




## Perspective

## We have to talk! Claims of early career researchers to transform circular economy research

Laura Beyeler<sup>a,\*</sup>, Marlene Eimterbäumer<sup>a,\*</sup><sup>1</sup>, Meret Jürgens<sup>b</sup>, Alexa Böckel<sup>c</sup>, Konrad Schoch<sup>d</sup>, Regina M. Bichler<sup>e</sup>, Michael Straub-Mück<sup>f</sup>, Magdolna Molnár<sup>a</sup>, Melanie Jaeger-Erben<sup>a</sup>

<sup>a</sup> Institute for Philosophy and Social Sciences, Sociology of Technology and the Environment, Brandenburg University of Technology Cottbus-Senftenberg, Erich-Weinert-Straße 1, 03046 Cottbus, Germany

<sup>b</sup> Institute of Plastics and Circular Economy, Leibniz University Hannover, An der Universität 2, 30823 Garbsen, Germany

<sup>c</sup> Centre for Sustainability Management, Leuphana University Lüneburg, Universitätsallee 1, 21335 Lüneburg, Germany

<sup>d</sup> University of Wuppertal and Wuppertal Institute for Climate, Environment, and Energy, Wuppertal, Germany

<sup>e</sup> Rachel Carson Center for Environment and Society, Ludwig-Maximilians-University Munich, Leopoldstraße 11a, 80802 Munich, Germany

<sup>f</sup> Institute of Materials Resource Management, University of Augsburg, 86135 Augsburg, Germany



It is evident that the concept of Circular Economy (CE) has gained significant traction in recent years, both in academic research and in practice as a means of advancing sustainability. The diversity of perspectives on how to develop, implement and improve a closed-loop system is evident in the many research domains that publish CE studies. This vibrant and dynamic field of research not only provides a plethora of open questions and research gaps but also offers a meaningful opportunity to contribute to actual transformation processes.

As early-career researchers (ECRs) from a range of disciplinary backgrounds, we individually examine specific practices, technologies, materials, or actors and their roles in the CE context. Following two years of discussion and reflection on our research topics in the context of CE within an interdisciplinary graduate school, we present this article as a reflection on the current state of CE research. Fig. 1 provides an overview of the research topics that we have been investigating.

The perspective of ECRs is particularly relevant to overcome the current silo mentality, as ECRs view CE as a unified field of study rather than a disparate collection of disciplinary perspectives and are less constrained by established research traditions. **From this position as ECRs, we aim to highlight the shortcomings of the current research orientation and structure, emphasising the value of integrated knowledge.** In the following section, we will address four challenges that we, as ECRs, have faced, with concrete examples from our own research and a call for a more reflexive, engaged and interdisciplinary approach to CE research.

### 1. Challenge #1 reformist vs. transformative approaches

The first challenge concerns the distinction between reformist and transformative strategies in CE research. Reformist strategies are designed to maintain the status quo of the existing system, enhancing circularity and efficiency, while transformative approaches seek to fundamentally rethink societal structures (Friant et al., 2020). Researchers can be classified by their respective stance towards the established system: In a review of CE definitions, Kirchherr et al. (2023) found research increasingly aligned with the transformative approach focusing on rethinking, refusing, and sufficiency which contrasts with previous foci on recycling and the waste hierarchy. This shift aligns with the observation that ECRs increasingly aim to achieve practical impact in sustainability (Wierenga et al., 2025).

For instance, ECR 1 investigates sufficiency in the context of businesses, while ECR 8 explores repair services and the normalization of repair to decelerate economic activity. While some researchers, practitioners and funders consider these approaches to be overly idealistic, a few established researchers remain intrigued by visions of alternatives to capitalism, yet do not consider them realistic enough to merit significant academic attention (for instance, at conferences or in review processes). **We therefore propose that academic environments foster critical and novel approaches. This could be achieved by establishing chairs or research groups, enabling targeted funding opportunities, and creating innovation labs, all dedicated to exploring CE practices beyond capitalist structures, thereby**

\* Corresponding authors.

E-mail addresses: [laura.beyeler@b-tu.de](mailto:laura.beyeler@b-tu.de) (L. Beyeler), [marlene.eimterbaeumer@b-tu.de](mailto:marlene.eimterbaeumer@b-tu.de) (M. Eimterbäumer).

<sup>1</sup> Both authors contributed equally to the paper.

enabling productive discussions on the fundamental design of the economic system despite institutional constraints.

## 2. Challenge #2 intransparency of power relations in research

In the absence of platforms such as conferences or special issues to discuss critical ideas, ECRs typically align with existing research projects and structures tied to the interests of research institutes, universities, or private actors. Consequently, ECRs are encouraged to work in research projects that focus on technologies, economic feasibility, and efficiency in Europe, the USA, and China (Alcalde-Calonge et al., 2022), thereby reproducing the reformist approach. As a result, social science perspectives, transformative approaches, and research on other world regions are underrepresented. **We suggest shifting some research attention and funding towards under-researched regions, particularly in the Global South, where diverse sustainability challenges and innovative local solutions are often overlooked. We also advocate for greater integration of social sciences into CE research, for example by considering social justice and decolonialisation to question, rather than reproduce, existing power relations.**

In our own research, we have found it challenging to investigate perspectives beyond existing capitalist structures. Emphasis remains on improving existing or established policies, such as extended producer responsibilities, which could be enhanced but not fundamentally altered. Furthermore, the roles of consumers, producers, or other actors are often oversimplified, lacking the nuance and multidimensionality that characterise human nature and the diversity of roles one can assume. To illustrate, regarding the consumption perspective, ECRs typically conduct research within the context of user behaviour or acceptance, reinforcing the notion of a rational and autonomous consumer. An alternative approach from the field of social science is the understanding of consumer behaviour in terms of social practices. This approach is employed by both ECR 2 and ECR 6 as a theoretical framework. ECR 2 examines neglected basements of households and the inventory of the unused goods stored therein. ECR 6 explores the obstacles to everyday consumer repair practices within a complex

infrastructural setting that often locks consumers into replacing devices prematurely. The roles of consumers that extend beyond the conventional categories of buyers and users, such as value keepers, value sharers, or potential key players in the reuse of value, are overlooked in CE research (Haase et al., 2024). **A comprehensive and integrated understanding of actors, like consumers, is essential for transformative change, rather than relying on assumptions driven by vested interests.**

## 3. Challenge #3 diverging expectations in the research field of CE

CE research is generally application-oriented, aiming to develop circular systems to replace unsustainable linear ones. This transformation must address political, economic, technological, and societal factors. ECRs are encouraged to collaborate with stakeholders such as businesses, engineers, start-ups and civil society organisations, from the start. The skills required for these fields are not always taught in doctoral programmes. Moreover, interdisciplinary and transdisciplinary methodologies are not yet a standard component of the training curriculum in technical, economic, and social science degree programmes. Opportunities for reflection and learning are often lacking. Given CE's pivotal role in decarbonisation and dematerialisation, the normative pressure and sense of urgency during a PhD are amplified. **We advocate for doctoral programmes and university education that facilitate the development of skills for interdisciplinary and transdisciplinary research among ECRs. We also advocate for more time during research for reflection, critical thinking and the advancement of transformative knowledge.**

Two similar examples are provided by ECR 3 and ECR 7. The former is engaged in the technical implementation of CE practices in the plastics value chain, while the latter is concerned with the evaluation of photovoltaic module recycling. While these technical or techno-economic approaches are relevant, often neglected social factors are essential to replace the linear status quo. The inability to implement research findings due to the holistic nature of innovations can be

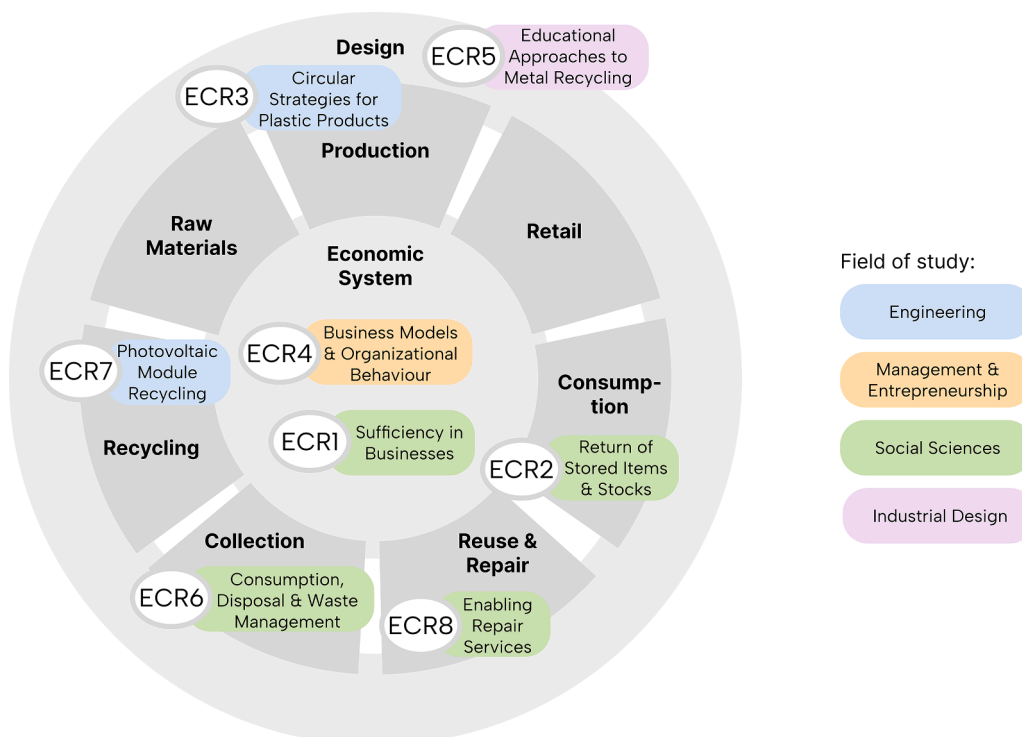


Fig. 1. CE value chain and different research topics of the different early career researchers (ECR1–8) who contributed to this work.

discouraging, and the structure of PhD projects may not accommodate these interdisciplinary tasks. ECR 5's work on improving recycling systems from an industrial design perspective further illustrates this; while systemic thinking is key, circular systems require an even broader view of product systems, business models, and consumers. **To address the inherent complexities of these systems early in the design process, suitable educational formats are required.**

#### 4. Challenge #4 challenging the neutrality of science and research

Many ECRs engage in CE research because they believe that CE can enable a better, more sustainable future. Our research topics are often strategically oriented and designed toward change and impact. A potential conflict arises between ECRs' motivations for change and the positivist tradition that claims scientific neutrality. Despite the existence of established methodologies like design science research, prescriptive theorising and engaged/impact scholarship, research conducted by ECRs is frequently criticised for its normative intent. Nevertheless, science is hardly ever neutral or objective. The continued influence of neoliberal economics, which is sometimes presented as a natural science, also reflects a normative perspective and is not neutral or value-free. It defends the status quo despite significant scientific evidence indicating its disastrous environmental and social consequences. Many contributing authors view themselves as activists who leverage sustainability research, including the CE concept, to facilitate transformation while upholding rigorous peer-reviewed standards. **We advocate for a research culture that recognises activism and scholarship as compatible, and that encourages transdisciplinary research, in which activists and scholars collaborate for transformation. This approach allows diverse roles within science, civil society, and multipliers to converge, and explore novel pathways for transformation (Williams and Whiteman, 2021).**

This perspective paper identifies four challenges within CE research from the perspective of ECRs. ECRs enter the academic system with the vision to create an impact on the real world. They bring new viewpoints to research, as they are not as strongly locked in path dependencies as senior researchers and have not yet built their expertise in a specific niche. Hence, this perspective paper offers the observations and experiences of nine ECRs that have different interdisciplinary backgrounds and who support a transformative approach to the CE. We argue that the development of a CE has the potential to affect not only societal and economic transformation but also calls for change within the academic and scientific systems to deliver requisite knowledge, facts, skills, and values for a sustainable future.

#### Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used DeepL Write in order to improve the readability and language of the manuscript. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

#### CRedit authorship contribution statement

**Laura Beyeler:** Writing – review & editing, Writing – original draft, Visualization, Methodology, Conceptualization. **Marlene Eimterbauer:** Writing – review & editing, Writing – original draft,

Visualization, Methodology, Conceptualization. **Meret Jürgens:** Writing – review & editing, Visualization, Validation, Conceptualization. **Alexa Böckel:** Writing – review & editing, Validation, Conceptualization. **Konrad Schoch:** Writing – review & editing, Validation, Conceptualization. **Regina M. Bichler:** Writing – review & editing, Validation, Conceptualization. **Michael Straub-Mück:** Writing – review & editing, Validation, Conceptualization. **Magdolna Molnár:** Writing – review & editing, Validation, Conceptualization. **Melanie Jaeger-Erben:** Writing – review & editing, Supervision.

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Laura Beyeler reports financial support was provided by German Federal Environmental Foundation. Marlene Eimterbauer reports financial support was provided by German Federal Environmental Foundation. Meret Juergens reports financial support was provided by German Federal Environmental Foundation. Alexa Boeckel reports financial support was provided by German Federal Environmental Foundation. Konrad Schoch reports financial support was provided by German Federal Environmental Foundation. Regina Bichler reports financial support was provided by German Federal Environmental Foundation. Michael Straub-Mueck reports financial support was provided by German Federal Environmental Foundation. Magdolna Molnar reports financial support was provided by German Federal Environmental Foundation. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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#### Data availability

No data was used for the research described in the article.

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