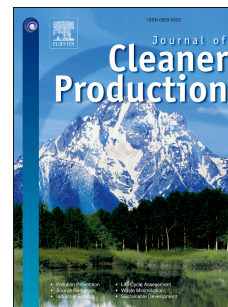


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Including the social in the circular: A mapping of the consequences of a circular economy transition in the city of Umeå, Sweden

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1. Author contribution

FV: conceptualization; data curation; formal analysis; funding acquisition; investigation; project management; methodology; supervision; validation; writing – original draft; writing – review and editing

SR: data curation; formal analysis; writing – review and editing

ME, JJ: data curation; formal analysis

MH: writing – review and editing; funding acquisition

KA: methodology; data curation; supervision; writing – review and editing

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Title:

Including the social in the circular: a mapping of the consequences of a circular economy transition in the city of Umeå, Sweden

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Manuscript

Including the social in the circular: a mapping of the consequences of a circular economy transition in the city of Umeå, Sweden

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Highlights

- Provides the findings from a social impact assessment in the city of Umeå, Sweden, which aims to be a leader in the circular economy (CE) this decade.
- It shows that the transition to a CE in the city is mainly viewed as positive by different stakeholders in the city (government, academia, and industry), with few perceived losers. Participation of civil society and citizens in designing the CE strategy has, however, been low.
- As transition processes are often prone to several injustices, including distributional, procedural, cosmopolitan and recognition ones, we recommend that the municipal government implements a more thorough consultation and participation process to design their CE interventions, allowing more diverse voices to be heard.

Abstract

The circular economy (CE) model, where resources are kept "in the loop" for as long as possible through a series of reusing, remanufacturing, recycling, and recovery strategies, has been acclaimed for reducing the environmental impacts of our current economic model substantially and has therefore been supported by a wide range of policymakers as one solution to tackling climate change. However, how circular transitions in cities impact people has been rarely researched, and even less attention has been paid to the negative consequences of CE transitions.

This paper presents the findings from a social impact assessment conducted in the city of Umeå, Sweden. We identified several negative impacts of a CE transition across seven social impact categories and explored three areas in depth with stakeholders in the city: employment, access to services and participation. We found that the negative impacts of the CE are perceived to be limited and that the CE interventions are mainly viewed as a win-win-win outcome, i.e., a win for the environment, the economy and people. This raises questions about the level to which societal consequences have been considered and whether all relevant stakeholders, in particular civil society, have participated in the design of the city's CE strategy. Our findings can inform other cities about possible negative consequences of CE transitions and provide insights into how to incorporate different stakeholders in the CE transition process to ensure that no one is left behind.

Keywords

Circular economy, urban transitions, employment conditions, participation, intersectionality

1. Introduction

With cities responsible for using 75% of global resources and generating over 70% of the global greenhouse gas emissions (IPR, 2018), the potential for closing, slowing and narrowing the “loop” of resource use in cities is substantial (Harris *et al.*, 2020; UN Habitat, 2020). In contrast to the conventional linear economic model, where resources are extracted, used, and discarded, the circular economy (CE) concept depicts both an ideal and an instrumental development model determined by the responsible and cyclical use of resources to maintain their value in the economy, minimize environmental pressures, and contribute to improved socio-economic welfare (Kirchherr, Reike and Hekkert, 2017; Geisendorf and Pietrulla, 2018). Implementing the CE model in cities is expected to address the complexity of sustainability challenges, in part as the CE is perceived to support certain Sustainable Development Goals (Schroeder, Anggraeni and Weber, 2019). As a result, many cities, including the city of Umeå, Sweden, adopt CE strategies (see, e.g., Petit-Boix and Leipold, 2018); Vanhuise, Haddaway and Henrysson, 2021), promoting a range of approaches to urban circularity (Remøy *et al.*, 2019; Paiho *et al.*, 2021).

Decision-makers in municipalities, given their role and responsibilities in society (European Committee of the Regions, 2019), must consider circular systemic solutions, practices, and strategies to better monitor and manage the transition towards a CE model with the inclusion of all aspects of sustainable development, including the social aspects (Hodson and Marvin, 2010; Vergragt *et al.*, 2016). To that end, the EU launched an initiative in support of cities and regions to test and implement those solutions across Europe (EU commission, 2022.), as well as a research call on circular urban economies transition pathway to “foster regenerative urbanism, i.e., liveable, inclusive, and green communities and neighbourhoods that are sustained by circular urban economies and resource flows” (EU commission, 2022b). Sustainable urban development is often founded on the 3 E's - environment, economy and equity (McCormick *et al.*, 2013; McPhearson *et al.*, 2016; Ahvenniemi *et al.*, 2017), and regardless of the differences between sustainability and the CE (Geissdoerfer *et al.*, 2017; Fratini, Georg and Jørgensen, 2019), to create socially inclusive circular cities, people need to be placed at the centre of the CE transition, alongside a focus on technological solutions (Gall *et al.*, 2020; Miranda *et al.*, 2020; Schröder, Lemille and Desmond, 2020). Previous studies have pointed out the lack of integration among ecological and social aspects of sustainability in urban planning and key policy strategies, as well as in operational planning in Swedish cities (Khan, Hildingsson and Garting, 2020).

Yet, while the research on the CE has grown exponentially over the past decade (see, e.g., Ghisellini, Cialani and Ulgiati (2016) for a review), the social side of the CE transitions has rarely been addressed (Hobson and Lynch, 2016; Murray, Skene and Haynes, 2017; Homrich *et al.*, 2018; Pitkänen K *et al.*, 2020). Most frameworks assessing the city-level circular economy cover only a limited set of social indicators (Moraga *et al.*, 2019; Papageorgiou *et al.*, 2021; Bote Alonso, Sánchez-Rivero and Montalbán Pozas, 2022). A review of 178 papers on circular cities found that only 8% covered social impacts, often related to employment conditions in developing countries or governance structures in developed countries (Vanhuise *et al.*, 2021). Indeed, Chen (2021) notes that “damage to workers’ and citizens’ health and rights are relatively ignored” when it comes to the CE in cities (p. 1). This could be due to the stance or vision that is taken when CE futures are designed. (Calisto Friant, Salome and Vermeulen, 2020; Calisto Friant, Vermeulen and Salomone, 2021), for example, found that discourses on the CE often center around technological improvements only, including at EU level. Other work on envisioning circular futures, by (Bauwens *et al.*, 2020; Lowe and Genovese, 2022; Marjanović *et al.*, 2022) stress the importance of multi-level collaboration to ensure that circular visions are embedded within society, as well as cities.

With this paper, we aim to fill the research gap related to the social impacts of CE transitions in cities, by exploring how the social impacts have been considered in the design and implementation of the CE strategy in a city. Indeed, as many technological innovations that are expected to contribute to the CE

have not been proven at scale (IEA, 2019), concentrating on the social transformation needed in cities becomes even more important (Calisto Friant, Salome and Vermeulen, 2020; Kotsila *et al.*, 2020; Calisto Friant, Vermeulen and Salomone, 2021).

Our focus is on the city of Umeå, Northern Sweden, given that it has made the CE a political priority (OECD, 2020b). Using a mixed-method research design, we elicit expert opinions to populate the social impact framework designed by the International Association for Impact Assessments (IAIA) (Vanclay *et al.*, 2015). To the best of our knowledge, this is the first social impact assessment of CE transitions in cities, performed using the IAIA social impact framework, which allows focusing not only on the positive contributions of a CE but also on the negative consequences. Our analysis can inform municipal and national authorities on whether they have fully considered all impacts and subsequently with the opportunity to design CE policies that tackle potential injustices and “unjust” transitions (Stern, 2015; Sovacool *et al.*, 2019).

The remainder of this article is structured as follows. Section 2 justifies the choice of a social impact framework for our analysis. Section 3 provides the socio-economic context of the city of Umeå and describes the methodology used in this research. Results are presented in Section 4, followed by a discussion and recommendations in Section 5. Section 6 concludes and outlines suggestions for further research.

2. Social considerations in the circular economy

Whereas methods exist to assess the social impacts of circular products, such as Social Lifecycle Assessment (SLCA) (see, e.g., Reinales, Zambrana-Vasquez and Saez-De-Guinoa, 2020; Tsalis, Stefanakis and Nikolaou, 2022), there is no agreement on the scope for assessing the social impacts of CE transitions at a city or a country level. The EU CE monitoring framework, for example, mentions only employment creation as its social indicator in its framework (Eurostat, 2022). Similarly, out of 474 CE-related indicators, the OECD identifies only job creation as a social indicator (OECD, 2020a). Aguilar-Hernandez, Dias Rodrigues and Tukker (2021) also focus solely on job creation as the “social” indicator for CE. Korhonen, Honkasalo and Seppälä (2018) broaden the “social wins” to include new employment opportunities and an increased sense of community, cooperation and participation, and shared functionality between users. Padilla-Rivera, Russo-Garrido and Merveille (2020) further organise the social aspects of the CE in four areas (labour practices and decent work; human rights; society; and product responsibility), with 31 corresponding indicators. Mies and Gold (2021) note employment opportunities, education and awareness, health and safety, and government involvement as most mentioned by scholars.

Most of the research considers the CE to bring about positive changes, neglecting unintended, negative consequences of the CE. The CE concept, therefore, lacks reflections on “greater social equality, in terms of inter- and intra-generational equity, gender, racial and religious equality and other diversity, financial equality, or equality of social opportunity” (Murray, Skene and Haynes, 2017, p. 22). Indeed, frameworks developed by practitioners on urban sustainability cover the social dimension quite considerably, suggesting goals and indicators related to citizen participation, social cohesion and inclusion, social and intergenerational equity, spatial equity, and safety (URBACT, 2017; Global Platform for Sustainable Cities and The World Bank, 2018). These frameworks include justice as a key aspect, encompassing distributional aspects or the fair distribution of resources to all relational partners (equity), procedural aspects such as citizen participation and political processes, and interactional aspects related to recognition (Kotsila *et al.*, 2020). Transition policies, including those designed to address climate challenges, at times breach justice principles (Sovacool *et al.*, 2019; Williams and Doyon, 2019; Green and Gambhir, 2020). The assessment of four decarbonization policies performed by Sovacool *et al.* (2019) brought to light 28 injustices per policy on average (14 distributional injustices, 3 procedural injustices, 4 cosmopolitan injustices and 8 recognition injustices

per policy). If adverse consequences of CE transitions are not well understood, the transition risks creating unjust and, therefore, unstable and unsustainable societies (Agyeman, Bullard and Evans, 2002).

The IAIA presents a holistic approach to assess social impacts (Vanclay *et al.*, 2015). It defines social impacts as "*the intended and unintended social consequences, both positive and negative, of planned interventions (policies, programs, plans, projects) and any social change processes invoked by those interventions*" (Vanclay *et al.*, 2015, p. 1). It goes beyond employment creation and participation and covers fears and aspirations, health and wellbeing and personal and property rights. This approach addresses, among others, concerns noted by Fuchs *et al.* (2016); Hobson and Lynch (2016); and Moreau *et al.* (2017) about the importance of trust, social capital, power, entitlement and access, and belonging for transformational CE. Table 1 provides an overview of the eight social impact categories of the IAIA framework. The procedural injustices (due process) from (Sovacool *et al.*, 2019) are linked with the IAIA's social impact category 4 on political systems, with distributive justice (cost and benefits, cosmopolitan justice (global externalities) and recognition justice (vulnerable groups) linked with multiple social impact categories, including people's way of life (category 1), people's culture (category 2), people's environment, health and wellbeing (category 5 and 6); and personal and property rights (category 7). Overall, any of the injustice could also impact on people's fears and aspirations, and future perceptions of injustices occurring to them, their communities, and their next generation (social impact category 8).

Table 1. Conceptualization of social impact categories with descriptions

Impact area	Description
People's way of life (category 1)	How do people live, work, play and interact with one another on a day-to-day basis
People's culture (category 2)	Shared beliefs, customs, values and language or dialect
People's community (category 3)	Cohesion, stability, character, services, and facilities of the community
Political systems (category 4)	The extent to which people can participate in decisions that affect their lives, the level of democratization that is taking place, and the resources provided for this purpose
People's environment (category 5)	The quality of the air and water people use; the availability and quality of the food they eat; the level of hazard or risk, dust and noise they are exposed to; the adequacy of sanitation; their physical safety; and their access to and control over resources
People's health and wellbeing (category 6)	The state of complete physical, mental, social and spiritual wellbeing and not merely the absence of disease or infirmity
People's personal and property rights (category 7)	Whether people are economically affected or experience personal disadvantages, which may include a violation of their civil liberties
People's fears and aspirations (category 8)	People's perceptions about their safety, their fears about the future of their community, and their aspirations for their future and the future of their children

Source: Vanclay (2003, p. 8)

Using the IAIA social impact assessment framework as guidance, we carried out our research in the city of Umeå.

3. Materials and methods

This section describes the methodological approach of the study. Section 3.1 introduces key characteristics of Umeå city as a study setting. Then, we explain the methods used for data collection and analysis.

3.1. About the city of Umeå

Umeå is located in Northern Sweden and currently has over 130,997 citizens, double what it had 50 years ago (RKA, 2022). Its population is mostly below 65 years old and is highly educated compared to the Swedish average. About half the households are single-person households. On average, 14% of the population in the city are classified as having low economic standards, having a disposable income that is less than 60% of the median income in Umeå, but 45% of them are younger than 25 years old (Delmos, 2021). These are, therefore, most likely students – about 30,000 people are enrolled at Umeå University (Umeå Universitet, 2021). Less than 5% of the population is unemployed. In the latest election, 29.5% of the voters voted for the social democrats (RKA, 2022). In 2020, 11,819 people worked for the municipal government; 7,884 for the regional government; 37,651 in the industry; and 3,416 in civil society and other organisations (SCB, 2021b). The largest sectors are the care sector (14,481), followed by education (10,064); retail (6,876) and corporate services (6,747) (Umeå kommun, 2022).

Since the 1990s, Sweden endures welfare erosion, widening inequalities, and increasing poverty (Gould, 1999; Elander, Granberg and Montin, 2021). Umeå, however, maintains a local welfare society. Access to welfare services is better than the national average: 4,7 physicians per 1000 people (2,7 national average) and 84% live less than five minutes from a health centre (66% national average) (Regionfakta, 2022a). Public expenditure on culture is the highest in Sweden (Regionfakta, 2022b). Umeå is the largest city in Sweden with no 'vulnerable area' (a term used by the Swedish Police Authority to describe areas characterized by social exclusion and crime) (Swedish Police Authority, 2021). Reported crimes per 1000 inhabitants are lower than the national average – 106 in comparison to 142 (Regionfakta, 2022a). To combat income segregation, most neighbourhoods consist of a mix of rental apartments and tenant-owned accommodations. In the 2015 refugee crisis, 247 unaccompanied refugee minors settled in Umeå (Antemar, 2017). Poverty is twice as common among immigrant populations. Yet, scholars acknowledge that spatial inequality is a reflection of overall socio-economic inequalities (Andersson, Bråmås and Holmqvist, 2010) and as such is beyond the potential policy instruments directly related to CE model implementation.

Annual greenhouse gas emissions in the city, expressed in tonnes of CO₂-e per capita, amounted to 371,166t CO₂-e or 2.88t CO₂-e per capita (RKA, 2022). These emissions originate mainly from private transport (25%), electricity consumption and district heating (21%), industrial production (11%) and machinery used in industry and construction (4%). However, the consumption-based emissions, taking the point of consumption instead of production as the measure of assessment, are substantially higher, at, on average, 11.5t CO₂-e per capita (Axelsson, Vanhuyse and Dawkins, 2018). Households are responsible for 60% of emissions, which covers transport (32%), food (17%) and clothes and gadgets (9%). The other 40% of emissions originate from government consumption and investment (Naturvårdsverket, 2019).

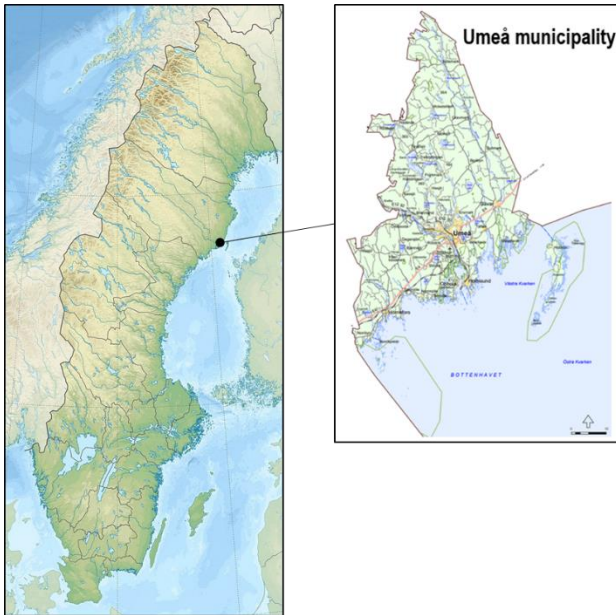


Figure 1. The municipality of Umeå

Source: adapted from Umeå municipality (2022)

While Umeå is at the initial steps of planning for a CE transition, the municipality of Umeå declared the CE a priority in its Strategic Plan 2016-28 (Umeå kommun, 2016). Several bottom-up initiatives are on their way already (Umeå municipality, 2022b). At present, there are no assessments of the circularity performance or supposed wins or losses except a coming-up quantitative assessment of the level of circularity performance in the city of Umeå (Henrysson *et al.*, in review) indicating that the municipality is performing well in several categories of resource management while improvements are still needed. Table 2 contains some key parameters for the city of Umeå and Sweden.

Table 2. Key indicators for Umeå and Sweden (2021)

	Umeå	Sweden
Socio-economic data		
Total number of citizens (2021)	130,997	10,379,295
Age structure (2021)	0-19: 22% 20-64: 60% 65-79: 13% 80+: 5%	0-19: 22% 20-64: 53% 65-79: 18% 80+: 7%
Education level – % of the population with a degree higher than high school (2020)	57%	35%
Median net income per capita (SEK), population aged 20 and above (2020)	245,500 SEK	253,300 SEK
Unemployment - % of population (2021)	4.6%	6.3%
Population born abroad, aged 18-64 (2021)	16.6%	20.1%
Environmental data		
Total territorial emissions - tonnes of CO ₂ -e per capita (2019)	2.9	4.6
Waste collected - kg per capita (2020)	438	517
Waste for resource recovery - % of the total waste collected (2020)	41%	38%

Source: Delmos (2021); Naturvårdsverket (2021); SCB (2021a); RKA (2022)

Umeå's population is expected to increase from 130,000 to 200,000 inhabitants by 2050 (Umeå kommun, 2018). Designing the city using CE principles provides the city with ample opportunity to reduce pressures on resource use and the environment. In its Strategic Plan 2016-2028, the municipality set the objective to become a role model in CE (Umeå kommun, 2018). Umeå joined the OECD programme on circular cities in 2019-2021 (OECD, 2020b), and its mayor signed the European Circular Cities Declaration in 2020 (ICLEI, 2020). In collaboration with the OECD, the municipality put forward 18 policy recommendations to accelerate its CE agenda. The recommendations include developing a CE strategy and sector-specific guidelines, exploring synergies with other plans, adapting regulatory frameworks, and mapping existing initiatives, resource flows, and future job opportunities (OECD, 2020b). Further advice pertained to the enabling of a CE transition through fiscal and economic tools, green public procurement, and the facilitation of collaboration and coordination with universities, the private sector, and the national government (OECD, 2020b). That report, however, contains little detail on how to measure the social impacts of the circular economy strategy and only refers to the number of employments created as an indicator of the socio-economic aspects of the CE. The municipality promotes circular initiatives on their website, which, for example, sharing initiatives, circular events, municipal-owned second-hand stores, sport equipment sharing platforms, and bike sharing initiatives (Umeå municipality, 2022b). Figure 3 in section 4 shows the location of these initiatives across the city.

3.2. Data collection and analysis

We used an explorative case study approach, using mixed methods to assess the social impacts of the CE strategy in Umeå (Table 3). First, we collected the CE strategy and related documents for the city of Umeå. We performed the text analysis and extracted socio-economic data on Umeå from websites (e.g., Delmos, 2021; SCB, 2021b; RKA, 2022) and used the municipal government's website to find references to their work on the CE (ICLEI, 2020; SCB, 2021a, 2021b; Swedish government, 2022; Umeå kommun, 2022). A socio-economic profile of the city, including employment figures, population groups, and so on, was made using the data collected. The retrieved documents were also analysed against the selected social impact framework. This led us to the set-up of a semi-structured interview guide, including questions on the participant's CE perceptions, their vision of a CE transition in Umeå as well as opportunities and barriers linked to that. Another section in our interview guide focused on perceptions of social impacts, with both open-ended and follow-up questions, to dig deeper into social considerations. The interviews were conducted between September and December 2021 (Annex 1).

The interviewees (Annex 2) were initially selected from the organisations representing the quadruple helix model: government, private sector, academia and research institutes, and citizens and civil society, given the role they play within the society (Leydesdorff, 2012). We aimed to involve actors linked to a CE transition in Umeå and with an interest to the city, representing different types of initiatives and sectors. Snowballing techniques were applied to identify additional interviewees during each interview. In total four interviewees were added.

The interviews were conducted online. Out of the 25 interviews, nine were conducted in Swedish and translated into English. Informed consent was collected from each interviewee. The interviews were recorded, and detailed notes were taken. In the first step, additions were made to the interview notes while listening to the recordings. The revised interview notes were then uploaded and analysed in NVivo software. Two of the authors coded all interviews against the IAIA framework. We used content analysis to identify connections and discrepancies between the different stakeholders' viewpoints, following an iterative and explorative approach which combined inductive and deductive coding. We started with a deductive coding framework based on the social impact categories by Vanclay et al. (2003) and added new categories as they emerged from the interviews. The lead author verified the coding of the interviews, and subsequently, the two authors reviewed the coding. The findings were then anonymized and written up, pinpointing certain topic areas that could be followed up upon.

To supplement the analysis and validate the results, two focus group discussions (FGDs) were organised online in February – March 2022, with 11 of the participants from the interviews (Annex 3). FGDs are an appropriate method to follow up on findings from surveys and interviews (Wilkinson, 1998). Both FGDs were conducted in Swedish. Informed consent was obtained. Private industry and civil society were not well represented in the FGDs as it required them to take time away from their employment. To overcome this, we conducted a field visit to all civil society organisations we interviewed in April 2022 (see below).

During the FGDs, we first presented the anonymised results from the interviews (see Rezaie, Vanhuysse and André, 2022), followed by a conversation around three topic areas which stood out in the interviews: 1) employment; 2) access to services; 3) participation (Table 4). Employment was most mentioned in the interviews. Access to services was selected as it is a prerequisite to new forms of consumption, such as the sharing economy, which was mentioned by 10 out of 25 interviewees. Participation was selected given that many civil society organisations commented upon the lack of participation in the CE decision-making process. Reflecting on the postulates of Sovacool *et al.* (2019) and Wuyts and Marin (2022), representation of different societal groups is a prerequisite to defining just transition strategies, and we aimed at understanding how this was viewed in the city of Umeå. For the conversation about access to services, a map with the location of the CE initiatives listed on the municipal government's website (Umeå municipality, 2022b), supplemented with the location of public transport (e.g., bus stops and train stations), and showing whether the area in the city is of low economic standard (Delmos, 2021), was presented first (Figure 3). Low economic standard means that the average household income is less than 60% of the median of the country, and can be used as a proxy for assessing households that are at risk of poverty compared to others (Folkhälsomyndigheten, 2022).

To start the conversation on each topic area, participants were asked to fill in a questionnaire in Microsoft Forms (anonymously). Adding a questionnaire at the start of each topic, allowed the participants to form their opinion independently from the moderator and other participants, thereby overcoming one of the disadvantages of FGDs (Wilkinson, 1998). The results were then displayed to the FGD participants and discussed in the group. The sessions were recorded, and detailed notes were taken. The lead author coded the notes of the sessions. The coding was done inductively, starting from a mapping against the IAIA social impact framework and coding statements as positive or negative against each category of the IAIA social impact framework. These statements were then triangulated against other research on social aspects and the CE. The analysis was then discussed with the co-authors and validated.

In April 2022, the research team visited the city of Umeå to collect more data from certain organisations and also to test and validate some of the findings. A total of 15 locations were visited, including the premises of two academic institutes, six civil society organisations and two private companies (Annex 4). At every location, the team started with a tour of the premise (e.g., the second-hand store or the recycling centre), followed by questions to the employees that showed the researchers around. These questions were unstructured, providing flexibility to the team to dig deeper into some of the conversations that were being held with the different organisations (Burgess, 1982). Questions centred around their perceptions of the CE strategy in Umeå and who would benefit or lose from the CE. At the university, a different approach was taken. There, the research team approached students to understand their knowledge of the CE, asking them to indicate their level of knowledge and what the CE meant. Notes were taken at each location and coded by the lead author. This coding was also done inductively, where statements were added to the FGD analysis, using positive and negative as a label against each category of the IAIA social impact framework. This analysis was also discussed with the co-authors and validated.

Linking to the socio-demographic structure of the city, with a highly educated and young population, it is relevant to reflect on the background of the participants and how that might have affected their perceptions of social impacts. All interviewees and by consequence participants of the FGDs were Swedish-born, Caucasian, mostly highly educated, and employed. Groups such as elderly people, migrants and citizens with lower incomes, who were identified as potentially disadvantaged, were underrepresented in our interviews and the FGDs. To overcome that, we organised field visits to different CE initiatives in the city. Yet, these field visits were mostly led by Swedish-born, Caucasian people in managerial positions. In terms of familiarity with the CE concept, the participants of both interviews and FGDs presented pre-existing knowledge of sustainability and environmental awareness, and the company representatives had been either involved in the city's CE plans, provide a service linked to a CE transition, or have some type of sustainability commitment. However, despite this knowledge, some had difficulties identifying potential social implications of transitions and linking them to the CE. Interview questions about social impacts were designed as open-ended to avoid bias, for instance, asking who might be advantaged or disadvantaged by a transition towards a CE. Nevertheless, follow-up questions and an explanation of the social impact categories by Vanclay (2003) were provided for a better understanding. Out of the seven industry representatives, five are small- and medium-sized enterprises and only two were representatives of large companies. Most of the initiatives visited during our field study were in the field of the sharing economy and recycling of consumer goods. The surveys in the FGDs were anonymous, and we could therefore not analyse whether there were different perceptions based on the type of stakeholder each participant represented.

Table 3. Overview of data collection methods

Date	Method	Description
June 2021- June 2022	Document retrieval and analysis	Desk-based review, aimed at providing baseline data for the interviews and FGDs
Sept-Dec 2021	Key informant interviews (25)	Interviews with actors in the field of a CE with an interest/connection to the city of Umeå <ul style="list-style-type: none"> • Government representatives (7) • Industry, including municipally owned companies (7) • Academia (3) • Civil society (8)
February 2022	Focus Group 1 (7 participants)	Presentation of the findings from the interviews, followed by in-depth conversations on 3 topics (access to services; employment; participation) <ul style="list-style-type: none"> • Government representatives (3) • Industry, including municipally owned companies (2) • Academia (1) • Civil society (1)
March 2022	Focus Group 2 (4 participants)	Presentation of the findings from the interviews, followed by in-depth conversations on 3 topics (access to services; employment; participation) <ul style="list-style-type: none"> • Government representatives (3) • Industry, including municipally owned companies (1)
April 2022	Field visits and interviews (15 locations)	Visits to the different organisations' premises, walk-through, and questions from the research team to the different organisations. <ul style="list-style-type: none"> • Government representatives (5) • Industry, including municipally owned companies (2) • Academia (2) • Civil society (6)

		These visits took place during working hours, during which someone of the management team freed up some time to introduce us to the organization, how it supported the CE in Umeå, and its perceptions on social impacts, including barriers and opportunities for the organization.
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4. Results

Below, we briefly present the results of the interview analysis, followed by the findings from the three topic areas: employment, access to services, and participation.

Most interviewees mentioned impacts related to employment (20 out of 25), followed by impacts related to the community in terms of increased social cohesion (14 out of 25) and new forms of consumption such as the sharing economy (10 out of 25). Among the 18 interviewees that mentioned participation and collaboration in the city's CE vision, 11 stressed that the current level of collaboration on CE decisions was insufficient. Civil society organizations and academia wished for more involvement in the process. Very little reference was made to personal and property rights (social impact category 7) and health and wellbeing (social impact category 6). Various themes emerged around fears and aspirations, such as fears of transitioning to slow and miscommunicating the transition towards a CE (social impact category 8). Table 4 contains the findings per social impact area. Rezaie, Vanhuyse and André (2022) provide an in-depth analysis of the interview findings. As reflected upon in section 3.2., the selection of interviewees could have influenced our findings. The sections below are therefore supplemented with publicly available quantitative data to frame their relevance in the context of Umeå.

Table 4. Overview of social impacts mentioned in the 25 interviews

Impact area	Sub-categories	Perceived positive impacts (+)	Perceived negative impacts (-)
People's way of life (1)	<i>Employment</i>	Potential job gains through CE strategies and new local jobs (11)	Job losses and employment shifts in different sectors such as the retail and car sector suggested (11) New skills required in connection to new jobs (3) and the quality of jobs needs to be assessed (2)
	<i>Consumption</i>	Increased affordability of CE services and products for a population with low incomes and local consumption (5)	Risk of a growing social divide due to changes in consumption and lifestyles, for instance, through price increases (4)
	<i>Transport and mobility</i>	Positive impacts through a modal shift and more local services are suggested – for instance, less traffic and reduced emissions from transport (6)	Alternative modes of transport too timely, affordability and accessibility challenges (3)
	<i>Other</i>	Potential of migration for new circular jobs (3), the role of education and the emergence of new careers (5)	Potential for an increase in the urban-rural divide (4)
People's culture (2)	<i>Cultural diversity</i>	Cultural knowledge and learning exchange through local CE initiatives (3)	
	<i>Public awareness</i>	Environmental awareness is generally considered high in Umeå and a start of a culture of sharing, renting, and refurbishing, in Umeå (8)	A radical shift in mindset is required to create a 'circular culture' (4)
People's community (3)	<i>New forms of consumption</i>	Positive impacts linked to CE initiatives, such as increased affordability and accessibility (4)	CE initiatives are not always sustainable – for instance, Uber services (2) Access to CE initiatives presents obstacles (4)
	<i>Social cohesion</i>	New social ties and networks through sharing initiatives Neighbourhood services create a feeling of togetherness and increase trust (14)	
Political systems (4)	<i>Participation</i>		Risk of a divide between people who are involved and those who are excluded from CE vision

			In particular, civil society organisations and citizens feel excluded and wish for more involvement (11)
People's health and wellbeing (6)	<i>Public health</i>	Positive impacts linked to modal shift perceived – fewer cars and better air quality (3); circular materials for better health impacts (1)	
	<i>Wellbeing</i>	Improved mental health suggested, with CE empowering individuals to take concrete actions in contrast to sustainability, more time through less consumption (3)	A circular lifestyle is perceived as more time intensive (1)
People's personal and property rights (7)	<i>Digitalisation</i>		Negative impacts linked to increased digitalisation – for instance, elderly and migrants, who lack access and skills for digital empowerment (5)
Fears and aspirations (8)	<i>Fears</i>		Fear of creating negative impacts through CE plans and miscommunication (6)
			Fear of excluding vulnerable societal groups (2)
			Fears linked to growing and changing population (1)
			Fears linked to time and scale of transition (7)

Source: adapted from Rezaie, Vanhuyse and André (2022)

4.1. Employment

During the FGDs, we asked how transitioning to a CE would affect employment across several sectors (Figure 2). As illustrated by the first survey question, most participants envisioned a positive or very positive impact from the CE on job creation (71% of answers across all sectors), except for in the retail trade, extractive industry and warehousing and storage.

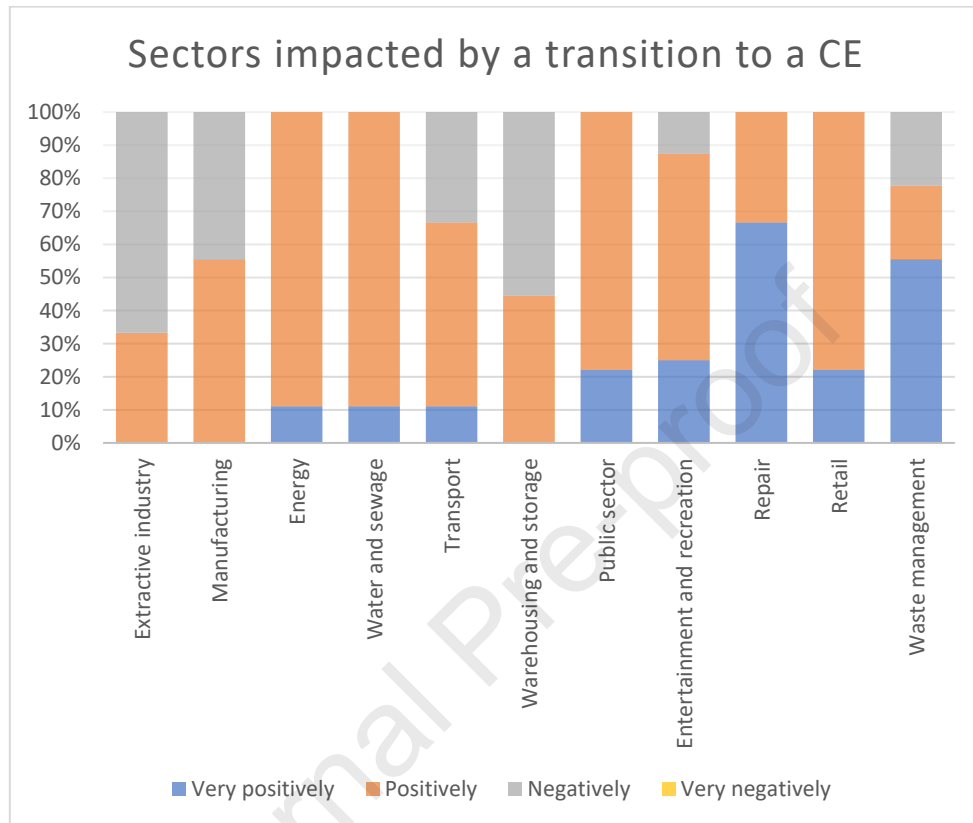


Figure 2. Responses from the survey about the impacts of the CE on employment

In the conversation following the survey, respondents overall were very positive about creating more jobs with the CE. Indeed, as found by the Swedish Statics Agency, the number of people employed in the CE industry amounted to about 75,000 people, a slow but steady increase since 2010 (SCB, 2022). The respondents were more concerned about finding sufficient labour forces when unemployment rates in Umeå are already low.

The respondents agreed that individual sectors would not disappear but would require an influx of new skills and a transformation of business activities. For example, they noted that the negative responses to employment opportunities in the extractive and manufacturing industries entailed a disruption and transformative shift from the current business model to circular strategies. Data shows that the number of jobs in the extractive industry decreased already between 2009-2017 to 5,007 employees. For the retail trade, respondents felt that even though they mainly noted negative impacts, the sector had been undergoing a transformation given the Covid-19 pandemic (changing to preferences for online shopping and, consequently, empty shops in the city centre). Data on employment positions in retail showed an increase between 2009 to 2017 to 6,876 jobs (Umeå kommun, 2022). However, the local employment office confirmed the decrease in the retail industry during 2020-2022 in the interview. Indeed, data shows that the number of shops in Umeå decreased from 419 in 2017 to 370 in 2020, even though the sales from these stores increased from 9,685M SEK in 2017 to 10,717M SEK in 2020 (Handelsrådet, 2022).

The respondents briefly touched upon the status of the new job opportunities and whether they would provide decent working conditions to the employees. Second-hand shops mostly rely on volunteers. Micro-businesses are expected to flourish that provide repair services, but income is generally low. Bicycle delivery services were seen as an industry with challenging working conditions, often employing foreign nationals with poor access to the labour market. During our field visit, we observed the same: while there was a focus on job creation and integration of people in the community, many positions were as interns or temporary employment. Most initiatives we visited mentioned financial challenges as a key barrier for them to operate well. In the second-hand stores, feedback was given on the sheer volume of goods being donated to the initiatives, and the challenges for the teams to work through the vast number of donated items, which at times was of low value, and needed to be brought to the municipal recycling company. In the circular mall, there was a lack of visitors, resulting in low sales and profits for the business owners. The second-hand stores commented on a challenging business model, with low-value end goods requiring high manual processing.

In addition, the respondents commented that male-dominated industries would be affected most, which they felt could potentially result in social challenges. The labour market was said to be still quite gender-segregated. Indeed, statistical data show that 6,104 people (4,546 men and 1,558 women) work in extractive industries; 24,139 people (19,383 men and 4,756 women) in manufacturing; and 11,802 people (9,620 men and 2,182 women) in warehouse and logistics in the regions of Norrbotten and Västerbotten, where Umeå is located (SCB, 2021a).

4.2. Access to services

Figure 3 shows several maps with the CE initiatives, listed on the municipal government's website (Umeå municipality, 2022b) overlapped with the economic standards in these areas. Most CE initiatives on this list pertained to the sharing economy (including shared transportation; sports and recreation centres such as free outdoor gyms; and community gardens and allotments); the resale and recycling of consumer goods; and household waste. Linking this with the R-frameworks (Potting *et al.*, 2017), these are lower on the list, concerning mostly R3 reusing products, R8 recycling materials and R9 recovery of resources. This visualisation aimed to trigger the discussion around the extent to which certain groups in society had access to circular initiatives.



Figure 3. Visualization of the CE initiatives in the city of Umeå

Sources: own elaboration, using Delmos, (2021); Umeå municipality (2022b)

Overall, the respondents felt that many societal groups had good to very good access to services and CE initiatives within the city, with a few exceptions (Figure 4). These included people with low education skills, people with disabilities, and people with weak networks, aside from people facing the travel barrier (people living in rural areas and people without a car). Respondents reported good access to these initiatives regardless of gender, property ownership status, or occupation.

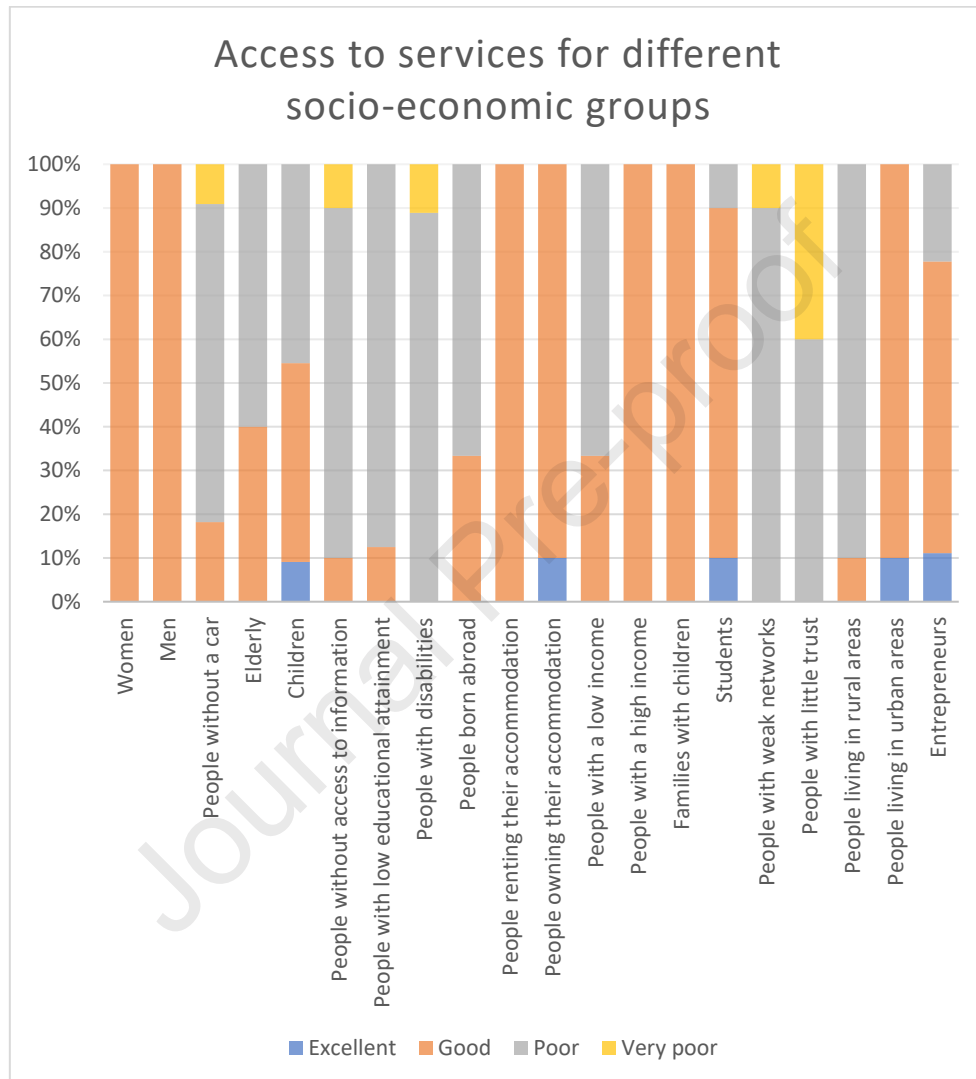


Figure 4. Responses from the survey about the impact of the CE on access to services

The respondents commented on a few aspects. First, the type of accommodation people lived in was not deemed relevant. Access to a car was essential for participating in the sharing economy, where buyers or renters of the product needed to pick up the product they purchased or rented. Across the city, access to public transport is high, with 86% of the population having access to a bus stop within 500 metres of their residence (RKA, 2022), as also seen in Figure 3. However, for low-value products using public transport for pick-up and drop-off would reduce the value for money of the goods purchased or rented. Second, having access to information (including digital services) seemed a prerequisite for many CE initiatives as they operate online. Foreign-born people who do not speak Swedish might suffer from a language barrier. A lack of social networks that include connections to the municipal government and its CE initiatives additionally might limit their access to the information. Similarly, for people moving from other parts of Sweden to Umeå, the lack of networks might limit

their access to information on the CE in the city. Most work with social integration is outsourced to civil society organizations, for example, the Red Cross local branch, Studieförbundet, and Vän i Umeå. Many of these initiatives are circular and include cooking classes using food surpluses, clothes swapping days, and bike pooling.

The participants also commented on social norms. They noted that while some foreign-born communities were more apt at certain aspects of CE (e.g., repair), culture and norms might make them value new products more. For people with lower income levels, buying from second-hand stores might entail shame. For children, they noted good access due to school initiatives, yet the parents were the ones who influenced access to services after school hours the most.

One of the initiatives we visited allowed people to borrow different sports and outdoor gear (e.g., skis, hockey gear, ice skates) without charge for up to two weeks. They commented on the essence of the location. Initially, they were in the city centre where they had few customers. After they relocated to the area next to the university and a shopping area, their customer base increased substantially; however, and mostly included students and families with children. At another second-hand store, the respondents reported limited opening hours as a barrier for their customers. The store offered a paid delivery against a fee for people without a car to address this barrier. They noted primarily young to middle-aged female customers at a second-hand store in the city. Respondents in a second-hand store in the city reported that their customers are predominantly primarily young to middle-aged female customers with a lack of participation of male costumers. It was stressed that attractiveness and awareness of second-hand shops needed to be increased among male costumers, both to increase the supply and demand of used clothes and other items.

4.3. Participation

To end the FGS, we discussed with the participants how different stakeholder groups were involved in CE decisions. The different stakeholder groups were presented in the quadruple helix model: 1) universities and research institutes, 2) government including the municipality itself, 3) companies, and 4) citizens and civil society.

The respondents felt that citizens and civil society were not involved much in CE decisions, whereas companies and the municipal government were highly involved. They noted that even though civil society had been invited, they did not often participate. They argued this was since many people volunteered for civil society organisations and therefore might not prioritise participation in government consultations in their spare time. In addition, the respondents commented that the civil society sector presented quite dispersed viewpoints and that they felt that it was not the responsibility of the municipal government to ensure civil society participated in consultations on the CE. Indeed the city of Umeå has 415 registered civil society associations covering areas such as sports, religion, climate, and integration (Umeå kommun, 2022), which could make it quite challenging to invite a representative sample of organisations.

The engagement of citizens in the CE decision-making process was also seen to be negligible. One civil society organisation commented in the field observation that they requested the municipal government to communicate the CE vision and strategy with citizens and that more marketing of the CE initiatives was needed. Two civil society organisations were claiming that invitations by the municipal government to participate in CE discussion were rather ad-hoc, without providing them with a substantial role and voice. A point of critique from another organisation was that some CE activities were expected to be completed by civil society organisations, even though capacities were lacking, and no formal budget was provided for this. The visit to the university confirmed the lack of knowledge and awareness of the CE: in response to our inquiries about the awareness of CE initiatives, only one

out of 19 students we spoke with claimed to know a lot about the CE, four claimed to have medium knowledge, and 14 had little knowledge.

5. Discussion

Our interviews, survey and FGDs with organisations representing government, industry, academia, and civil society, i.e., the quadruple helix, lead us to a few points of discussion related to 1) the extent to which negative social consequences have been considered in the process; 2) how different groups in society will be affected by the CE, and 3) how stakeholders have been approached to participate in the design and decision-making process of the CE strategy. As no holistic social impact studies have been undertaken on CE transitions in cities (see, e.g., (Vanhuysse *et al.*, 2021)), we situated each of our key findings in literature. We note some reference to social impacts in CE strategies in cities, for example in the city of Turku, Finland (City of Turku, 2021). Yet, its social equity assessment will be “built into the next phase of the project” and “ultimately, social equity guidelines for CE projects will be created and shared across ICLEI’s network” (p. 69). For other cities, social impacts are limited to job creation, like in the case of Valladolid, Spain, and Amsterdam, and the region of Flanders, Belgium (Circulair Vlaanderen, 2021; City of Valladolid, 2021; Gemeente Amsterdam, 2022). In Prato, Italy, the CE’s win-win is in the field of health and climate (City of Prato, 2021). While we recommend more holistic social impact assessments on CE transitions in cities, building up the evidence base, our findings should inspire cities in their CE design and transition processes.

5.1. Limited consideration for negative consequences

Our results suggest that the transition to a CE in the city of Umeå is perceived to produce mostly winners, with only a few exceptions. In this, it appears that the CE experts in Umeå support the position of among others Korhonen, Honkasalo and Seppälä (2018) and Aguilar-Hernandez, Dias Rodrigues and Tukker (2021) that the CE will generate a “win-win-win” outcome: more jobs, more economic growth and a reduced environmental impact. This also aligns with the viewpoint of the EU, in that the CE will bring with it positive impacts on the environment and the economy (European Commission, 2020). As in the cities of Reburg and Masdar, and the 5 cities in Alberta, Canada, Umeå focuses on performance, and a series of initiatives that build up its CE strategy (Marin and De Meulder, 2018; Marjanović *et al.*, 2022). Our findings also resonate with our previous systematic map on the limited consideration for social impacts in literature on circular cities: we found that only 8% of the retained corpus reports on social impacts, and where they do so, it is restricted to informal sector work in developing countries, and on participation in developed countries (Vanhuysse *et al.*, 2021).

Understandably, the city of Umeå is in the early stages of its CE strategy design and therefore needs to paint a positive picture. However, considering the socio-demographic and socio-economic constellation in the city, helps to contextualise the results. The participants of this study presented overall high environmental awareness and some knowledge of sustainability and CE. Though, the CE was often associated with sustainability. Additionally, Umeå was described as a very cohesive city, with a young and highly educated population and a sense of community. Umeå presents a medium-sized city in the Swedish context, with an overall stable socio-economic context, while more diversified results are to be expected for countries with no social welfare system in place or other city priorities.

Yet, being mindful of unintended negative consequences of a CE transition before policies are designed will allow overcoming some of the injustices accompanying climate change mitigation strategies. For example, concerns around the quality of employment have been discussed by a few scholars (Coats and Benton, 2015; Morgan and Mitchell, 2015; Willeghems and Bachus, 2018; Stavropoulos, Burger and Dufourmont, 2020). Willeghems and Bachus (2018), for example, find an educational and geographical mismatch in the region of Flanders for the anticipated job growth in the CE sector. Gregson *et al.* (2016) note that the jobs in the waste sector are “dirty, often demeaning, physically demanding and in some cases, dangerous work; added to which it is extremely lowly paid” (Gregson

et al., 2016: p. 543). As in other cities and regions, the second-hand initiatives in Umeå experienced “donation dumping”, where goods with limited reuse potential are left at second-hand initiatives, “washing their previous owners free of guilt while entangling laborers in messy relationships with objects” (Berry, 2022, p. 26). In other words, there is a “perpetuum mobile of waste and material flows” (Corvellec *et al.*, 2020, p. 98). Further research on the mental burden and emotional cost for second-hand store workers could provide insight into how policies could be designed to ensure that the goods donated to these initiatives are of higher quality and that the volumes are manageable, as suggested also by (Berry, 2022).

For the sharing economy, scholars have reported on the potential for creating more inequality, class divisions and racism (Edelman, Luca and Svirsky, 2017; Schor, 2017; Schor and Attwood-Charles, 2017; Ganapati and Reddick, 2018; Wachsmuth and Weisler, 2018; Piracha *et al.*, 2019); unfavourable working conditions (Codagnone, Abadie and Biagi, 2016; Kirchner and Schüßler, 2020; Tan *et al.*, 2021); and challenges with regulation and rights (Miller, 2015).

In addition, there is a breath of research on the importance of spatial planning and the CE (see, e.g., Soto, 2020; Izdebska and Knieling, 2020; Williams, 2020)). Overall, urban policies and instruments are multi-level nested policy mixes with individual interventions responding to multiple policy and developmental objectives and multi-dimensionality of urban issues that demand action from multiple policy sectors, and the engagement of different public and non-public actors (Navarro *et al.*, 2020). Earlier literature prescribes how sustainable urban developments should recognize and address aspects of social inclusion ensuring among others equal representation in urban planning, designing people-centered systems, establishing partnerships with communities, while considering socio-cultural-political-economic contexts, and recognizing intended and unintended effects of urban transitions (Cohen, 2017; Mirzoev *et al.*, 2022). For instance, in the context of urban planning in Sweden, it is established that eco-technological investments bear social implications and several measures exist to ensure that social integration and inclusion, participation and place identity are promoted by diversifying the physical and tenure forms of housing locally, participation in local planning and policy among others (Elander and Gustavsson, 2019). Strategies adopted by municipal authorities to address social concerns of urban development, such as rising unaffordability due to the increased cost of modernized eco-efficient housing, include subsidies for not-for-profit housing associations (Debrunner, Jonkman and Gerber, 2022). Tax incentives, subsidies and grants, and regulations are among the most common interventions in urban and spatial planning that aim to change individual or collective behaviour (Navarro *et al.*, 2020). Tools, such as participatory budgeting to promote integrated, adaptive and collective planning decisions co-production and co-design (Nadin *et al.*, 2021) have been used in Umeå already for example to promote more gender-equal public spaces (Sandberg and Rönblom, 2016; Umeå kommun, 2021) and can be tested in facilitating urban circular solution and raising awareness of circularity potential. Umeå municipality has adopted CE in its planning as a vision statement (Umeå kommun, 2016), which in itself is a planning tool that is a “general statement of desired future outcomes to provide broad overall directions and motivations” (Stead, 2021, p. 301). To further integrate the CE agenda in spatial and urban planning, municipal authorities will need to expand the scope of procedural policy tools, such as sustainability impact assessments, public consultation, urban experimentation (Stead, 2021) to include CE aspects, as well as instruments such as taxation and subsidies to encourage CE model integration and consideration for societal impact in the city’s development. It will be paramount that the city, as it has grown substantially and intends to grow further, is attentive to the landscape, the value it adds for citizens in their daily life, and the importance of spatial planning (Amenta and Van Timmeren, 2018).

Further research therefore on how the city envisions its circular future, and how it conceives the value that will be created for the city, linking among others with research done by (Bauwens, Hekkert and Kirchherr, 2020; Calisto Friant, Salome and Vermeulen, 2020; Lowe and Genovese, 2022), could provide more insight why the city mostly takes an optimistic stance to the CE. In our case study, the

participants' perceptions were shaped by the city's priorities such as the sharing economy, resulting in reflections on social cohesion, participation, and inclusion. In low- and middle-income countries, however, waste and recycling strategies and the impacts on informal waste sector workers shape the discourse (Vanhuysse *et al.*, 2021).

5.2. Narrow assessment of the losers

Our survey design did not incorporate intersectionality, i.e., when different socio-economic traits, such as race, ethnicity, class, gender, age, and disability are considered simultaneously, and during the FGDs, this was sparsely covered, perhaps due to the background of the participants in the discussions (see section 3.2). The groups that stood out to lose most from the CE were male (due to the gendered nature of some of the CE industry, and as they did not visit second-hand stores as much as women), and foreign-born people due to the limited social networks they could have. Data shows that work in the recycling and resource recovery sector is mostly done by men, including in Sweden (SCB, 2021a), and that overall, the labour market is segregated between natives and foreign-born people (Englund, 2003).

Yet, community reuse is noted to be "powered by an invisible labour force" (Berry, 2022, p. 29). Indeed, aside from workers formally employed within the industry, there is additional labour being carried out by the owners of the goods to clean, pack, and donate them to the second-hand store. As most customers in the second-hand initiatives are female, one could assume that they are also the ones making the donations, and therefore spending their spare time organising their household's goods for donation. Not recognizing the work done by these groups of people could "lead to the individualization of collective problems, as well as the commoditization and capture of social practices and resources" (Berry, 2022, p. 33).

Limited research exists on intersectionality and CE transitions in cities (Wuyts and Marin, 2022). Yet, looking more broadly at environmental sustainability or the creation of sustainable cities, the importance of considering the interwovenness and identity of different people has been highlighted by many (Lacey *et al.*, 2012; Kaijser and Kronsell, 2014; Malin and Ryder, 2018; Perkins, 2018; UrbanA, 2020).

5.3. Low engagement with civil society

We found limited engagement with civil society organisations and citizens throughout the CE strategy design process, as did OECD (2020b). This could also be seen in the light of their strategy where CE is seen as "a means to achieve its goal to be fossil fuel-free by 2040, while enhancing innovation and creating the enabling environment for new business models" (OECD, 2020b, p. 4). Hence, addressing the CE from a business-oriented perspective might explain why primarily companies and municipal government had been involved and not civil society. Moreover, the role of civil society and citizens has also been commented upon in other research on CE in cities (Prendeville, Cherim and Bocken, 2018; Fratini, Georg and Jørgensen, 2019; Kębłowski, Lambert and Bassens, 2020). There is a risk that certain groups, such as migrants and informal sector workers, are "nobodyed" (Wuyts and Marin, 2022), and that viewpoints of often white and/or highly educated people are overrepresented (Kębłowski, Lambert and Bassens, 2020). Municipal spatial planning is also an important instrument to engage with communities around CE visions (Williams, 2020), and if a more transformative discourse of circular economy (Calisto Friant, Salome and Vermeulen, 2020) is to be developed, it will need to entail conversations beyond technological solutions and economic systems. Looking across studies, as in ours, the key barrier to participation for civil society is a lack of time.

Over the past decades, neoliberal changes in Swedish governance have decentralized accountabilities for welfare services to private enterprises and civil society. In the 1990s, civil society organizations moved from being opinion-makers demanding accountabilities and rights to welfare service providers

(Wijkström, 2012). This appears as a form of responsabilization (Thörn and Svenberg, 2016). Responsibilities for accelerating the CE transition are outsourced from the municipal government to civil society organizations and private enterprises but without addressing their budgetary constraints. It indicates that civil society holds little power in steering the CE transition despite their knowledge and experience in managing circular initiatives. Our empirics show no clear indication of whether such structural factors are leveraging or hindering the CE transformation in Umeå.

Still, designing processes that enable participation of a diverse group of people, regardless of resources, competencies and background, is paramount to creating sustainable societies (Bouzguenda, Alalouch and Fava, 2019; Shulla *et al.*, 2020; Leminen *et al.*, 2021). Progressive NGOs, academia and local community organisations play a central role in “converging between sustainability, environmental justice and equity (Agyeman, Bullard and Evans, 2002, p. 77). Furthermore, being attentive to the methods used to elicit insights for CE in cities is essential (Fratini, Georg and Jørgensen, 2019).

6. Conclusions

This study demonstrates how different stakeholders in the city of Umeå view the social impacts of a circular economy transition within their city. It aimed at shedding light on the perceptions of various types of organisations and understanding the extent to which social impacts had been considered. It contributes to the emerging field of circular cities, and so far, the insufficiently studied societal consequences of CE transitions.

Overall, we found limited consideration for the negative, unintended consequences of the CE; a narrow assessment of the people who would lose from the CE; and low engagement from civil society and citizens in the process. The city has high CE ambitions yet is in the early stages of developing a CE strategy and has an overall positive stance towards the CE. In contrast, other cities such as Amsterdam and Turku are further in their transition process, yet to our knowledge, no comprehensive social impact assessment has been carried out. Our findings could provide those cities with inspiration on how their CE strategies could impact its citizens, on who would stand to lose out from a CE transition, and therefore how they should design their processes to ensure participation of all relevant actors in the design and implementation of the CE strategies. This could reduce the number of injustices that occur in transition processes.

Our data collection methods were mostly qualitative (interviews, focus group discussions, and a field visit), supplemented by document analysis and a survey. While we are cognisant that the experiences and beliefs of the participants in our study could have influenced the social impacts brought forward, we triangulated their perceptions with statistical data, and in our field study, broadened the participation to include several civil society organisations. Further research could focus perhaps solely on the perceptions of vulnerable communities in relation to a CE transition, uncovering more in-depth how they imagine a circular city, and how they could be given power and agency to participate in and influence the CE transition process.

As the city designs its CE strategy further, perhaps moving also towards higher R's in Potting *et al.*'s framework (Potting *et al.*, 2017), it will be important to include more stakeholders in its design process. Most of its CE initiatives to date are about the sharing economy and recycling of consumer goods and household waste, with many of these initiatives relying on volunteers. One recommendation would be that the municipal government maps the stakeholders in the city against the “ladder of participation” (Arnstein, 1969) as well as their various roles. The MapStakes tool (Barquet, Segnestam and Dickin, 2022) could, for example, support the process of involving stakeholders by providing a stepwise approach starting with defining system boundaries, followed by stakeholder identification, mapping, involving and monitoring. This would allow an understanding of how different viewpoints can be

incorporated throughout the CE strategy design process. It could give the different actors a real voice in the process, going beyond non-participation and tokenism, and provide the municipal government with better insight into the losers of the CE, for them to design policies that overcome injustices.

Based on the empirical study we suggest further explorations possible around current rights holders, using an intersectionality lens, to allow a better understanding of the potential losers of the CE transition and the extent to which their rights might be harmed. This would allow the cities, and other relevant government agencies, to design policies that support a just CE. We also suggest further research on spatial planning and the CE, aimed at understanding access to the CE initiatives, and whether certain groups in society would be more vulnerable. Participation of all stakeholders should be a focus, as should the methods used to co-design CE strategies. Comparisons with cities that have managed to integrate more critical voices of a CE transition would be beneficial.

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Annex 1 – interview guide for interviews (Sept – Dec 2021)

1. Background information on participants
1.1. What is your current position and role in your organisation?
1.2. Do you work with the topic of circular economy (CE) and if yes, in which way?
1.3. In those CE initiatives or activities, who do you collaborate with?
1.4. What is your main motivation to work with the topic of CE?
2. Personal perceptions on CE
2.1. What is your understanding of CE?
2.2. From your point of view, what are the main benefits of CE?
3. CE in Umeå, opportunities and barriers of the CE
3.1. How do you envision Umeå by 2030 in the context of a CE transition?
3.2. What would you consider as the main opportunities of a CE transition in Umeå?
3.3. What would you consider as the main barriers of a CE transition in Umeå?
3.4. Do you feel that there is a political will towards a CE transition in Umeå?
3.5. Do you feel that there are enough support systems in place to facilitate a CE transition in Umeå?
3.6. Do you feel involved in city's vision of becoming a leader in the CE?
4. Social impacts and CE
4.1. Who might be affected by a CE transition in Umeå? (Please also explain why or how)
4.2. Are there any groups or organisations that could be advantaged/disadvantaged by the transition towards a CE in Umeå?
4.3. In your current work in Umeå, have you already noticed groups that are advantaged/disadvantaged in the CE transition process?
4.4. Can you think of any other social impacts linked to a CE in Umeå?
5. Closing
5.1. Do you have any additional comments?
5.2. Were any questions unclear?
5.3. Can you recommend other stakeholders that we could interview?
5.4. Can we interview you again if needs be?
5.5. Would you like to be involved in the dissemination of the results (sometime in 2022)?

Annex 2 – overview interviews (Sept- Dec 2021)

Type of stakeholder	Organisation (number of interviews held)
Government (7)	Green Party Umeå (1) Umeå municipal government (5) Umeå City Library (1)
Industry, including municipally owned companies (7)	Cykelåkeriet (1) Östenssons Design (1) Ragn-Sells (1) Bostaden Umeå (1) Companion Noord (1) Umeå Energi (1) Vakin (1)
Academia (3)	RISE (1) Umeå university (2)
Civil society (8)	Emmaus (1) Naturskyddsföreningen Umeå (1) Red Cross Umeå (1) Studieförbundet (1)

Svenska kyrkan (1)
 Umeå Hackerspace (1)
 Vänn i Umeå (1)
 Fritidsbanken Umeå (1)

Annex 3 – overview FGDs (Feb-March 2022)

Type of stakeholder	Organisation (number of interviews held)
Government (6)	Green Party Umeå (1) Umeå municipal government (4) Umeå city library (1)
Industry, including municipally owned companies (3)	Umeå Energi (1) Bostaden Umeå (1) Companion Noord (1)
Academia (1)	KTH (1)
Civil society (1)	Red Cross Umeå (1)

Annex 4 – overview organisations visited (April 2022)

Type of stakeholder	Organisation visited
Government (5)	The strategic business development unit The labour market office The gendered city project team The transport planning team Umeå city library
Industry, including municipally owned companies (2)	Vakin Umeå Energi
Academia (2)	RISE Umeå University
Civil society (6)	Red Cross Umeå Kasam Fritidsbanken Returbutiken Studieförbundet Re Umeå - Revolt

Declaration of interests

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

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

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