high-income countries and may even reinforce market power asymmetries along the value chain. To capture justice considerations, patent counts should therefore be complemented by metrics on the geographical distribution of patent ownership or the share of innovation originating from SMEs and actors in lower-income regions.
- Finally, the *number of circular economy-related meetings with stakeholders of the value chain* assesses **inclusiveness and multi-stakeholder dialogue**. This indicator reflects *procedural justice*, ensuring that transition decisions are co-created with suppliers, workers, and communities rather than imposed by dominant market actors.

Relevance for the textiles and plastics sectors

In the textile sector, governance and supplier-level indicators are particularly relevant due to its' extensive subcontracting networks and dominance of global brands in Europe. Public procurement for sustainable textiles can stimulate upstream innovation and fairer supplier relations. Supplier-training indicators capture how knowledge and technology diffuse across tiers, especially for small and medium enterprises (SMEs) in material processing and finishing.

In the plastics sector, these indicators are equally crucial given the growing importance of value-chain collaboration for chemical safety, design-for-recycling, and secondary-material uptake. Transparent procurement policies, joint innovation platforms, and stakeholder meetings across polymer producers, converters, and recyclers determine how circular commitments translate into practice. Tracking patents and manager engagement also provides insights into whether the benefits of circular innovation, such as improved recyclability or material traceability, are shared equitably across the chain or concentrated among a few large players.

Box 6 – Spotlight indicator: Circular economy education and training for suppliers

These indicators measure the number of circular economy educative workshops for suppliers and the number of participants engaged in such capacity-building activities. The two indicators are merged here as they are closely interlinked. They assess whether value-chain partners, particularly SME's, are meaningfully included in the circular transition through access to training, information, and dialogue. Education for suppliers is a critical precondition for enabling fair participation in new circular markets and ensuring that sustainability standards, procurement criteria, and reporting requirements are attainable for all actors, not only for large firms with greater resources.

Policy relevance

These indicators help policymakers and industry networks assess how knowledge transfer and inclusion are distributed along the value chain. A higher number of supplier-focused circular economy workshops and participants indicate stronger institutional support for equitable capability development, helping suppliers comply with new regulatory frameworks and circular economy requirements. They also provide a measure of supply-chain preparedness, identifying where technical assistance or financial incentives are needed to help SMEs and suppliers adapt to circular business models.

Data availability and challenges

Data on circular economy training activities are currently scattered. Some information can be extracted from industry associations, corporate sustainability reports, or EU-funded projects that track outreach and training. However, systematic monitoring across Member States and sectors is lacking, and workshop counts alone may not capture the quality or long-term impact of training. Future data collection could be harmonised through reporting templates under the EU Circular Economy Monitoring Framework or through platforms that record supplier participation in circularity programmes.

Circular linkages

The indicators apply across multiple R-strategies, particularly in remanufacturing, reuse, and recycling, where supplier understanding of circular standards and traceability requirements is essential. In the plastics sector, training workshops can focus on chemical safety, recyclate use, and design-for-recycling principles. In textiles, they may address material traceability, eco-design, and repair logistics. By quantifying the extent of supplier education, these indicators shed light on how capacity-building can enable a fair and inclusive circular transition, where smaller actors share not only the responsibilities but also the opportunities of new circular value chains.

4.4.4 Consumers

Consumers occupy a central position in the circular economy, influencing both the pace and fairness of the transition. Their behaviour, purchasing power, and trust in product systems determine whether circularity delivers inclusive and equitable outcomes. The indicators under this stakeholder group, as seen in Table 14, focus on two impact categories: *Governance* and *Socio-Economic Repercussions*.

Table 14 – Indicators for consumers

Impact Category	Subcategory	Indicator	Justice Dimension
Governance	Transparency	Existence of consumer privacy policies for circular products or activities (Luthin et al., 2023)	Procedural
		Existence of clear information about EOL options for circular products (Luthin et al., 2023)	Distributional; Procedural
		Number of participative circular economy workshops with customers/clients (Luthin et al., 2023)	Procedural
		Existence of labels to promote transparency for consumers (Luthin et al., 2023)	Distributional; Procedural
Socio-Economic Repercussions	Social benefits/impacts/social security	Number of campaigns to enhance social acceptance (Luthin et al., 2023)	
	Accessibility	Change in price of the final product, due to circular economy actions.	Distributional

Source: own elaboration.

Governance

Governance indicators relate primarily to procedural and recognitional justice, examining how transparency, accountability, and participation mechanisms ensure that consumers are adequately informed and can influence circular transitions:

- **Existence of consumer privacy policies for circular products or activities** (Luthin et al., 2023) addresses data protection and consumer rights in emerging digital circular systems (e.g. digital product passports, take-back apps, and sharing platforms). Ensuring privacy safeguards is essential to prevent exploitation of consumer data and maintain trust in circular economy mechanisms.
- **Existence of clear information about end-of-life options for circular products** reflects how accessible and transparent product lifecycle information is. This indicator connects directly to *procedural justice*, as informed consumers can make decisions that support equitable waste management, responsible repair, and proper recycling.
- **Number of participative circular economy workshops with customers/clients** measures the degree of consumer inclusion in co-design and awareness activities. Participation in workshops or public consultations provides a tangible measure of how citizens’ perspectives shape circular policy and business models.
- **Existence of labels to promote transparency for consumers** captures both *recognitional* and *distributional* dimensions by assessing whether product information—such as recyclability, social sourcing, or repairability—is communicated clearly and comparably. Reliable labels empower consumers to make informed choices and reward socially responsible producers, thereby redistributing market advantages toward fairer actors.

Socio-economic repercussions

This domain evaluates how circular economy measures affect affordability, social acceptance, and perceived benefits for consumers:

- **Number of campaigns to enhance social acceptance** (Luthin et al., 2023) indicates the level of investment in consumer awareness and behavioural change efforts. Public campaigns promoting repair, reuse, and responsible purchasing can reduce stigma associated with second-hand or recycled goods and foster inclusivity in consumption patterns.
- **Change in price of the final product due to circular economy actions** measures whether circular initiatives make sustainable goods more or less affordable. This indicator captures a critical justice aspect: if circular products are priced higher, they may exclude lower-income groups, undermining fairness and accessibility. Monitoring price effects helps ensure that circular economy policies do

not inadvertently widen socio-economic disparities. See Box 7 for a more detailed analysis of this indicator.

Relevance for the textiles and plastics sectors

In the textile sector, consumer-facing transparency and affordability are central challenges. Labels that communicate fibre origin, recyclability, or fair-labour standards can enhance informed decision-making, while campaigns promoting clothing reuse, repair cafés, and rental schemes support cultural shifts toward sufficiency. Price-accessibility indicators are particularly important, as sustainable or circular apparel often remains costlier than conventional products, limiting uptake among lower-income consumers.

In the plastics sector, consumer transparency is equally critical. Clear EOL information and trustworthy labelling help consumers properly separate, return, or recycle packaging materials. Privacy safeguards become increasingly relevant as smart packaging and digital traceability systems proliferate. Social acceptance campaigns are key for reducing resistance to products containing recycled content and for promoting citizen participation in waste collection and sorting systems.

Box 7 – Spotlight indicator: Change in product price due to circular economy actions

This indicator measures the change in the price of final products resulting from circular economy actions, such as increased recycled content, modular design, repairability features, or take-back schemes. It reflects the distributional justice dimension by showing how the costs and benefits of circular transitions are passed along the value chain and ultimately affect consumers. A just circular transition requires that circular products remain accessible and affordable, ensuring that low-income or vulnerable groups are not excluded from sustainable consumption.

Policy relevance

For policymakers, this indicator provides a direct link between circular innovation and consumer wellbeing. Tracking price variations across product categories (e.g. textiles, packaging, electronics) allows assessment of whether circular economy policies lead to price premiums or savings for end users. When combined with income data or household expenditure surveys, it can reveal whether circular policies support equitable access to sustainable goods or risk creating “circular affordability gaps.” This insight is critical for designing compensatory measures such as targeted subsidies, repair vouchers, or social tariffs that promote fairness in circular consumption.

Data availability and challenges

Data on price changes are partly available through market surveys, consumer price indices, and retail databases, but attribution to specific circular economy actions is complex. Disentangling the influence of circular interventions from other price drivers, such as energy costs or supply chain disruptions, requires complementary qualitative or econometric analysis. Another challenge lies in the heterogeneity of circular actions: for instance, modular design may initially increase production costs, while reuse schemes could reduce long-term prices. Developing product-category-specific metrics and standardised methods for identifying circular economy-related price effects would therefore enhance data comparability and policy relevance.

Circular linkages

This indicator is relevant for textiles and plastics, where circular economy actions may affect consumer prices. In textiles, using recycled fibres or introducing repair services can alter pricing structures. In plastics, recycled-content packaging or reusable systems may temporarily increase costs before economies of scale are reached. By tracking these price dynamics, the indicator provides a tangible measure of how circular transitions impact everyday affordability, and whether circularity advances both environmental goals and social inclusion in consumption patterns.

4.4.5 Society

The stakeholder group society captures the broad, system-level effects of the circular economy on economic resilience, innovation, and collective wellbeing. Unlike the other stakeholder categories, these indicators operate at a macro level, assessing whether the circular transition contributes to societal progress and shared prosperity.

Table 15 – Indicators for society

Impact Category	Subcategory	Indicator	Justice Dimension
Socio-Economic Repercussions	Economic Resilience	Number of circular economy innovation meetings/workshops/brainstormings for innovation development (e.g. Ratio of R&D circular economy investments to total investment) (Luthin et al., 2023)	Procedural

Source: own elaboration.

Economic resilience is presented as an indicator under the socio-economic repercussions impact category (see Table 15). The indicator captures how actively societies invest in research, development, and knowledge-sharing around circular solutions. While the current operationalisation reflects the overall level of commitment to circular innovation, it does not on its own capture societal involvement, knowledge sharing, or co-creation processes. To reflect justice considerations, this indicator should be complemented with metrics on the geographical distribution of innovation activities, the share of SMEs and civil-society organisations involved in circular economy innovation, or the number of participatory innovation workshops and co-creation initiatives. As such, the indicator could highlight whether innovation is concentrated in a few regions or actors or is broadly distributed across society.

Relevance for the textiles and plastics sectors

In the textile sector, economic resilience is linked to how effectively innovation supports sustainable materials, local production systems, and reuse or recycling technologies. Tracking the number and diversity of innovation meetings or R&D investments provides insight into whether value creation remains concentrated among large global brands or is redistributed to SMEs, cooperatives, and regional innovation clusters.

In the plastics sector, these indicators are particularly relevant to the ongoing transition from fossil-based to recycled or bio-based feedstocks. Collaborative innovation between polymer producers, recyclers, and technology developers is essential to overcome current bottlenecks in material recovery and design-for-recycling. Monitoring the balance of R&D investment between primary and secondary materials offers a measure of how society directs resources toward long-term sustainability and economic inclusiveness.

4.4.6 Children

Children represent an often-overlooked stakeholder group in the just circular transition. As future workers, consumers, and citizens, they will inherit both the benefits and burdens of circular economy. Monitoring how circular transitions address children’s rights, education, and wellbeing provides insight into intergenerational justice, which is a cross-cutting concern linking distributional, procedural and recognitional dimensions of justice.

Under the human rights impact category, the indicator focuses on education (see Table 16), recognising that awareness and early learning are key enablers of long-term behavioural and cultural change. From a justice perspective, education acts as a *procedural* and *recognitional* mechanism: it ensures that children’s perspectives are acknowledged and that all social groups have equitable access to circular economy learning opportunities. Exposure to circular economy concepts at an early age can shape long-term

attitudes, skills, and opportunities, influencing how future generations engage with and benefit from circular transitions.

Table 16 – Indicators for children

Impact Category	Subcategory	Indicator	Justice Dimension
Human Rights	Education	Existence of circular economy education/awareness raising for students (Luthin et al., 2023)	Recognitional; Procedural

Source: own elaboration.

Relevance for the textiles and plastics sectors

In the textile sector, educational programmes can influence future consumption habits and awareness of the social and environmental impacts of clothing. Initiatives that teach repair, reuse, or responsible fashion choices not only reduce waste but also empower children and youth as agents of change in household and community behaviour.

In the plastics sector, awareness-raising on waste reduction, recycling practices, and pollution prevention has direct environmental and social benefits. Educational campaigns in schools and youth organisations can help prevent littering, encourage responsible disposal of packaging, and build understanding of material circularity. Integrating circular economy topics into formal and informal education thus contributes to a more informed and participatory transition toward circular plastics systems.

4.5 Conclusion

The indicator framework developed in this chapter represents an early attempt towards operationalising justice dimensions in circular economy monitoring.

The analysis shows that the most well-covered areas are those related to workers’ rights and working conditions, reflecting the maturity of existing international datasets (ILO, OECD, Eurostat) and their alignment with distributional and procedural justice. Indicators on wages, occupational safety, training, and employment in circular sectors provide a tangible basis for assessing social outcomes, particularly where data already exist. Similarly, governance indicators for community participation and transparency offer measurable entry points to procedural justice.

However, the review also shows that recognitional and systemic dimensions remain underdeveloped. Indicators capturing informal labour, Indigenous rights, cultural heritage, and social inclusion in decision-making face persistent methodological and data gaps. In addition, many indicators — though relevant to social justice — lack a direct link to circular activities. The challenge is therefore not only to expand social coverage, but to also ensure that indicators clearly reference circular processes such as repair, reuse, collection, and recycling, rather than measuring social outcomes in generic economic terms.

Methodological and data challenges

Several recurring challenges emerged from the RACER assessment and expert feedback:

- **vagueness of definitions:** Terms such as “circular jobs”, “fair income”, or “circular economy training” are not consistently defined across studies or datasets. Harmonised definitions are essential for data comparability and credibility (Circle Economy, ILO, and WBG, 2024).
- **data availability and granularity:** Reliable social data remain largely concentrated in formal sectors and high-income regions. Informal circular economy activities — such as repair, reuse, and small-scale recycling — are statistically invisible in most national accounts (Van Opstal et al., 2025;

Leclerc & Badami, 2023). This limits the ability to track distributional and recognitional justice outcomes.

- **geographical comparability:** Laws and enforcement practices, such as freedom of association, differ widely across contexts. Divergence between legal frameworks and real conditions complicates cross-country comparisons, particularly outside Europe.
- **quantitative-qualitative integration:** As emphasised by Purvis and Genovese (2023), procedural and recognitional justice cannot be meaningfully measured through quantitative indicators alone. Qualitative evidence, such as participatory assessments, stakeholder interviews, or community meeting records, should complement numerical data to ensure contextual validity.
- **circular economy boundary definition:** Many indicators capture social aspects that are relevant to sustainability in general but not specific to circularity. To reflect the true scope of a just circular transition, indicators should be explicitly linked to circular economy R-strategies (i.e. refuse, reduce, reuse, repair, refurbish, remanufacture, repurpose, and recycle), rather than to the linear stages of production (e.g. cotton cultivation in textiles or virgin polymer extraction in plastics). Connecting each indicator to the relevant R-strategy or life-cycle phase would strengthen their usefulness for policy-making.

Sector-relevant monitoring

The application of justice-oriented indicators to the textiles and plastics sectors demonstrates that a sector-sensitive approach is indispensable for meaningful monitoring. Each value chain exhibits distinct material flows, labour structures, and governance systems, which determine where and how circular strategies intersect with social justice outcomes. Measuring circularity and justice together therefore requires indicators that are not only generic but tailored to the actual R-strategies being implemented in each sector.

In the textile sector, circular activities — such as repair, reuse, recycling— are increasingly recognised as central to decoupling value creation from resource extraction. However, these activities often rely on low-paid, gendered, or informal labour concentrated in downstream stages. Workers engaged in sorting, cleaning, repairing, or reselling garments frequently operate outside formal labour protection frameworks in low- and middle-income countries. Indicators focusing on job quality, gender equality, access to training, and formalisation are therefore crucial to assess whether circular strategies deliver decent work or reproduce structural inequalities.

At the same time, upstream production processes, such as cotton cultivation or chemical fibre production, remain part of the value chain and will not disappear in a circular economy. Even if primary production decreases over time, a just transition requires monitoring labour conditions, environmental impacts, and the governance of a gradual, well-managed phase-down. However, these upstream activities are not where most circular strategies are currently implemented. For this reason, justice monitoring in a circular economy should place stronger emphasis on the R-strategies that extend product life, enable reuse, and reduce waste. Monitoring waste exports, supplier transparency, and access to local repair or recycling infrastructure provides insights into distributional fairness, both within Europe and along global supply chains.

In the plastics sector, justice concerns in a circular economy transition are concentrated in waste management, recycling, and transboundary trade. These stages involve high exposure to toxic substances, physically demanding work, and weak social protection, often affecting informal waste pickers, migrants, and low-income communities. Indicators on occupational health and safety, traceability of exported waste, and formal recognition of informal workers are therefore central to align circular economy goals with social safeguards. Moreover, plastics recycling often depends on global secondary-material trade, where inequalities between exporting and importing regions can amplify injustices if value and responsibility are not equitably distributed. By linking indicators to specific circular strategies rather than

to the linear extraction and production of virgin polymers, monitoring efforts can more accurately evaluate whether the plastics transition contributes to restorative rather than extractive outcomes.

Overall, both sectors illustrate that just circularity must go beyond material metrics. Traditional indicators such as recycling rates or resource productivity describe efficiency gains but remain silent on who benefits and who carries the burdens of circular transitions. Embedding justice into sectoral monitoring ensures that the pursuit of circularity does not come at the expense of workers' rights, community wellbeing, or fair global trade.

5 Main conclusions and reflections

This report was undertaken in recognition of the fact that the circular economy has historically been conceptualised through ecological and economic lenses, and that the discourse is only gradually expanding to consider the potential social dimensions associated with circular economic practices and systems.

While the preceding ETC report titled “A Just Transition to Circular Economy. Exploring current and potential social implications exemplary for the value chains batteries, plastics, and textiles” (ETC CE, 2025) analysed this development by mapping the understanding of circular economy and a just transition, providing a conceptual approach on a just transition towards circular economy, this report translates these conceptual insights into an operational framework and proposes a core set of indicators. This serves the following purposes: indicators can track the state and trajectory of social implications associated with circular economy activities and provide transparent and comparable evidence of progress across time, regions and policy domains. The identification of social imbalances and burdens can support governance processes and circular economy policy design, ensuring that pledges on the policy level towards a just transition (e.g. Just Transition Declaration (COP26), Leaving no One Behind) are met.

The literature uses various terminologies to highlight social implications of the circular transition, such as *just transition*, *environmental* and *social justice*, *equity*, *equality*, or *fairness*. Analysing those terms, the authors suggest the terms just transition, equity and fairness to be central for circular governance and policy, as they ensure all relevant societal actors – in particular marginalised groups – benefit from the promises of the circular transition. Policy-making should thereby prioritise the integration of distributive, procedural, and recognitional justice as central dimensions of justice discourses; The concept of justice denotes a reasoned allocation of opportunities and burdens, encompassing financial impacts, income distribution, or opportunities for societal participation (distributive justice). It further encompasses inclusive representation in decision-making, recognition of the complexity of systems involved, capacity building and participation, alternative sustainable and accessible practices, as well as monitoring, evaluating, and adjusting policies based on new insights and societal needs (procedural justice). Flanking these two dimensions, viewpoints of different relevant and affected actors must be taken into consideration (recognitional justice).

In chapter 3, a structural framework has been offered to assess how circular economy strategies might affect different social groups, allowing the authors to identify hot spots and blind spots of justice-related implications. For this analysis, stakeholder categories and impact subcategories outlined in the UNEP (2020) Guidelines for Social Life Cycle Assessment (S-LCA) have been adapted. The analysis shows that the justice question is not abstract. Across stakeholder groups, recurrent hot spots relate to decent work and social protection, health and safety burdens, and human rights risks in circular value chains. These risks concentrate among workers and communities with limited bargaining power or weak regulatory coverage, including informal workers, migrants, and communities exposed to pollution or land pressures.

Building upon this structural framework, the operational framework (applied to two resource-intensive and socially sensitive sectors: textiles and plastics) combines the stakeholder categories and impact categories and provides an indicator matrix that structures the indicators by stakeholder group and impact category.

One main reflection on this analysis is that social impact coverage is uneven across stakeholder categories as indicators referring to workers and consumers are relatively common, but those addressing local communities, value-chain actors, and society at large remain rare. The authors conclude that the consideration of recognitional and systemic dimensions remains hardly considered.

The analysis of justice-oriented indicators for a circular economy highlights both the progress achieved and the substantial work still required to build a coherent, operational monitoring framework; The challenges ahead are multifold, leading to the following extensive list of recommendations for future work.

Recommendations for future work

A first priority is to advance conceptual precision. Many existing indicators capture important dimensions of social sustainability, such as labour rights, income, or gender equality, but their relevance to circularity remains indirect. To achieve meaningful monitoring, establishing clear operational definitions for what constitutes, e.g. circular jobs or circular activities is necessary. Without a shared taxonomy, comparability across countries and sectors remains limited. Circular transitions are also at risk of being assessed through generic labour or welfare indicators rather than through measures that capture the specific distributional and procedural aspects of the circular economy transition. Further, conceptual precision needs to clarify how monitoring frameworks classify informal and community-based circular work, how platform-mediated circular services are treated, and how responsibility for protections and harms is allocated across formal and informal segments of circular value chains.

Secondly, the integration of disaggregated and inclusive social data into circular economy monitoring is equally important. Employment, participation, and income indicators must systematically account for gender, age, migration status, and contract type to reveal who benefits and who is excluded from circular opportunities. The lack of visibility of informal and community-based circular activities, such as repair and reuse, remains a major obstacle. Data integration also needs to cover occupational and community exposure to hazardous substances, consumer safety risks in secondary markets, privacy risks in digitalised circular models, as well as human rights due diligence signals that distinguish circular inputs sourced under fair conditions from those tied to coercion or child labour. Achieving meaningful monitoring depends on data coherence, interoperability, and transparency. Consistent data collection across Member States, open sharing between statistical offices, industry associations, and local authorities are necessary.

Thirdly, future monitoring efforts require hybrid methodological approaches. Quantitative indicators can track employment, earnings, or health and safety trends, but they cannot fully capture how people experience circular transitions in different territorial and socio-economic contexts. Qualitative methods – e.g. participatory assessments, deliberative processes, and community feedback – are essential to interpret quantitative data, provide context, and account for procedural and recognitional justice. Combining both forms of evidence allows indicators to function not only as statistical measures but as tools for learning and policy reflection.

Fourthly, justice indicators may also explicitly correspond to relevant R-strategies, rather than to general economic activities. Linking each indicator to a specific circular process or value-chain stage will enable more targeted analysis of justice implications, particularly as sectors shift to circularity. As highlighted above, justice outcomes in a circular economy vary widely across regions, communities and value chains. Indicator development must therefore account for territorial differences in infrastructure, labour markets, and governance capacity.

In sum, the development of justice-oriented circularity indicators remains technically challenging and politically sensitive. A key step forward is to ensure that issues of access, distribution of benefits and burdens, and participation in decision-making are treated as essential elements of the circular economy transition. Indicators are not neutral tools: what is selected, measured, and reported ultimately shapes policy direction and determines which stakeholders and regions become visible within the transition. Advancing a just circular economy will thus require not only better data and methods, but also explicit institutional commitment and participatory governance to ensure that monitoring frameworks reflect societal values, and support fair, inclusive and territorially grounded transition pathways. Improving circular economy monitoring is hence not solely about making indicators better, but about designing them to be reflective and transformative, considering both justice issues and the effects of the monitoring framework itself.

List of abbreviations

Abbreviation	Name	Reference
CBDR-Principle	Principle of common, but differentiated responsibilities	
CE	Circular Economy	
CEAP	Circular Economy Action Plan	www.eur-lex.europa.eu
CENIA	Czech Environmental Information Agency (česká informační agentura životního prostředí)	www.interreg-central.eu
CML	Circular Metrics Lab	www.eea.europa.eu
COP26	Conference of Parties	www.un.org
CSCP	Collaborating Centre on Sustainable Consumption and Production	www.cscp.org
CTI	Circular Transition Indicators	www.wbcsd.org
DMC	Domestic Material Consumption	
DPP	Digital Product Passport	https://data.europa.eu/en/news-events/news/eus-digital-product-passport-advancing-transparency-and-sustainability
ESPR	Ecodesign for Sustainable Products Regulation	https://commission.europa.eu/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/ecodesign-sustainable-products-regulation_en
EEA	European Environment Agency	www.eea.europa.eu
EOL	End-of-Life	
EPR	Extended Producer Responsibility	
ETS	Emissions Trading System	www.climate.ec.europa.eu
EU	European Union	www.european-union.europa.eu
ETC CE	European Topic Centre on Circular economy and resource use	www.eionet.europa.eu/etcs/etc-ce
GDP	Gross Domestic Product	www.oecd.org
ICAT	Initiative for Climate Action Transparency	www.climateactiontransparency.org
ILO	International Labour Organisation	www.ilo.org
IP	Intellectual Property	
JT	Just Transition	

JTIF	Just Transition Indicator Framework	www.eta.ie
LMIC	Low- and Middle-Income Countries	
LNOB	Leaving No One Behind	
NESC	National Economic and Social Council	www.nesc.ie
NIMBY	Not in my backyard	
OECD	Organisation for Economic Cooperation and Development	www.oecd.org
R&D	Research and Development	
RACER	Relevance, Acceptance, Credibility, Ease of monitoring, Robustness	www.era-learn.eu
SEAP	Social Economy Action Plan	https://social-economy-gateway.ec.europa.eu/eu-initiatives/seap_en
SEEDS	Università Degli Studi Di Ferrara	www.unife.it
SES	Structure of Earnings Survey	https://ec.europa.eu/eurostat/web/microdata/structure-of-earnings-survey
S-LCA	Social Life Cycle Assessment	www.unep.org
SMEs	Small and Medium-sized Enterprises	
UBA	German Environment Agency	www.umweltbundesamt.de
UNECE	United Nations Economic Commission for Europe	www.unece.org
UNDP	United Nations Development Program	www.undp.org
UNEP	United Nations Environmental Program	www.unep.org
US	United States	www.usa.gov
VITO	Vlaamse Instelling voor Technologisch Onderzoek	www.vito.be
WI	Wuppertal Institut für Klima, Umwelt, Energie gGmbH	www.wupperinst.org
WRF	World Resources Forum Association	www.wrforum.org

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Annex 1 – Literature review method

To better conceptualize what the terminology “just” entails within a just circular transition, a literature review was conducted to examine which specific social issues are addressed in literature using different keywords related to social aspects.

The search strategy employed a variety of search strings to capture as many relevant documents as possible, utilising Boolean operators and phrase searches to intersect circular economy concepts with social dimensions. A multi-platform search strategy was deployed across academic and grey literature databases (including Google Scholar, Consensus, and SemanticScholar). The specific search terms used were: Circular Economy, Waste Management, Circularity, Just, Fairness, Equity, Social Inclusion, Environmental Justice, Just Transition, Distributive Justice, Procedural Justice, Recognitional Justice, Global South, Vulnerable groups, Marginalised communities, Human rights, Stakeholder engagement, and Waste pickers. The search included a wide range of document types covering articles, reports, book chapters, and grey literature.

The screening workflow was designed to be efficient, prioritizing high-quality sources like scientific journals and reports published between 2021 and 2025. The screening process was carried out in two main phases: First, documents were assessed for relevance based on explicit or implicit references to social aspects in the context of circular economy. Purely technical circular economy papers, documents that mention keywords without elaboration, or those lacking a link to circular economy were excluded from the review. Second, the selected documents were reviewed in depth to extract key definitions, concepts, and arguments.

Annex 2 – Long list of potential indicators

Stakeholder	Impact Category	Sub-category	Indicator
Workers	Human Rights	Freedom of association and collective bargaining	Existence of law to allow freedom of association / unions
		Equal opportunity	Number/percentage of informal workers in circular jobs who gain access to formal employment (SLCA, 2021)
			Number/percentage of informal workers joining cooperatives/labor associations (SLCA, 2021)
			Gender employment gap in circular jobs / Number of women employed in circular jobs
			Gender wage gap in circular jobs (adapted from ICAT, 2025)
	Working conditions	Job creation	Number of workers in circular sector (European Labour Force Study, Eurostat 2024, ICAT 2025)
		Job displacement	Compensation for those who cannot be resettled into new circular jobs as a result of transition (amount committed/disbursed) (adapted from ICAT, 2025)
			Number of employment opportunities shifted from one place to another (Purvis et al., 2025)
		Quality of jobs	Fair income / Earning (ILO, OECD): Average earnings (ILO/OECD)
			Job security (ILO/OECD): Number of temporary vs permanent jobs OR the share of full-time jobs created in new circular industries as a proportion of total jobs (ICAT 2025)
		Personal development	Average hours of CE training provided for workers per year (Purvis et al, 2025, Luthin et al. 2023)
		Safe working conditions	Number of accidents / Number of work damages related to CE activities (Purvis et al., 2025, Luthin et al, 2023)
	Informal sector job recognition	Informal employment rate (ILO)	
		Presence of informal recycler associations	
Child labour	Percentage of children under the legal age or 15 years old (14 years old for developing economies) working in circular activities (SLCA, Method. Sheets, 2021)		
Local Communities	Health and safety	Living conditions	Number of CE related accidents/malfunctions leading to increased emissions (Luthin et al, 2023)
			Percentage of exported waste (e.g. plastic, e-waste, ...) that can be traced to verified environmentally sound recycling destination (adapted from Baker et al. 2023)
	Cultural heritage	Inclusion of cultural aspects in circular activities	Presence of policies or management plans in place to protect and or support cultural heritage (SLCA Method. Sheets, 2021)
			Presence of relevant organizational information to community members in their spoken language (SLCA Method. Sheets, 2021)
	Governance	Community engagement	Existence of formal participatory mechanisms in decision making process related to circular activities
			Percentage of community recommendations that were meaningfully incorporated into final CE regulations, policies or decisions (adapted from Baker et al. 2023)
			Representation/Existence of workers/civil society/small businesses/communities on advisory and decision making bodies related to CE (adapted from ICAT 2025 & Baker et al. 2023)
			Number of community engagement events related to circular jobs (Based on SLCA Method. Sheets, 2021)
	Indigenous rights		Presence of policies to protect the rights of indigenous community member (Based on SLCA Method. Sheets, 2021)
			Number of annual meetings with indigenous community members (Based on SLCA Method. Sheets, 2021)
			Budget available to preserve cultural heritage (van der Welf, 2025)
Socio-Economic repercussions	Engagement of the communities	Number of local initiatives promoting CE (Luthin et al., 2023)	
		Number of circular economy policies/actions that address historic injustices (adapted from ICAT, 2025)	

			Number of jobs created that involve CE activities (Luthin et al., 2023)
			Number of job losses due to circular activities (Based on Luthin et al., 2023)
			Percentage of total population of the community with a NIMBY attitude (Luthin et al., 2023)
			Number of campaigns to enhance social acceptance (Luthin et al., 2023)
<i>Value chain actors</i>	Governance	Transparency	Green or circular government purchases for the region (Luthin et al., 2023)
	Socio-Economic repercussions	Promoting social responsibility	Number of CE educative workshops for suppliers (Luthin et al., 2023)
			Number of participants to CE educative workshops for suppliers (Luthin et al., 2023)
			Number of managers commitments to green supply chain management (Luthin et al., 2023)
			Number of patents related to innovative technologies (Luthin et al., 2023)
		Number of CE related meetings with stakeholders of the value chain. (Luthin et al., 2023)	
<i>Consumer</i>	Governance	Transparency	Existence of consumer privacy policies for circular products or activities (Luthin et al., 2023)
			Existence of clear information about EOL options for circular products (Luthin et al., 2023)
			Number of participative CE workshops with customers/clients (Luthin et al., 2023)
			Existence of labels to promote transparency for consumers (Luthin et al., 2023)
	Socio-Economic repercussions	Social benefits /impacts / Social security	Number of campaigns to enhance social acceptance (Luthin et al., 2023)
	Accessibility	Change in price of the final product, due to CE actions.	
<i>Society</i>	Socio-Economic repercussions	Economic resilience	Number of CE innovation meetings/workshops/brainstormings for innovation development (e.g. Ratio of R&D CE investments to total investment) (Luthin et al., 2023)
<i>Children</i>	Human rights	Education	Existence of CE education/awareness raising for students (Luthin et al., 2023)

European Topic Centre on
Circular economy and resource use
<https://www.eionet.europa.eu/etcs/etc-ce>

The European Topic Centre on Circular economy and
resource use (ETC CE) is a consortium of European
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Environment Agency.

