



Towards achieving the sustainable development goals: a collaborative action plan leveraging the circular economy potentials

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Abstract

This contribution to the journal “Gruppe. Interaktion. Organisation. (GIO)” delves into the critical role of Sustainable Development Goal 17 (SDG 17), “Partnership for the Goals,” in fostering interdisciplinary collaboration to further circular economy objectives. Aiming to address the existing research focus on isolated technical aspects within the circular economy, this study uses an expertise- and interaction-based foresight process to integrate perspectives from business, engineering, social sciences, and work and organizational psychology to unearth broader, interconnected challenges and solutions for the implementation of circular economy practices. Based on the pooled experience of experts within the foresight process, this contribution elucidates major challenges, ongoing issues, and prospective hurdles to be tackled by 2030 in circular economy, presenting an action plan centered on interdisciplinary cooperation and stakeholder engagement to advance labor conditions and continuous learning, sustainable and regenerative systems, minimize waste, and optimize resource efficiency. The collaborative action plan serves as a pivotal resource for the transformation task for researchers and practitioners, offers insights and strategic directions for implementing circular economy practices, and emphasizes collective responsibility and action in achieving global sustainability, all while aligning with the principles of SDG 17. The presented collaborative approach propels the discourse on sustainability forward, highlighting the potential of the circular economy in realizing a more sustainable world by 2030.

Keywords Circular economy · Sustainability · Sustainable development goals · Interdisciplinary cooperation · Action plan · Foresight

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Auf dem Weg zur Verwirklichung der Ziele für nachhaltige Entwicklung (SDGs): Ein kollaborativer Aktionsplan zur Ausschöpfung des Potenzials der Kreislaufwirtschaft

Zusammenfassung

Dieser Beitrag in der Zeitschrift „Gruppe. Interaktion. Organisation. (GIO)“ befasst sich mit der kritischen Rolle des 17. Ziels für nachhaltige Entwicklung (SDG 17), „Partnerschaften zur Erreichung der Ziele“, und soll die interdisziplinäre Zusammenarbeit in der Kreislaufwirtschaft fördern. Aktuell werden vor allem isolierte technische Aspekte innerhalb der Kreislaufwirtschaft behandelt. Dies soll überwunden werden. In einem Foresight-Prozess werden Perspektiven aus den Bereichen Betriebswirtschaft, Technik, Sozialwissenschaften und Arbeits- und Organisationspsychologie integriert und so umfassendere Herausforderungen und Lösungen aufgedeckt. Basierend auf den gebündelten Erfahrungen von Expert*innen im Rahmen des Foresight-Prozesses werden in diesem Beitrag die wichtigsten Herausforderungen, aktuellen Probleme und voraussichtlichen Hürden beleuchtet, die bis 2030 in der Kreislaufwirtschaft zu bewältigen sind. Es wird ein gemeinsamer Aktionsplan vorgestellt, der sich auf interdisziplinäre Zusammenarbeit und die Einbindung von Interessengruppen konzentriert, um Arbeitsbedingungen und kontinuierliches Lernen, nachhaltige und regenerative Systeme, die Minimierung von Abfall und die Optimierung der Ressourceneffizienz zu fördern. Der kollaborative Aktionsplan dient als zentrale Ressource für die Transformationsaufgabe für Forscher*innen und Praktiker*innen und bietet Einblicke und strategische Ausrichtungen für die Umsetzung von Kreislaufwirtschaftspraktiken. Ebenso betont der gemeinsame Aktionsplan die kollektive Verantwortung und das kollektive Handeln zur Erreichung globaler Nachhaltigkeit. Der vorgestellte interdisziplinäre Ansatz treibt den Nachhaltigkeitsdiskurs voran und unterstreicht das Potenzial der Kreislaufwirtschaft für eine nachhaltigere Welt in 2030.

Schlüsselwörter Kreislaufwirtschaft · Nachhaltigkeit · Nachhaltigkeitsziele · Interdisziplinäre Kooperation · Aktionsplan · Foresight

1 Introduction

Modern organizational practices are heavily influenced by the striving for sustainability, for example, due to the scarcity of production resources or the corporate impact on environmental pollution (Fenwick 2007). Efforts to achieve greater sustainability were strengthened and institutionalized when the Sustainable Development Goals (SDGs) were established by the United Nations General Assembly in 2015 (Biermann et al. 2017; UN General Assembly 2015). The 17 SDGs aim to promote healthy work environments (SDG 3), build sustainable cities and communities (SDG 11), or foster resource-efficient production patterns (SDG 12), among many others. Additionally, SDG 17 (“Partnership for the goals”) highlights the pivotal role of cooperation in building a more sustainable future. With this article, we put SDG 17 into action and highlight the crucial role of cooperation between organizations and between science and practice across disciplines while addressing the following research question: How can a comprehensive approach to circular economy challenges be fostered, based on foresight methodologies, and including perspectives of work and organizational psychology? This question emphasizes the proactive role of current interdisciplinary cooperation in influencing the trajectory of achieving the SDGs. As a main contribution of this paper, we provide a collaborative action plan as a first step toward establishing the necessary cooperation. This action plan provides

points of influence for organizations, teams, and individuals alike to collectively shape the transformation to a circular economy. This goes beyond current academic and practical work on circular economy which often focuses more on technological aspects (e.g., products, materials) and less on “people and places” as do the SDGs (Garcia-Saravia Ortiz-de-Montellano et al. 2023). This action plan aims to transform the current isolated efforts of different disciplines and on different levels (i.e., organization, team, individual) into an interdisciplinary, cooperative endeavor. Furthering this cause, the action plan encapsulates the expertise of an interdisciplinary team of scientists and is accessible not only to other scientists but also policymakers and practitioners striving for meaningful change toward a circular economy.

1.1 SDG 17: The role of cooperation in circular economy

Nations around the globe have committed to the SDGs to impact the prosperity of people while preserving the planet (Mingst et al. 2022) and have imposed policies and rules on organizations to reach subgoals and sustainability indicators. Following this, various organizations began to publish sustainability reports to show their commitment to the SDGs (Rosati and Faria 2019). Many organizations have also begun their transformation from a linear to a circular economy model (Sarja et al. 2021), as the circular economy has been recognized to contribute to the fulfillment



Fig. 1 Simplified overview of the phases of circular economy. *Note.* Depicted is a simplified overview of circular economy that illustrates the different phases along the value chains in circular economy into which different stakeholders are embedded. Stakeholders within the phases can be businesses (e.g., manufacturers and suppliers, service providers, recycling firms) as well as individuals (e.g., employees, users of products or services). Additionally, some stakeholders may be included in more than one phase (e.g., policymakers, unions). It should be noted that circular economy is much more complex in reality and can be depicted as the Comet Circle (Trademark of Ricoh Company, Ltd.) or a “butterfly model” (see Hopkinson et al. 2018)

of the SDGs (Warmadewanthi et al. 2023). By definition, circular economy adheres to various sustainability factors which are in line with the SDGs. Circular economy is seen as beneficial or even prerequisite for sustainability (Garcia-Saravia Ortiz-de-Montellano et al. 2023; Geissdoerfer et al. 2017) as it stands out as the economic system most aligned with sustainability principles, particularly through its focus on resource efficiency, waste minimization, and stakeholder collaboration. While other measures can be taken to support the attainment of the SDGs, this contribution focuses on the measure of circular economy and aims to underscore its pivotal role in sustainability, emphasizing interdisciplinary efforts and a collaborative action plan. For this article, circular economy is defined in accordance with Geisendorf and Pietrulla (2018): “In a circular economy, the value of products and materials is maintained, waste is avoided, and resources are kept within the economy when a product has reached the end of its life” (p. 779). This definition implies three key factors in circular economy: First, the maintenance of products and materials that are often used and processed by multiple stakeholders along the value-chain. Second, the avoidance of waste implies a coherent design and use of materials and products from manufacturing, through customer-use until their second-life application or recycling of materials. Third, the understand-

ing of the economy as a unified system that aims to achieve common goals and take collaborative action, instead of an aggregation of individual actors striving for their own profit. The focus on these three key factors uniquely positions the circular economy as an area where interdisciplinary cooperation can yield significant, tangible outcomes. Compared to other ongoing transformation processes requiring interdisciplinary efforts, the circular economy presents a direct pathway to operationalizing the SDGs, making it an especially potent example of how integrated scientific and practical approaches can affect sustainable transformations when leveraged using foresight processes. This paper demonstrates how using foresight methodologies can foster interdisciplinary cooperation in overcoming current challenges in circular economy as a central example of necessary transformation processes contributing to the achievement of the SDGs.

The three key factors of the circular economy imply that the transformation from a linear to a circular economy requires organizations to overcome barriers in their transition to this economic model (Ritzén and Sandström 2017). This includes, for example, the diffusion of responsibility for intraorganizational change or finding new cooperation partners for supply chains. For example, product designers might focus on the ease of assembly alone, shifting the responsibility of disassembly to stakeholders in later phases. Stakeholders in the disassembly phase, however, might argue that high quality of disassembly is only possible once it is considered in the design phase. Corresponding to the third key factor of circular economy, establishing new and sustaining existing cooperation between organizations will be crucial in achieving the core premise of circular economy to deliver a sustainable life cycle of a product multiple times (Vimal et al. 2021). The role of cooperation becomes even more apparent when considering the true complexity of circular economy that surpasses the simplified overview in Fig. 1. In each phase of a circular economy depicted, multiple stakeholders are interacting (e.g., in the production phase of a product, a complex network of suppliers and manufacturers is involved). Stakeholders can be whole organizations, teams, or individuals and are typically embedded in only a few of the phases (e.g., a product designer in the design phase typically knows little about disassembly in the recovery phase). For a more detailed overview of the complex relationships between stakeholders in circular economy, we direct readers to the Comet Circle (Trademark Ricoh Company, Ltd.) or the “butterfly model” (as depicted in Hopkinson et al. 2018). Fostering cooperation within the complex relationships of circular economy, therefore, plays a central role in establishing a more sustainable future as anchored in the 17th SDG “Partnership for the goals” (Castillo-Villar 2020).

Research on the topic of circular economy is growing, especially regarding connecting scientific progress to achievement of specific SDGs (Dantas et al. 2021; Schroeder et al. 2019). However, present research on circular economy tends to focus mainly on disciplinary approaches (e.g., chemical waste management strategies, battery recycling, sustainable packaging solutions, eco-design principles; Ceschin and Gaziulusoy 2016; Pomponi and Moncaster 2017; Wikström et al. 2018). If a systems perspective is taken, insufficient attention is paid to the interconnections and cross-effects between different research disciplines and across all phases of the circular economy. By integrating the perspective of non-technical disciplines, specifically sociology of labor and work and organizational psychology, efforts in implementing circular economy practices can be better aligned with the SDGs which prioritize human and geographical considerations (Garcia-Saravia Ortiz-de-Montellano et al. 2023). Additionally, research addressing SDG 17 specifically might identify strategies that could foster interdisciplinary collaboration and facilitate knowledge transfer at regional and national levels within the circular economy context. Finally, it is imperative that research on circular economy should illuminate the synergies between scientific progress and practical implications. While new technologies, processes, and organizational interventions might be developed within academia, these innovations can only unfold their transformative potential when applied in practice. Yet, this application can only be successful when researchers and practitioners collaborate from the beginning, for example, to understand important practical boundary conditions. By cooperating as early as possible during innovation processes, research and practice can develop and evaluate innovations to fit the specific needs of organizations within the circular economic system.

1.2 Current contribution

The research question as well as the collaborative action plan put forth in this contribution address the raised concerns. The collaborative action plan should serve as a guide for researchers and practitioners striving to further circular economy. As such, the collaborative action plan follows the idea of the SDGs as a common actionable agenda and applies it to research and practice in circular economy specifically. This is in line with the principles of *futures research* (Karwehl and Kauffeld 2022). Futures research describes a field of research that aims to investigate and develop new and inclusive solutions (Sardar 2010) and contribute to a better understanding of emerging fields, and overcome challenges (Karwehl and Kauffeld 2022; Krasteva et al. 2022). Methods of futures research, called *foresight*, can identify points of influence that can be used to develop the

desired future out of several possible futures (van der Laan 2021). “Foresight [...] rests on two key assumptions: (1) that the future is not laid out and (2) that decisions made and action taken today can affect the future” (Hobday et al. 2020, p. 632). While establishing circular economy as seen in Fig. 1 has been identified as a desired future globally, specific steps to develop this future in a holistic and interdisciplinary approach are still lacking (foresight assumption 1; see also Pomponi and Moncaster 2017). Hence, this paper aims to contribute insights into how the yet indeterminate future can be influenced by collaborative action and interdisciplinary cooperation fostered today. We argue that the action that research and practice undertake today will have a profound impact on the implementation of circular economy as a desirable future (foresight assumption 2).

Using foresight methods, circular economy as a megatrend (Fric 2019) can be analyzed and understood to pinpoint current and future measures to shape the desired future (Karwehl and Kauffeld 2022). Therefore, this contribution will take an interdisciplinary foresight approach to establish a collaborative action plan that tackles the major challenges to circular economy and builds on current and futures research and practice that promise to address these challenges. This aligns with the premise of foresight to develop specific points of influence and inclusive solutions to address challenges to work toward a shared goal (Sardar 2010; van der Laan 2021). The collaborative action plan will provide specific and actionable steps that can be used in research and practice. Importantly, this contribution puts SDG 17 into action and goes beyond previous research in circular economy and other foresight processes in single disciplines (see Krasteva et al. 2022 for a Vision Board approach) by using a holistic, interdisciplinary approach that includes societal and psychological considerations across all phases of circular economy (see Fig. 1).

2 Foresight analysis

In preparation of the foresight process, the timeframe, approach, and involved stakeholders were selected. The chosen time frame for the foresight process was set to be until 2030. This was done to align with the Agenda 2030 in which the SDGs were set (UN General Assembly 2015), although it is unusually short compared to other foresight processes (Nordlund 2012). However, given our research focus on using foresight methodologies to foster cooperative efforts in implementing circular economy and the high urgency with which actions need to be implemented to fulfill the SDGs, the shortened timeframe was judged to be appropriate. We choose a qualitative foresight approach as it is particularly valuable in dynamic environments where future outcomes depend on numerous variables that can

change rapidly (Schwarz 2008) as is the case in the development towards circular economy.

Based on the “Foresight Diamond” (Popper 2008), we use an expertise-based approach that uses the competence of people and their experience in their respective fields of expertise. This method is often used to generate action recommendations (Karwehl and Kauffeld 2022) such as the collaborative action plan we put forth in this contribution. When selecting the stakeholders to include in our foresight process, we relied on a convenience sample based in South-East Lower Saxony. This region is part of the Circular Cities and Regions Initiative (CCRI), a program launched and funded by the EU as part of the Circular Economy Action Plan (European Commission, Directorate-General for Communication 2020). Within this region, there is a highly interconnected network of scholars that hold many years of experience within disciplines connected to circular economy. We ensured that experts from all stages of the circular economy model (see Fig. 1) were included in our foresight process. Experts were contacted directly via e-mail or approached personally. Experts that agreed to participate were invited to recruit additional experts from their respective networks (snowball sampling). Therefore, no exact response rates of experts can be reported. Overall, 28 experts were included in the foresight process (21 men, 7 women). Of these, 15 were employed at a university (either as a professor or research associate), 3 were employed at a research institute, and 10 were employed in organizations in the private sector. While no experts dropped out, involvement in the process differed according to the phase of foresight process (see below). Due to the nature of the convenience sampling, the design and recycling phase of circular economy were overrepresented by a small degree within our sample, while the phases of raw material extraction, production, and usage were only represented by few experts.

Throughout circular economy, each phase, from raw material extraction to recovery, plays a vital role and is closely linked with various disciplines. Therefore, each phase was represented by at least one expert of either industry or academia. In the *raw material extraction* phase, the resource efficiency perspective emphasizes the necessity to use materials consciously and sparingly to minimize environmental impacts and design sustainable supply chains. During the *design process*, component development for second-life applications is crucial because it creates the foundation for products optimized for reuse and repair, thereby extending product life, and minimizing waste. During this stage, all phases of the product must be considered as well as the implications design choices will have on work during all other phases (e.g., working conditions in production or recycling phases). During *production*, the evaluation of sustainable value chains plays a key role by ensuring that all manufacturing processes are ecologically and socially

compatible and determining which practices and materials have minimal environmental impact. The *usage phase* underscores the relevance of the circular economy model as a business model. Here, drivers and barriers are analyzed to promote sustainable practices, such as rental and operator models, and to facilitate the transition from traditional business models, enabling longer product life and lower resource consumption. In the *collection phase*, automation and robotics are particularly relevant for optimizing processes, increasing efficiency, and ensuring that materials are correctly sorted and forwarded. In the *recovery phase*, digitization in recycling is supported by technologies such as artificial intelligence and machine learning to optimize processes, effectively allocate resources, and recover high-quality materials. Lastly, *work design* is essential in all phases of circular economy to consider the human aspects of change and ensure that jobs are not only efficient and adapt to technological developments but also safe and human centered. Moreover, fostering intra- and interorganizational cooperation falls within the expertise of occupational science, underscoring the importance of its role in the development of circular economy.

A typical foresight process is structured around three distinct stages (Horton 1999): (1) Gathering and condensing existing information, leading to the creation of future knowledge; (2) Interpreting and translating this generated knowledge to extract implications for the future; (3) Ensuring that the comprehension of these implications is aligned and evaluated. This last phase is essential as it serves as a prerequisite for setting guidelines for future actions and solidifying the planned course of action.

During the first stage of the foresight process (February 2022 until April 2023), we invited all selected stakeholders to a series of bilateral exchanges and group discussions to openly explore and build a collective understanding of possible and desired futures within the megatrend of circular economy. In doing so, we complement the expertise-based foresight approach with interaction-based methods (see Popper 2008), given the high importance of cooperation for circular economy. In this way, we could gain a more holistic and multidimensional understanding of possible futures and actionable steps to shape the desired future (Karwehl and Kauffeld 2022). The process of open exploration within the group discussions allowed the stakeholders not only to reflect on the current status and future perspectives within their own field of expertise but also gain insights and new ideas from other experts of neighboring disciplines in the circular economy (Stebbins 2001). The following three key questions along with the overview of phases in circular economy seen in Fig. 1 built the basis for the open exploration and defined the space of abstraction for the stakeholders: What are the major challenges facing circular economy? What are the current issues of circular economy

that are being addressed in your field of research? What are the future challenges of circular economy that need to be addressed by your field of research in circular economy until 2030? After the group discussions, the stakeholders again individually engaged with the open explorations (May to June 2023) and their colleagues' suggestions and summarized them into short paragraphs for this manuscript. This step was performed by the stakeholders employed at universities only who are part of the author team. The explorations can be found in the Supplementary Material.

During the second stage of the foresight process (July 2023), a group of three experts from industrial/organizational psychology who are part of the author team combined and interpreted the open explorations, considering current discussions and expertise from the field of occupational sciences. The resulting overarching, interdisciplinary challenges and issues that could be distilled and interpreted during this step, are reported in this article. Finally, during the third step of the foresight process (August 2023), the experts from industrial/organizational psychology addressed the main aim of this contribution. The identified challenges and issues were summarized and transformed into actionable steps toward circular economy within a collaborative action plan. The collaborative action plan as a result of a 19 month process is the key contribution of this article and represents the implications of the foresight process for research and practice.

3 Overarching, interdisciplinary challenges and issues in circular economy

Based on the open explorations of the involved experts (see Supplementary Material), emerging themes were extracted to provide overarching answers to the three key questions that were the basis for the open exploration of the experts (see above). Albeit challenging, summarizing the diverse perspectives of the interdisciplinary experts in this way presented the opportunity to build a basis for a collaborative action plan that can be used by stakeholders across all phases of circular economy (Fig. 1). For more information on specific challenges and issues (e.g., technical solutions that are currently being explored), please see the Supplementary Material for the complete open explorations of the experts.

3.1 What are the major challenges facing circular economy?

The realization of circular economy principles is imperative to fulfill the SDGs, particularly those related to responsible consumption and production (SDG 12). However, transitioning to circular business models is challenging for stake-

holders across all phases of the circular economy. The transition requires extensive cooperation among diverse stakeholders within the value chain. However, reluctance among actors such as firms or customers poses a substantial hurdle in embracing such transitions. A lack of readiness to change as well as reservations against interorganizational cooperation poses a central threat towards circular economy. Furthermore, transforming supply chains to align with sustainable practices is critical, given the increasing concerns over resource scarcity and sustainable consumption. This calls for comprehensive, cooperative solutions that address every aspect of product life cycles and sustainable resource utilization. Specifically, tools are lacking which could enable more sustainable supply chains (e.g., supply chain analysis or life-cycle information processing). Lastly, the transformation toward circular economy is stalled as technological development in disassembly and recycling (recovery phase, Fig. 1) is lagging. While development and dissemination of new digital tools and technologies could alleviate harsh working conditions, they require workers to accept new technology and build new competences, posing an additional challenge toward the transition from linear to circular economy.

3.2 What are the current issues various fields are tackling?

Currently, research is focusing on the identification of drivers and impediments in the transition to circular business models and optimizing closed-loop supply chains. Enhanced digitization across all phases of the circular economy is focal in addressing operational challenges, ensuring the seamless flow of information and sustainable management of resources from the material extraction, through design and production, until recovery and second-life applications (see Fig. 1). The emphasis is also on the collaborative development of automated robotic disassembly systems and the strategic incorporation of digital technologies to create synergistic, circular ecosystems that align with ecological, social, and economic requisites, all while considering market demands and fluctuations. Additionally, issues such as decent working conditions, skills development, and the role of workforce availability are being addressed. Notably, current research seldom incorporates truly interdisciplinary perspectives but focuses on specific aspects and phases of circular economy. This is in line with the literature stating that more interdisciplinary efforts are needed (e.g., Vimal et al. 2021).

3.2.1 What are the future issues these fields need to tackle by 2030?

The foresight for 2030 envisions strong interdisciplinary cooperation in research on and practice in all phases of circular economy to address the broad challenges that were identified. The establishment of comprehensive knowledge and specialized skills across diverse labor markets will be crucial to address, to create attractive, sustainable employment options and promote innovations in a circular economy. This will require collaboration between engineering, social sciences, and business. For example, the development of automation and digitization of disassembly and recovery processes need to take the necessary skill development of workers into account as well as their openness to new technologies. The development and integration of sensitization tools and training are paramount to advance the circular product development. Furthermore, evolving technology acceptance and the balanced combination of human and technological roles in tasks such as automated disassembly are crucial. Additionally, harmonizing labor relations, addressing work-related risks in recycling jobs, and proliferating structures in multiple companies for broad-scale impacts are important strides toward a resilient, sustainable circular economy. This will require research into drivers and barriers of knowledge transfer and the readiness to change and for all levels of stakeholders within the circular economy from the shop-floor production worker to the business strategist. Only through identifying conducive factors for cooperation between stakeholders can we overcome the challenges facing circular economy and realize the core idea of SDG 17.

4 A collaborative action plan for advancing circular economy

Based on these overarching, interdisciplinary challenges and issues that were extracted from the open explorations of the experts, we developed a collaborative action plan for research and practice to advance circular economy. We define a collaborative action plan in this article as a set of integrated recommendations for futures research and practice to reach an overarching goal, jointly developed by stakeholders (see also Cook 2006). In line with the literature (e.g., González-Domínguez et al. 2020; Vimal et al. 2021) and the emergent challenges and issues, we put forth an action plan that stresses interdisciplinary cooperation and cooperation between science and practice as these approaches hold the most promise to effectively transform current linear economic models to a circular economy.

The collaborative action plan is aimed to provide points of influence for organizations, teams, and individuals alike

who strive to realize circular economy and the SDGs. While some recommendations are more tailored towards the organizational level (e.g., engaging in interdisciplinary cooperation with other organizations), other points of the collaborative action plan can be put into practice by teams and individuals themselves (e.g., engaging in knowledge and skill development). Given the development of the action plan based on a detailed foresight process, all recommendations are embedded within the context of the economic and societal transformation towards circular economy specifically, and more sustainable practices, in general, to realize the SDGs. This is especially crucial as the current literature stresses the importance of organizational context (such as organizational narratives or culture) for the organizational and individual development and the implementation of sustainable and circular economy practices (e.g., Hussain and Malik 2020; Richter 2020; Zacher et al. 2023).

Foster interdisciplinary collaboration To advance the circular economy, academia, industry, policymakers, and civil society must work together to foster interdisciplinary and cross-sectoral collaboration. This cooperative approach will facilitate the integration of diverse knowledge and expertise, fostering holistic and sustainable innovations and solutions. An interdisciplinary approach ensures that the technical, economic, social, and environmental dimensions of circular economy models are integrated and synergized, thereby addressing the multifaceted challenges associated with the transition from linear models. This is in line with literature indicating higher performance of interdisciplinary teams in solving complex problems (e.g., Edmondson and Nembhard 2009; Kozłowski and Chao 2012). To leverage these advantages, research needs to identify drivers and barriers of cooperation between disciplines, organizations, and between research and practice and develop strategies to foster cooperation in practice. Starting from what we know about interdisciplinary team work (Haeussler and Sauermann 2020), drivers of interdisciplinary cooperation should be extended towards interorganizational cooperation spanning disciplinary boundaries. This approach directly supports SDG 17 (Partnerships for the Goals) by emphasizing the importance of collaborative efforts across academia, industry, policymakers, and civil society to achieve sustainable solutions.

Strengthen stakeholder engagement Enhance the engagement of all stakeholders, from firms to customers, through inclusive dialogues, workshops, and partnerships. By aligning the visions, interests, and resources of various stakeholders, we can collectively overcome reluctance and resistance to circular transitions, making strides toward responsible consumption and production. Engaging all stakeholders aligns with SDG 12 (Responsible Consumption

and Production) by promoting inclusive dialogues and partnerships for sustainable practices and ensures a collective move toward a circular economy, overcoming barriers such as resistance to change and differing stakeholder interests, which have historically impeded circular transitions. Following Mathur and colleagues (2008), both the strategic management perspective of stakeholder involvement (e.g., integrating knowledge, increasing ownership, and reducing conflict) as well as the ethical perspective (e.g., inclusive decision making, promotion of equity) need to be considered. While the strategic management perspective can foster the technical and strategic cooperation aspects of circular economy, the ethical perspective is crucial for shaping humane working conditions in circular economy. Realizing this step, the engagement of businesses, workers, social partners, and politics (i.e., stakeholders on the individual, team, and organizational level) in current research needs to be strengthened by directly involving these stakeholders in research and application projects and unifying expertise in strategically shaping the next steps within the transformation toward circular economy.

Develop and implement sustainable practices Collaboratively develop and implement sustainable supply and value chain practices. This involves integrating circular principles into every stage of product life cycles and resource utilization, addressing challenges related to resource scarcity, and contributing to the sustainability of economic practices. By involving all stakeholders, we ensure a collective move toward a circular economy, overcoming barriers such as resistance to change, lack of public and political pressure, and differing stakeholder interests, which have historically impeded circular transitions (Droege et al. 2021). This entails the acceptance of shifting power dynamics (e.g., between production and recycling organizations) as well as decisive changes toward sustainability values and green behavior on all levels. Additionally, new conceptualizations of measurement might be necessary as measurement of sustainable and circular economy practices on the micro level has been identified to be lacking (Kristensen and Mosgaard 2020). This approach targets SDG 9 (Industry, Innovation, and Infrastructure) and SDG 12 (Responsible Consumption and Production) by integrating circular economy principles into supply and value chains.

Promote technological innovations Encourage the synergistic development and adoption of technological innovations, such as digitization, automation, and robotics. Enhanced cooperation in technology development and integration will simplify the provision, processing, and exchange of information, enabling improved management of product and material flows and contributing to the efficiency of recycling processes. Technological innovations such as au-

tomation and digitization can significantly enhance the efficiency of resource usage and waste management (Agrawal et al. 2021; Trevisan et al. 2021), thereby addressing the operational complexities and information management challenges inherent in circular business models. Additionally, technological innovations can address harsh working conditions (as has been observed in the context of care; Van Kemenade et al. 2015), especially for workers in recycling. At the same time, technological innovations need to be complemented with practices conducive of technology acceptance and competence development to realize their full potential (Bröhl et al. 2016). This means that bottom-up transformations in which the needs of the individual are met with technological advances need to be combined with top-down approaches which implement innovations that increase efficiencies and sustainable practices. Encouraging technological advancements as described in this approach will support SDG 8 (Decent Work and Economic Growth) and SDG 9 (Industry, Innovation, and Infrastructure) by improving efficiency and sustainability in the life-cycle processes and promote humane working conditions.

Invest in knowledge and skills development Prioritize the development of specialized knowledge and skills across various labor markets to establish sustainable, attractive employment options in the circular economy. This action aligns with SDG 4 (Quality Education) and involves creating training programs, sensitization tools, and educational resources to empower individuals and organizations with the competencies required to innovate and thrive in a circular economy (Burger et al. 2019; Janssens et al. 2021). Ensuring that individuals and organizations possess the necessary competences directly impacts the ability to innovate and implement circular economy principles, addressing gaps and emerging needs in the labor market. Training and competence development tools need to be developed with conditions of the current labor markets in mind. Innovative ways of fostering readiness to change and competence development need to be explored (e.g., Kauffeld and Berg *in press*; Karwehl et al. 2022). Responsibilities for this point of action are shared between organizations which need to recognize this need, teams that allow individual skill development, as well as individuals who need to proactively seek and take opportunities for skill development.

Encourage continuous learning and improvement Facilitate a culture of continuous formal and informal learning and improvement that is implemented on the organizational but enacted on the team and individual level. This should be encouraged by the sharing of experiences and lessons learned between individuals, teams, and organizations. This culture will promote innovation and the consistent

enhancement of practices, technologies, and strategies in the circular economy. Fostering a culture of continuous improvement is crucial for adapting to evolving challenges and opportunities in the circular economy (Mínguez et al. 2021), ensuring resilience and perpetual enhancement of practices and models (Scarpellini et al. 2020). Moreover, a positive culture of learning, improvement, and thus innovation will positively impact the achievement of SGD 9 (Industry, Innovation, and Infrastructure). Research needs to identify the prerequisites for this culture and propose avenues toward a conducive environment in which knowledge sharing on all levels is encouraged.

Harmonize labor relations Address emerging work-related risks and ensure the involvement of labor relations in shaping the circular economy, thus directly targeting SDG 8 (Decent Work and Economic Growth). By fostering harmonious labor relations and the health of workers, and addressing the dynamics of social partnerships, we can ensure the well-being of workers and the sustainability of employment in the circular economy. This involves cooperation on different levels: between the individual workers and their organizations, between workers and social partners, as well as between organizations, social partners, and policymakers. We need to understand the role of job demands and resources within the circular economy and how to address them to sustainably improve working conditions (Rogers et al. 2024). Adequate labor relations are pivotal in ensuring equitable transitions to circular models (Guillibert et al. 2023), addressing concerns related to job security, workforce adaptation, and the redefinition of roles within evolving circular economic structures.

Proliferate sustainable structures Expand the implementation of sustainable structures across multiple companies and sectors, aiming for broad-scale, multiplicative impacts. This requires the establishment of clear, actionable frameworks and the sharing of best practices to facilitate the adoption and dissemination of circular economy principles beyond specific regions. The proliferation of sustainable structures is imperative to scale the impact of the circular economy, navigating challenges such as the decentralization of production and the establishment of regionally effective circular practices. This will require research to develop and identify strategies and solutions that can be adaptable to other regional or organizational realities (e.g., Chembessi et al. 2021) as well as engage in transregional and transnational exchange to proliferate experience and best practices.

Align with sustainable development goals To ensure that advancements in circular economy can be impactful globally, all actions and innovations should align with and contribute to the attainment of the Sustainable Development

Goals. This alignment ensures that advancements in the circular economy contribute to overarching sustainability objectives and can be aligned with other efforts to shape our societies to be more sustainable. Thus, cooperation can be fostered with other stakeholders pursuing other specific SDGs. This means that research needs to clearly state how they contribute to the fulfilment of the SDGs and include the SDGs in training of students and future scientists to consolidate their impact in the coming years. Additionally, it includes introducing an emphasis on “people and places” into considerations of circular economy as those are the main focus of the SDGs (Garcia-Saravia Ortiz-de-Montelano et al. 2023).

An interconnected action plan Each proposed action of our action plan should be interlinked, reinforcing the others to bolster the interdisciplinary approach necessary for the transformation to a circular economy. Fostering interdisciplinary collaboration (action 4.1) acts as the nexus, bringing together various stakeholders (action 4.2) including academia, industry, policymakers, and civil society, each contributing diverse knowledge and innovations (actions 4.4 and 4.5) to address the multifaceted challenges of the circular economy. Strengthened stakeholder engagement (action 4.2) nurtures a common vision and shared commitment, overcoming reluctance, and creating a milieu conducive to the development and implementation of sustainable practices (action 4.3) across supply and value chains. Technological innovations (action 4.4) emanating from this confluence facilitate enhanced information processing and management of material flows, thereby ensuring the efficiency and sustainability of recycling processes. The harmonization of labor (action 4.6) relations within this framework addresses the human aspect, ensuring the well-being and sustainability of employment in the evolving economic landscape, while the investment in knowledge and skills development (action 4.5) equips individuals and organizations with the competencies needed to innovate and thrive in a circular economy. The proliferation of sustainable structures (action 4.7) and alignment with the Sustainable Development Goals (action 4.8) ensures that the innovations and advancements are resonant at a global level, contributing to overarching sustainability objectives. Encouraging a culture of continuous learning and improvement (action 4.9) fosters innovation and the consistent enhancement of practices and strategies in the circular economy, with each element of the action plan mutually reinforcing and elevating the others, epitomizing the essence of a truly integrative and transformative interdisciplinary approach.

The collaborative action plan for advancing circular economy practices underscores the paramount importance of SDG 17 (Partnerships for the Goals) in achieving a sus-

tainable development, by fostering global cooperation across academia, industry, policymakers, and civil society. While highlighting the critical role of partnerships, this plan also contributes to a range of SDGs including SDG 9 (Industry, Innovation, and Infrastructure), SDG 12 (Responsible Consumption and Production), SDG 4 (Quality Education) and SDG 8 (Decent Work and Economic Growth) through its integrated recommendations. By advocating for interdisciplinary collaboration, stakeholder engagement, and the implementation of sustainable practices, the plan exemplifies a holistic approach to sustainability and circular economy, demonstrating how collaborative efforts are vital for not only enhancing global partnerships as envisioned by SDG 17 but also for making substantial progress across the broader SDG framework, thereby ensuring a sustainable and resilient future through the principles of the circular economy.

While individual actions integrated in our action plan might already be considered within single disciplines, the collaborative action plan we propose takes a decidedly interdisciplinary approach, addressing the vital role of interdisciplinary cooperation in circular economy and the fulfilment of the SDGs in each proposed action. This entails the cooperation between different disciplines such as engineering and psychology, but importantly also the cooperation between disciplines focusing on different phases of the circular economy (Fig. 1). Only with all stakeholders of all phases involved can transformation toward circular economy be successful. Moreover, this action plan incorporates both perspectives on management and utilization of products and materials as a central aspect of circular economy with societal and psychological considerations that are inherent in the SDGs. By emphasizing the critical role of interdisciplinary cooperation for the transition to a circular economy, this article highlights how foresight processes can be used to create collaborative action plans, leveraging diverse expertise to address complex challenges on the organizational, team, and individual level. Crucially, the collaborative action plan as an output of an interdisciplinary foresight process stresses the involvement of practitioners in the transformation process. Closing the gap between research and practice, developing joint solutions, and evaluating them are paramount in addressing each step of the action plan.

5 Limitations and future research

Some limitations of this article may offer avenues for future research. The article mainly synthesizes diverse perspectives and strategies through a qualitative foresight process but may lack extensive empirical substantiation or quantitative validation due to its broad scope. It is pivotal for

future research to delve deeper into each interdisciplinary domain and validate the proposed strategies and models through empirical studies, focusing on practical implementations and their consequent impacts in real-world settings. However, using the foresight process allowed a deep analysis of the major challenges of circular economy and current and future issues to tackle them through the lens of interdisciplinary experts, which would have been difficult to achieve using a broader and less detailed approach. The collaborative action plan as an output of the foresight process can serve as a starting point for future evaluations.

Additionally, a potential limitation is the inability to encompass all pertinent disciplines and perspectives, thereby possibly omitting valuable insights and solutions from unexplored fields. Additionally, the included stakeholders were all sampled from a region included in the Circular Cities and Regions Initiative (CCRI). As this region is already beginning to connect, the results of this article might have limited generalizability to stakeholders that are embedded in less connected regions. Future research should aim to rectify this by integrating more diverse and specialized disciplines and sampling from regions that have not yet established interdisciplinary cooperations to support the implementation of a circular economy. This will ensure a more holistic and inclusive approach to developing innovative strategies and solutions in the pursuit of a circular economy. Further exploration and development of more refined, context-specific strategies and methodologies are crucial for advancing our understanding and facilitating the effective realization of a circular economy within various organizational and industrial contexts. However, given that our sample stemmed from a region selected within the CCRI and our careful selection of experts for all stages of circular economy (Fig. 1), we argue that the expertise represented within our foresight process was extensive and sufficient to address the central aim of this contribution. Additionally, the sampling of experts from academia and practice that have already begun to establish interdisciplinary cooperations allowed us to draw on both positive and negative experiences to both drivers and barriers of cooperation.

While the action plan developed in this article focuses on circular economy, its framework and methodology are highly transferable to other initiative advancing the fulfillment of the SDGs. Due to its interdisciplinary, stakeholder-engaged, and future-oriented approach and methodology, emphasizing sustainability, stakeholder inclusion, and continuous learning, the framework of the action plan provides an example for addressing complex challenges across various SDGs. By showcasing strategies for minimizing waste, optimizing resource efficiency, and enhancing labor conditions among others, this plan illustrates how collaborative, interdisciplinary efforts can be adapted to foster broad-

based collaboration and innovation that is necessary for achieving sustainable development objectives worldwide.

6 Conclusion

This article underscores the pivotal role of interdisciplinary cooperation in transitioning to a circular economy, in line with the essence of SDG 17 “Partnership for the Goals”. Additionally, it emphasizes the need for proactive, interdisciplinary cooperation, inclusion of societal and psychological considerations, and engagement in foresight methodologies to foster comprehensive approaches to current challenges from organizations, teams, and individuals. Based on a foresight process combining the expertise of varied disciplines, this article provides insights and solutions that could be pivotal for overcoming the multifaceted challenges inherent in embracing circular models. The collaborative action plan proposed in this article applies central themes of the SDGs to the discussion of circular economy practices: a unified set of goals and actions with a central concern for “people and places” in sustainability efforts. With the establishment of this action plan, efforts in research and practice and on all levels of an organization can be coordinated more efficiently, knowledge and experience shared more easily to collectively advance the transformation toward circular economy. This article and the proposed action plan emphasize the imperative of comprehensive, cross-disciplinary collaboration among academia, industry, policy-makers, and civil society. This cooperation serves as a catalyst for the development and integration of transformative strategies, technological innovations, and sustainable practices, ensuring alignment with the SDGs and enhancing the resilience and sustainability of economic models. This indicates the success with which foresight processes can be leveraged to create collaborative action towards achieving common goals. Practitioners are thus impelled to use and build on this integrative foresight approach, fostering a cooperative ethos, harmonizing labor relations, and promoting continuous learning and improvement.

For practitioners, the synthesis of interdisciplinary perspectives and the collaborative action plan provide several practices that can be selected and used in their own organizations to embrace a multifaceted approach to sustainability, addressing multiple aspects from product life cycles to labor relations, while fostering an environment conducive to continuous learning, innovation, and improvement. Moreover, the cooperation between academia, industry, and policymakers needs to be promoted further to develop solutions and take the steps laid out in the action plan. The emphasis on cooperation and partnerships in achieving circular economy goals signifies the importance of shared responsibility

and collective action in the quest for global sustainability, making strides towards a more resilient, sustainable future.

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