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Ramos, Tomás B. (Ed.); Raggi, Andrea (Ed.)

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Circular Economy Realities: Critical Perspectives on Sustainability

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CIRCULAR ECONOMY REALITIES

Critical Perspectives on Sustainability

Edited by Pauline Deutz, Walter J.V. Vermeulen,
Rupert J. Baumgartner, Tomás B. Ramos,
and Andrea Raggi

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CIRCULAR ECONOMY REALITIES

This book addresses the realities of the circular economy, a resource efficiency concept that has risen to global prominence in academic, policy and business circles over the last decade. Considered an approach to sustainable growth, the volume critically analyses how sustainable emerging applications of a circular economy are in practice.

The book stems from an international, interdisciplinary project exploring the discourses, policies, implementation and impacts of the circular economy across public, private and third sector accounts. It draws on a wide range of case studies, from the UK, Portugal, Austria, Italy, the Netherlands, France, Chile, China, Nigeria, Taiwan and Vietnam, highlighting how experiences both shaped and were shaped by the places in which they were happening. It provides a guide to researching a complex phenomenon such as a circular economy, which involves both collaboration and competition between multiple stakeholders across different sectors and places. Synthesising the multiple perspectives employed in the project, the book makes recommendations for circular economy implementation in different contexts, including the assessment of sustainability implications, whilst indicating the limited potential for circular economy activity to bring social and economic benefits without explicit motivation for those to happen.

Benefitting from extensive empirical research, this critical assessment of sustainability in the context of the circular economy will appeal to a broad readership of academics, upper-level students, practitioners and policy-makers in sustainable development, business, economics, geography, sociology and environmental engineering.

Pauline Deutz is Professor of Circular Economy and Sustainability in the School of Environmental Sciences at the University of Hull, UK.

Walter J.V. Vermeulen is Associate Professor in the Copernicus Institute of Sustainable Development at Utrecht University, the Netherlands.

Rupert J. Baumgartner is Professor of Sustainability Management in the Department of Environmental Systems Sciences at the University of Graz, Austria.

Tomás B. Ramos is Professor of Sustainability Assessment and Planning in the Department of Environmental Sciences and Engineering at the NOVA School of Science and Technology, NOVA University Lisbon, Portugal.

Andrea Raggi is Full Professor of Industrial Ecology and related issues in the Department of Economic Studies at 'G. d'Annunzio' University of Chieti–Pescara, Italy.

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CIRCULAR ECONOMY REALITIES

Critical Perspectives on Sustainability

*Edited by Pauline Deutz, Walter J.V. Vermeulen,
Rupert J. Baumgartner, Tomás B. Ramos, and
Andrea Raggi*

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CONTRIBUTORS

Rupert J. Baumgartner is Professor of Sustainability Management in the Department of Environmental Systems Sciences, University of Graz, Austria. Since November 2018 he has been director of the Christian Doppler Research Laboratory for Sustainable Product Management. He served as a board member of the International Sustainable Development Research Society and acted as subject editor for the *Journal of Cleaner Production*. His main research interests are corporate sustainability management, sustainability assessment, circular economy and sustainable innovation. He was named 2016 DuPont Young Professor, and in 2017 he was awarded the Seraphine-Puchleitner Prize for the best PhD supervisor by the University of Graz.

Sabrina Brulot is Associate Professor at the research unit InSyTE (Interdisciplinary research on Society-Technology-Environment interactions), University of Technology of Troyes, France. Her research focuses on sustainable territorial approaches based on the principles of industrial ecology. She is particularly interested in all the socio-economic factors influencing the implementation of industrial ecology approaches (governance, stakeholder, modes of coordination, scales of decision versus scales of action, etc.). She uses quantitative and qualitative methods for analysing the sustainability and resilience of socio-technical systems on a territorial scale.

Sandra Caeiro is Full Professor in the Department of Science and Technology at the Portuguese Distance Learning University (UAb) and a researcher at the Center for Environmental and Sustainability Research, NOVA University of Lisbon, Portugal, and at the Center of Global Studies at UAb. Her main research and teaching areas include education for sustainable development, sustainability/circular

economy management and assessment. She has mentored several postgraduate students and postdoctoral researchers, published papers in peer-reviewed ISI journals, book chapters and international conference proceedings, coordinated and participated in several national and international research projects and in several national and international PhD and Masters' juris. She is also on the editorial board of three journals and is Associate Editor of the *Journal of Cleaner Production*.

Martin Calisto Friant is a postdoctoral researcher at the Autonomous University of Barcelona, Spain, where he leads work package 2 of the Just2CE project. He has an interdisciplinary academic background in international development, political ecology, environmental governance and urban studies from Utrecht University (PhD), the University of Melbourne (MA), University College London (MSc) and McGill University (BA). Martin has over eight years of experience as a sustainability practitioner and researcher working on projects in Europe, Oceania, Africa and North and South America. His current research focuses on circular economy and society, degrowth and environmental discourse and policy analysis.

Kieran Campbell-Johnston is a scientific researcher at the Netherlands Organisation for Applied Scientific Research (TNO) in the Centre for Social Innovation and Strategy (TNO Vector). His work examines the inter-organizational and policy dynamics of supply chains, particularly in the areas of critical raw materials and materials for the energy transition. He has an interdisciplinary background, with a BA in History (University of Sussex), Human Geography (University of Amsterdam) and a PhD from the Copernicus Institute of Sustainable Development (Utrecht University), which he completed in 2022. His PhD research examined the effectiveness of existing policies for promoting a circular economy within the European Union, particularly extended producer responsibility and eco-design policies.

Estephania Delgadillo is a scientific project leader and consultant in circular economy at Capgemini Engineering (France). She obtained her PhD in Design for Sustainability and the Circular Economy from the University of Technology of Troyes. Throughout her doctoral research, she innovatively devised a participatory design methodology tailored to guide companies in the conceptualisation of circular and sustainable product-service systems. She holds an MSc in Sustainable Resource Management from the Technical University of Munich (Germany) and a BA in Industrial Design from the University of Guadalajara (Mexico).

Pauline Deutz is Professor of Circular Economy and Sustainability in the School of Environmental Sciences at the University of Hull, UK. Her research concerns the coordination of environmental issues with other social and economic priorities, addressing the implications and limitations of trying to balance these priorities within capitalism. She has contributed to and/or led projects funded by UK bodies including NERC, ESRC, EPSRC and Research England. Pauline was the

PI for the H2020 EU-funded Cresting project. She was on the board of the International Sustainable Development Research Society from 2008–2023, serving as Vice President from 2012–2018, President from 2019–2020 and Past President from 2021–2023.

Anna Diaz holds a PhD degree in Circular Economy from the University of Graz. Her research contributions focus on the integration of circular economy strategies into the product planning and development processes in manufacturing industries. She has an interdisciplinary background, with a BSc in Biotechnology (Barcelona University) and an MSc in Environmental Sciences (Wageningen University & Research). Her current engagement with research activities and academic institutions involves curriculum development and teaching activities as an external lecturer.

Hinrika Droege holds a PhD in Circular Economy and Sustainability from the NOVA School of Science and Technology, Nova University Lisbon, Portugal. Her PhD research focused on the analysis of circular economy assessment in public sector organisations. She is currently working as a strategy consultant for the Boston Consulting Group, USA.

Andrew E.G. Jonas is Professor of Human Geography at the University of Hull. His research investigates the governance of urban and regional development, the geopolitics of city-regionalism, urban sustainability and climate governance.

Natacha Klein holds a PhD in Circular Economy and Sustainability from the NOVA School of Science and Technology, Nova University Lisbon. Her PhD research focused on the analysis of the circular economy practices and organisational change strategies in national-level public sector organisations in Portugal. She is currently working as the quality and sustainability manager of the Civil and Military Security Service of the Canton of Vaud in Switzerland.

Aodhan Newsholme is an interdisciplinary researcher and educator in topics related to sustainability and the circular economy. His PhD research examined supply chain and policy approaches to developing a regional circular economy. Aodhan has international industry experience, combined with a keen interest in research and teaching. He is a practice-focused researcher and is interested in co-developing sustainable circular economy initiatives with stakeholders. Aodhan is currently a lecturer in Circular Economy at Munster Technological University, Ireland.

Katelin Opferkuch holds a PhD from Aberta University, Portugal, where she investigated the integration of a circular economy within corporate sustainability reporting practices. Prior to this, she obtained an MSc in Sustainable Development (Utrecht University) and a BSc in Environmental Health (Curtin University). Katelin is currently working as a sustainability adviser and analyst, driving

transparency within the textiles sector. She continues to be involved with academic research through collaboration as a lecturer and supervisor at the University of Amsterdam, Netherlands, on Sustainable and Ethical Marketing courses.

Santiago Perez studied at the University of Technology of Troyes. His first degree was from the University of the Andes, Colombia, followed by an MSc in Sustainable Urban Management from Heriot-Watt University in Edinburgh, UK. He has been a member of organisations such as Engineers Without Borders, Transition UK, the 2050 Scotland's Youth Climate Group, the Full Footprint and the Circular Economy Club, among others.

Małgorzata Pusz (née Lekan) is a researcher and lecturer in the Faculty of Geography and Regional Studies at the University of Warsaw (Poland). She obtained a PhD from the University of Hull where she explored the role of social enterprises and their socio-spatial networks in the local development of the circular economy. She earned an MA in Geography and Hispanic Studies from the University of Aberdeen (UK), followed by an MSc in Environmental Sciences, Policy and Management (MESPOM programme) from Lund University (International Institute for Industrial Environmental Economics, Sweden), the Central European University (Hungary) and the University of the Aegean (Greece). Małgorzata has experience of working on sustainability-related issues with research institutes and non-profits in Europe, Latin America and Southeast Asia. Her current research focuses on circular economy, food systems, interorganisational networks and ESG.

Andrea Raggi is Full Professor of Industrial Ecology and related issues in the Department of Economic Studies at 'G. d'Annunzio' University of Chieti–Pescara, Italy. For more than three decades he has carried out academic research and teaching. His research perspective includes environmental management systems, life cycle sustainability assessment, industrial ecology, and circular economy. His research is mainly of an interdisciplinary nature, also involving engagement with stakeholders (mainly industry); he has participated in various research projects involving multi- and inter-disciplinary collaborations, both at a national and international level. He has authored or co-authored over 250 scientific publications.

Tomás B. Ramos is Professor of Sustainability Assessment and Planning at the NOVA School of Science and Technology, NOVA University Lisbon, and a researcher at CENSE, Center for Environmental and Sustainability Research. He has been Visiting Professor/researcher at the University of São Paulo (Brazil), Nanjing University and Fudan University (China), University of Salford and University of Sussex (UK), International University of Andaluzia and University of La Laguna (Spain), State University Peninsula Santa Elena and Escuela Politécnica del Litoral (Ecuador), Florida State University (USA), University Agostinho Neto (Angola). His research activity is centred on sustainability assessment and management,

including indicators and reporting, circular economy, impact assessment, stakeholder engagement and transdisciplinary collaborative approaches. He is Executive Editor of the *Journal of Cleaner Production* and Editor-in-Chief of the journal *Cleaner Production Letters*.

Tatiana Reyes is Professor at the Arts et Métiers and co-leader of the Institute of Chambéry, following her time at the University of Technology of Troyes. In addition, she has coordinated several research projects. Outside her activities in the university, she is involved in national (G.I.S Smart and Eco-design of Systems for Sustainable Development network) and international research networks (Sustainable design SIG – Design Society). She has been a visiting professor at the Federal University of Rio de Janeiro (Argentina). In terms of research interests, she works on the integration of sustainable criteria on the design process, the evolution of sustainable knowledge and values in industrial system, low-tech approaches, and the evolution of pedagogical methods to integrate sustainability in the engineering curriculum.

Heather A. Rogers is a research fellow pursuing the final stages of her PhD at the University of Hull. Her research explores aspects of employment in the circular economy, with a focus on the repair service sector. Heather holds an MA in Strategic Leadership towards Sustainability from the Blekinge Institute of Technology (Sweden), and a BA in Regional and Urban Planning from the University of Saskatchewan (Canada). Her previous work has included industry research in sustainable urban agriculture and circular economy for the organic waste industry.

Erik Roos Lindgreen, PhD, is a sustainability researcher from the Netherlands. His key interest lies in how to balance scientific completeness and practical feasibility when designing sustainability measurement methods. He previously worked as an LCA consultant at CE Delft. He then spent four years in Italy, where he obtained his PhD at the University of Messina as part of the H2020 EU-funded project Cresting. Currently, he works independently for research institutes such as the Copernicus Institute (Utrecht University), NGOs such as Footprints Africa and the private sector to better understand how sustainability measurement could be made more accessible, while remaining scientifically sound.

Roberta Salomone is Full Professor of Commodity Science at the Department of Economics, University of Messina (Italy). She participates in various research groups, also as a national coordinator and she is the author of more than 190 publications including national and international scientific journals, books and conference proceedings. Her main research themes are related to sustainability, circular economy, industrial ecology and industrial symbiosis, and environmental management and assessment, with reference to Life Cycle Thinking methods.

Tomas Santa-Maria is Assistant Professor at the Business Sustainability Center of the Faculty of Economics and Business at University of Desarrollo (Chile). He obtained a PhD in Sustainability and Innovation Management from the University of Graz where he explored processes of business model innovation for the circular economy. His current research deals with sustainability-oriented corporate-startup strategic alliances, regenerative organisations and data-driven circular business models.

Kaustubh Thapa's current transdisciplinary research at Radboud University (Netherlands) focuses on achieving high-integrity voluntary climate action. For his PhD at Utrecht University, he investigated sustainable and circular governance of European plastic waste and second-hand electronic and electrical equipment trade to Nigeria, China and Vietnam. He has an MA in environmental science, policy, and management from Central European University (Hungary) and a BA in philosophy, economics and political science from Westminster College (USA).

Walter J.V. Vermeulen is based at the Copernicus Institute of Sustainable Development of Utrecht University. Walter focuses on analysing progress in implementing sustainability practices in business in many different countries, both inside companies and in their socio-economic networks. He focuses in particular on private governance in (international) supply chains and on practices of circular economy, both in Europe as well as in supplier countries worldwide. Assessing the performance of these forms of value chain collaboration is enabled with the Oiconomy Pricing approach, revealing the hidden costs of unsustainability. He is former President of the International Sustainable Development Research Society.

Anna M. Walker is a Project Officer in the Fair and Sustainable Economy Unit at the Joint Research Centre of the European Commission in Seville (Spain). Her applied research for policy input revolves around the environmental and social impact of circular economy practices in European industries. She obtained her PhD at the 'G. d'Annunzio' University of Chieti-Pescara, where she analysed different methodologies for assessing the impact of circular business practices on sustainability factors. She holds a BA in International Affairs from the University of St. Gallen (Switzerland) and an MA in Standardization, Social Regulation, and Sustainable Development from the University of Geneva.

FOREWORD

The concept of the circular economy (CE), which advocates for resource efficiency, has gained global prominence as a policy initiative aimed at fostering sustainable growth within the business sphere, and as a way to get away from an unsustainable linear growth. Entities ranging from multinational corporations or international organisations like the United Nations to local municipalities and educational institutions such as university campuses are eager to adopt their own CE frameworks. There exists an assumption that the principles and outcomes of circularity align inherently with those of sustainability. However, given the contentious nature of each concept, the potential synergies resulting from their integration warrant a more comprehensive analysis than has been previously presented. This book is an important contribution to a more comprehensive analysis of the underpinnings and potential of a CE.

This book consolidates findings from a unique, international, interdisciplinary endeavour known as the Cresting project (Circular Economy: Sustainability Implications and Guiding Progress, based on funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 765198). The Cresting initiative enlisted 15 early stage researchers with the objective of providing them with advanced training in systematic analysis and methodologies pertaining to CE-related endeavours and initiatives across diverse geographic and economic contexts. The overarching goal was to facilitate the translation of critical assessments into actionable insights aimed at guiding the management of the transition towards a CE.

This important work represents a novel and rigorous endeavour in scrutinising the emergent circular economy paradigm within its social and spatial contexts, emphasising the value of combining different perspectives. The text highlights the urgency of environmental benefits from CE practices in achieving net zero carbon

emissions, contrasting this with the current slow pace of transformation towards a CE. It emphasises the need for enhanced policy ambition to drive a more holistic approach towards the implementation of a CE, acknowledging the constraints posed by economic priorities and logistical complexities within the global economy. While the social aspects of a CE remain elusive, the book is an important first step in highlighting the need to define and explore individual experiences, the cultural, gender, age and class influences of a CE, and to consider the perspectives of citizens, activists and voters alongside consumers in CE research, including inherent changes that may come with such perspectives. Furthermore, it underscores the transformative societal implications of a fully realised CE, suggesting that achieving widespread adoption of practices like repair and reuse requires political-economic shifts and greater social ambition, particularly among academics and individuals.

Peter Dobers, Sjors Witjes and Gyula Zilahy
Book Series Editors

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1

INTRODUCTION

Exploring the sustainability implications of a circular economy

*Pauline Deutz, Walter J.V. Vermeulen,
Rupert J. Baumgartner, Tomás B. Ramos
and Andrea Raggi*

1.1 Introduction

Since the passage of the European Union's (EU) Circular Economy Action Plan in 2015, the concept of a circular economy (CE) has taken hold in an extraordinary way as a policy for resource management (with some social expectations) and in a truly phenomenal way as an object for academic research. Since 2018, the Cresting project (Circular Economy: Sustainability Implications and Guiding Progress) has been researching the progress of the CE in a range of settings, as well as looking at the wider effects and developing strategies and practices for implementation thereof. The uptake of the field rather underscores the need to devote some critical energy to considering the implications of what is happening, or what it is hoped may be happening – a challenge that others have also taken up during this time. The same time period has also seen a global pandemic, wars and an extraordinary uptick in the number of people taking the search for sustainability into their own hands rather than waiting for it to come to them. Climate change has reached a point of influencing weather patterns on a scale difficult to miss, although ironically this has not consolidated public opinion in favour of action.

Into this maelstrom we offer the present volume as a critical appraisal of the progress and potential of a concept that offers sustainability benefits (e.g. reductions in carbon emissions, resource security, economic competitiveness, job creation). Members of the project team have been productive with their contributions to academic publications and policy recommendations. The present volume draws on our body of interrelated work to identify and explore a bigger and more holistic picture of the reality of developing a CE, and the implications thereof, than can be accomplished through individual research studies that by necessity focus solely on a specific aspect.

In this chapter, we outline our definitions of a CE and sustainability, provide a brief overview of their development and outline the project behind the research. We also provide a summary of the chapters that follow.

1.2 What is a circular economy?

The meaning, or meanings, of a (or the) circular economy(ies) and its relationship(s) with actually existing implementation(s) was one of the major research questions for the project and will be a recurring theme throughout the book. We need to establish a common understanding, or ontology, of the topic of discussion, however, to decide what is it that we deem should be included in or relevant to the discussion. For this, we favour [Geissdoerfer et al.'s \(2017\)](#) definition of a CE as a 'regenerative system in which resource input and waste, emission, and energy leakage are minimised by slowing, closing, and narrowing material and energy loops' (p. 757). This definition captures the intentions and practicalities of the policy approach which was established by the EU Action Plan. The terminology of loop closing is an analogy to nutrient cycling in biological ecosystems. A loop can be created by diverting some waste from disposal (e.g. landfill, incineration) back into production through a process of recycling. These loops can occur at different spatial and temporal scales – with shorter, slower loops being more favourable (assuming that less energy is needed, and other pollution avoided, to keep an item in use for longer than it would be take in order to collect, process and manufacture it into something else). Similarly, although the spatial element of CE activity is often overlooked, the local scale has been proposed by [Stahel \(2013\)](#), for example, as environmentally favourable and also offering potential benefits such as widely dispersed job creation. The strategies for loop closing prominently comprise the 10 Rs (Refuse, Reduce, Reuse/Resell, Repair, Refurbish, Remanufacture, Repurpose, Recycle materials, Recover energy, Re-mine) ([Reike et al., 2018](#)). These R strategies are a combination of activities that in some cases long pre-date environmental initiatives (such as Repair or Reuse), but are now enjoying a share of policy and public attention; they have increased in prominence as a result of environmental and economic drivers in recent decades (such as recycling, energy recovery and remanufacturing).

Two important terms not directly included on the list are sharing and design. Design is a significant element in the CE as it signals a firm's shift from the 'end of pipe' solutions (i.e. tidying up the environmental consequences of production and consumption). Rather, CE is about intentionally avoiding some of the associated environmental impacts. Sharing is a means to 'refuse' to purchase or a route for maximising the use of an item and brings a connotation of a different approach or opting out of consumerism – or possibly just changing its form ([Hobson and Lynch, 2016](#)). How far policymakers have grappled with the potential consequences of policies like the Right to Repair, and how the public might respond, remain uncertain.

A resource-focused definition of a CE is neutral as regards the social outcomes of implementations thereof, which is largely reflected in the approach of the early

academic work responding to the European uptake of the CE (Kirchherr et al., 2017). However, with the rapid growth of the field overall, by 2023 there had been a notable increase in understandings of CE incorporating an expectation of, or aspiration for, social benefits (Kirchherr et al., 2023). Desirable as they may be, we are not starting out with the assumption that they would follow from the implementation of a CE, or indeed that they are necessarily the intention of, or understood by, those implementing a CE. Determining the social and economic distribution of benefits from environmental policies, even historic ones, is not easy; it cannot be assumed that any benefits will be evenly distributed either socially (e.g. Jaffe, 1995; Fullerton, 2011) or geographically. The spatial distribution of benefits is likely to favour some places more than others; new areas of environmental investment introduce new aspects to competition between places, subject to the constraints of capitalism (Deutz, 2014) including the influences of market-oriented relationships (Siderius and Zink, 2022). Who might benefit from a CE (both socially and spatially) is very much an empirical question for the research – as, furthermore, is the question of who is doing the implementing (of what exactly)? We also consider the relationship(s) between theoretical, aspirational and policy definitions and the reality of implementations emerging.

In research terms many pre-existing fields of endeavour have been incorporated within the CE (e.g. Lieder and Rashid, 2016). Prominent among those are industrial ecology, which itself is a broad term incorporating industrial symbiosis, eco-design, dematerialisation and approaches such as life cycle thinking. These fields all had their own range of approaches incorporating more technical, modelling or social science research such as regional development or social network analysis (see Deutz and Ioppolo, 2015). Other fields of research re-energised by the CE include sustainable business models and considerations of corporate social responsibility, supply chain management, environmental (including waste) governance and sustainability appraisals. Most members of the team initiating the Cresting project were veterans of earlier studies relevant to the field, with the already multi-disciplinary team widened to include others with backgrounds relevant to emerging issues (such as the urban context or CE options drawing on ‘alternative’ economic approaches).

This points to the key question regarding the idea of the CE which was driving our project. To what extent, and under what circumstances, can the CE contribute to sustainability?

1.3 Sustainability and sustainable development

Our approach to the CE is that its value lies in it being a means to the end of sustainability. Being circular in some respect is not desirable if, for example, more emissions, or abusive employment practices, are generated by a process of recovery than would have been needed to make an alternative. This raises many uncertainties, of course, not least around the geographies of production and consumption.

Our understanding of sustainability is steered by the Brundtland Commission's concept of 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (World Commission on Environment and Development [WCED], 1987, p. 8), which established three so-called pillars comprising the environment, the economy and society. Although sustainability and sustainable development are strongly related concepts, the term 'sustainability' has tended to be used in an environmental context, while 'sustainable development' can have connotations of international development (Bolis et al., 2014), i.e. it more explicitly acknowledges the challenges and needs of the Global South to achieve the economic and social development of the Global North. Indeed, the expressions Global North and Global South originate from the debate relating to narrowing the wealth gap between nations prior to explicit discussion of sustainable development (Brandt, 1981). Notwithstanding the extraordinary levels of economic development achieved by, and the emerging soft power of, the BRICS group of major emerging economies (Brazil, Russia, India, China and South Africa), the distinction between Global North and Global South remains useful as a shorthand means to express the continuing levels of inequality and concomitant social conditions on a global scale. We can expect that the experience of a CE and the effectiveness of different strategies will vary in different parts of the world (Deutz et al., 2015). These experiences, however, are not separate but rather they reflect interconnections of materials and capital between places within the global economy (Dicken, 2011). There is plentiful evidence as well for a globally connected trade in waste (e.g. Bishop et al., 2020), with harmful social and economic impacts. Although our research has been predominantly focused on the European practices and experience of a CE, we have considered the implications of this at the global level.

Currently, global attention to sustainability is focused on the United Nations Sustainable Development Goals (SDGs) launched in 2015 (UN, 2015). Since the Earth Summit in 1992, some progress has been made and certainly lessons have been learned regarding the complexity of the process. The 17 SDGs are a comprehensive set of interrelated goals backed by 169 targets, albeit that they are reliant on national implementation. A CE can help with many of these (Schroeder et al., 2019). Although relevant we are not directly measuring our research findings against these targets, which will most likely need to be replaced by a revised set of goals in due course. Our attention is focused on the underlying issues and spatial variations around that (with global awareness, albeit a European focus). It is likely that the renewed interest in sustainable development that followed the launch of the SDGs has helped to build momentum for the CE. The (at least superficially) clear practices comprising the CE strategies (i.e. the ten Rs) offer an attractive means to implement sustainability – a concept notoriously open to interpretation and conveniently lacking in specifics, while comprising an ambition that few would dispute (Cecchin et al., 2021). However, the CE is but one of a number of 'sustainability economies' that have gained prominence since the global financial crisis on 2008 (others including the blue, green, low carbon and bioeconomies) – all offering

routes to stimulate economic growth through a focus on some particular aspect of the economy that comes with an apparently built-in mechanism of environmental protection (Sotiropoulou and Deutz, 2022). This serves as a salutary reminder that the term ‘economy’ in the CE is non-coincidental, but indicative of a pro-growth and essentially pro-business agenda. We need, therefore, to maintain a critical gaze on the motivations for adopting, or being seen to adopt, circular practices and to question, rather than assume, how the benefits might be (spatially and/or socially) distributed.

Social and geographic dimensions were largely absent from CE research at the time this project started. Research is now appearing that has begun to address and conceptualise the effects of a policy that, to be successful, implies a significant shift in processes and behaviour relating to production and consumption. This is in addition to the extensive body of research into promoting and supporting CE activities. It is unfeasible to do justice to all that material here, but each chapter will encapsulate literature of relevance to its theme. Much CE research remains at the aspirational or abstract level. The wealth of empirical insight we bring to bear to our theoretical analysis in this volume remains exceptional. Whether CE-related changes that are already underway can be seen as transformative in terms of resource use and the wider social implications thereof are what we aspire to address in this volume via these questions:

- 1 To what extent, and in what form, are CE practices occurring in public, private and third sector policy and practice?
- 2 What are the sustainability (*environmental, social and economic*) implications of developing a CE?
- 3 How can CE implementation be expanded and intensified?

1.4 The Cresting project

The Cresting project, the work of which is synthesised in this volume, was funded by the Marie Skłodowska-Curie Innovative Training Network (now renamed Doctoral Training Networks). Thus, the 15 researchers recruited met the European Commission criteria for early stage researchers (ESRs) (those having less than four years’ experience of research and in particular not having a PhD) and mobility requirements (studying in a country where they had spent less than 12 months out of the previous three years). Research training and each institution’s requirements for a PhD were therefore important considerations. Our network was primarily formed through the International Sustainable Development Research Society, the conferences of which have seen presentations of many aspects of the project.

Key principles underlying the design of the project were (1) working across disciplinary boundaries; (2) the geographic context as a critical element of research design; and (3) the incorporation of non-academic partners.

We wove cross-disciplinary collaborations into the projects by defining supervisory teams representative of more than one disciplinary (or in some cases interdisciplinary) approach. ESRs retained the scope to determine their approach, which could range from a largely disciplinary study informed by another discipline to a deeply integrated interdisciplinary approach. Interdisciplinarity research incorporates perspectives from more than one academic discipline, which brings different ideas, understandings, appreciation of different research methods and how they can be combined and, importantly, can generate different questions to address (e.g. Schmidt, 2007; Graff, 2015), capable of tackling issues beyond the scope of individual disciplines as currently defined (Thompson Klein, 2017). For complex sustainability-related issues, this approach has long been considered beneficial – the domain of any one discipline may offer important insights but is not likely to offer widely applicable solutions by itself (e.g. Murdoch, 1993). The challenges associated with a CE suggest that having access to multiple perspectives would be useful, whatever the preferred focus ultimately may be.

Cresting was also initiated with the geographical location of participating universities as an important active feature, rather than a more incidental one. The multidisciplinary supervisory teams were also international. This helps to avoid assumptions of prejudice about the significance of particular circumstances that might arise from simply being unaware of alternatives. All the projects are thus aware of their geographic context, although not all are explicitly undertaking a spatially informed analysis. ESRs spent time at their co-supervisors' institutions to take advantage of training opportunities, build personal networks and in some cases undertake research. The arrangement was supportive of comparative studies, as international fieldwork would be supported by local expertise and connections. Although somewhat curtailed by the COVID-19 pandemic, some projects managed to maintain this comparative feature.

The third principle was that all projects should benefit from a partner bringing an additional perspective. In 14 cases the partner was from outside of academia, representing national, regional or local government bodies, companies or non-profit organisations. In one case, the partners were academics from outside Europe, who provided the expertise and experience to support research on materials leaking from the European CE to China, Nigeria and Vietnam. For most of the ESRs, however, their partner organisation provided non-academic perspectives and expertise. Secondments with partners allowed ESRs to see aspects of the CE in operation, and/or efforts to implement a CE. The nature of the relationship with partners varied from a transdisciplinary process of shared project definition to hosting secondments, co-designing/distributing surveys, providing access to data and/or making staff available for interviews and/or workshops. ESRs also benefited from the insight of the international and multisectoral advisory board.

To build the project identity, and to provide a common training experience, the project included six advanced training workshops. Hosted by a different institution each time, these covered a range of generic and CE-specific research topics

as well as affording the opportunity to experience a local expression of the CE. Topics including introducing transdisciplinarity and critical realism as approaches to research (see [Chapter 2](#)), use of social media, accessing data and open access publications, engaging with policymakers and measuring circularity. These workshops included participation with a range of stakeholders (local companies, governmental organisations) as a learning opportunity for the project team and as a vehicle to disseminate findings. The last three workshops were online, which of course changed the experience in unintended ways, while facilitating participation from students, academics and other stakeholders from outside the project team. Ethical principles of research and the procedures to be followed were addressed at the first workshop and embedded in the project. Practices and expectations varied considerably between institutions. All the projects followed the most developed procedure. Supervisors served as ethics approvers for projects in which they were not involved.

This book is the culmination of the process of synthesising the findings of our research, which we began for our project conference held in December 2021. The book is divided into chapters addressing major aspects of the project to which all the ESRs were invited to contribute. They could select any themes that their work addressed, be that the relevant findings or a central aspect of their original research plan, or something else that emerged from it. The work of compiling the chapters has largely been undertaken by work package leaders, who are also the book editors. There is of course some presentation of ideas and data from the many publications that have already appeared. However, the approach here is to emphasise the additional learnings from multiple perspectives (i.e. ordinarily beyond the scope of any one project), which we hope will be of interest to non-academic readers as well as people engaged in all forms of CE-related research. Each chapter introduces the topic it covers, including a review of relevant literature from outside the Cresting project. The methods section briefly identifies the constituent projects and methods used. Findings are then presented – in some cases via case study sections encapsulating aspects of one project, in other cases findings are organised around themes. Emerging findings are then discussed and conclusions offered.

1.5 Outline of the chapters that follow

Given the research training element of the Cresting project, how to research a CE has been an explicit theme of the research, which we address in [Chapter 2](#) ('Approaches to circular economy research'). Furthermore, given the dominance and diversity of CE practices, a shared and diverse epistemology is required. A wide range of social science approaches are represented in the project, which support the multifaceted nature of the task of establishing a CE, assessing its effects and critically analysing its implications. The project was underlaid by the philosophy of critical realism, which is open to any research method or methods fitted to the questions at hand. It can also be accompanied by a wide range of approaches to engagement with stakeholders. These approaches can range from

transdisciplinarity (co-design of research, co-production of knowledge), to a more typical collection of primary data (e.g. via interview), to the use of secondary data or documents as primary sources. Critical realism is applicable across disciplines and research methods. This book comprises the apotheosis of our critical realist philosophy, seeking to gain insight to underlying influences and contingences that may help to explain empirical observations. Readers are directed to individual papers and theses for a more detailed overview of the methods utilised in each project and the rationale for their selection. In [Chapter 2](#) we present some examples of the range of methods used.

There are many different understandings of what a CE might be, or could be – with policymakers, practitioners and academics offering divergent views under the umbrella of the core resource efficiency idea driving the implementation of a CE by the EU and others. [Chapter 3](#) (‘Navigating diverse understandings of a circular economy’) addresses this divergence by presenting a scheme based on a wide range of literature to classify approaches to the CE and applying this scheme at different levels.

The environmental implications of companies and products were central to the forerunner fields of the CE and remain of critical relevance. CE approaches emphasise the need for solutions ‘by design’ – the antithesis of an ‘end of pipe’ approach. [Chapter 4](#) (‘Exploring the role of companies in transitioning to a sustainable and circular future: Insights and reflections’) addresses ways in which companies need to adapt in order to find economically sustainable circular approaches. This chapter takes a dual approach by both working with frontrunner companies to explore processes for adopting circular approaches to business models and product design and relating the challenges of this to the actual practices of companies that do not purport to be in the vanguard of the CE.

New approaches to business and public sector organisation are only advantageous in as much as they are more sustainable than the approaches they are replacing. [Chapter 5](#) (‘Assessment approaches and methods for a circular economy’) addresses methodologies both for assessing sustainability impacts and to support decision-making processes. This can relate both to companies seeking to improve the environmental design of products, e.g. how to decide which is the most environmentally suitable circular option while also considering circular aspects. Public sector bodies and other large office-based organisations also need to adopt circular practices and devise means of measuring progress, which might be more difficult to quantify than in inputs and outputs of a production process. How such information is relayed to external stakeholders (whether shareholders, customers or regulatory/accrediting bodies) is also considered.

A relatively neglected aspect of CE research has been the exploring of how the CE is influenced by and influences the places where it is happening. [Chapter 6](#) (‘Socio-spatial dimensions of a circular economy’) pulls together the findings of the most explicitly geographically oriented projects. The case studies include (1) a comparison of neighbourhood-level community-led approaches between three

cities (Hull, United Kingdom, Graz, Austria, and Santiago, Chile); (2) a contextualised comparison of the aspirations of three cities (Amsterdam, Netherlands; Glasgow, Scotland, and Copenhagen, Denmark); (3) comparison of regional-level approaches between Hull, Graz and Strasbourg; and (4) global-level implications of the European CE based on studies in Nigeria and Vietnam.

One of the most often cited social impacts of a CE is the creation of new jobs. [Chapter 7](#) ('Emerging indications of employment in a circular economy: A synthesis of European case studies') draws on projects considering small and large businesses, public sector, local government and sustainability reporting to assess the types of roles emerging and the necessary skills required to do them. A key finding is that in all these organisations, the people doing the hiring are not necessarily sure what is needed. Rather than the CE creating jobs, the right people are needed in the right roles to create a CE.

CE policy is building on several decades of waste and other environmental policies in the European context. Policies such as extended producer responsibility remain the cornerstone of CE implementation. [Chapter 8](#) ('Policy recommendations for a circular economy') puts CE policy in the context of European policy developments over recent decades, presents the findings of policy-focused projects examining producer responsibility at the national and global level, for example.

[Chapter 9](#) ('Emerging understandings of the implications of a circular economy') pulls together the findings of the research around the current practice and prospects for a CE in different contexts, the interrelationships between them; the sustainability implications at different levels, and offers thoughts for the further expansion of a CE. We also offer proposals for further work.

Finally, at our end-of-project conference held at the Royal Geographical Society (with IBG) in London, we had two graphic artists who recorded the sessions. The first day comprised presentations by the ESRs and responses from panels of distinguished CE researchers and practitioners (see Acknowledgements). We are pleased to share some of the graphic images at appropriate points throughout this volume. [Figure 1.1](#) sums up the presentations from ESRs whose projects related to either public or private sector organisations. [Figure 1.2](#) sums up the presentations from ESRs relating to place and policy in a CE.

The organisation session reviewed the ways in which public and private sector organisations engage with a CE, examined strategies for enhancing engagement and barriers to their implementation, and considered methodologies for undertaking sustainability assessments of circular practices. It included quantitative and qualitative studies of and with companies in Austria, France, Italy and the Netherlands and central government bodies in Portugal. The session was held on 15 December 2021 at our end-of-project conference.

This session examined the extent to which places may be able to capture the benefits of circularity and considered how policies can help to drive the transformation to a CE. The session included in-depth case studies undertaken in the city of

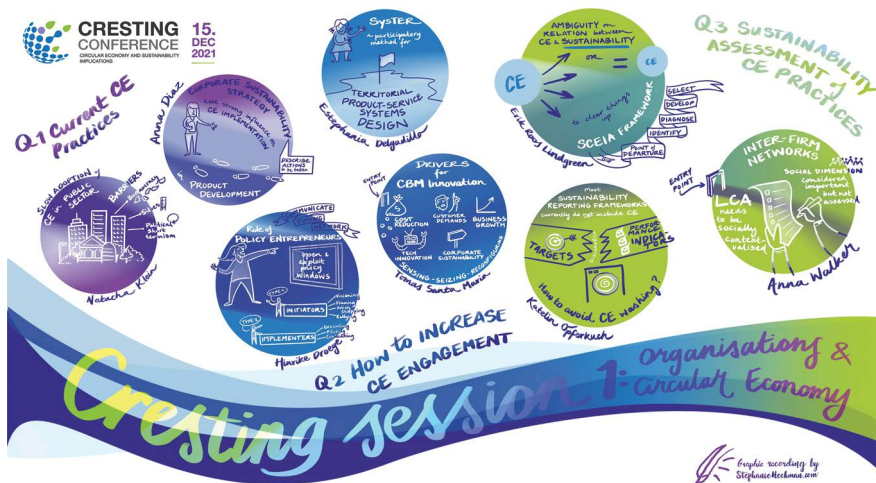


FIGURE 1.1 Organisations and the circular economy

Source: Digital recorder: Stéphanie Heckman, www.stephanieheckman.com, 15 December 2021.

Hull, UK, and the Port of Strasbourg, France. The policy discussion included an international multi-stakeholder study of extended producer responsibility implementation. It considered both how to drive compliance beyond 'end of pipe' approaches and to address the implications of policies beyond their geographic jurisdiction.



FIGURE 1.2 Place and policy in a circular economy

Source: Digital recorder: Stéphanie Heckman, www.stephanieheckman.com, 15 December 2021.

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2

APPROACHES TO CIRCULAR ECONOMY RESEARCH

Pauline Deutz, Sandra Caeiro, Erik Roos Lindgreen, Kaustubh Thapa, Anna M. Walker and Małgorzata Pusz

2.1 Introduction

This book comprises a contribution to understanding the current state of progress towards circularity and the extent to which outcomes are indeed environmentally and socially sustainable. In this chapter we present the assumptions behind, and the approaches used in, our research both to enable readers to assess the findings presented in the following chapters, and as a guide for future circular economy (CE) research.

For a CE to fulfil its potential, the principles of circularity need to be thoroughly engrained across society, involving new collaborations, different practices and forms of assessment, as will be shown in the following chapters (see also Cowan et al., 2023; [Schultz et al., 2023](#)). To support this progress, data are needed on products, processes, environmental/social impacts, costs, risks and behaviour relating to all types of companies and other organisations. Businesses of all sizes, public sector bodies and governmental agencies, non-governmental and non-profit organisations will need data to be able to relate to themselves and each other in order to progress collaboration. Attitudes of the public, consumers and citizens are likewise relevant. Some of those individuals and organisations (e.g. city administrations, local branches of companies or charities) will have a focus on particular places, while others will not. These groups will have very different interests, besides potentially wanting to prioritise different aspects of a CE (they might be trying to minimise costs, maximise growth, or provide, or indeed limit, public services). Sustainability challenges have been characterised as ‘wicked’ problems, i.e. they do not have a clear definition, nor are there any simple interventions or demonstrably right or wrong solutions – only those that are more or less preferable depending on one’s particular perspective ([Brown et al., 2010](#)). There are also

power discrepancies between organisations, i.e. they have different levels of ability to implement their plans and/or to influence others. Research cannot overcome different priorities or power dynamics but it can at least contribute to an informed compromise.

When different organisations and individuals are discussing the CE, it is relevant to ask what they understand by that and include in the conversation what they recognise as being relevant information (or indeed assume to be relevant) on which to base decisions. Academics refer to these issues respectively as ‘ontology’ (what is relevant) and as ‘epistemology’ (how can I learn about it). There is, however, no one academic response. The answers to ‘what’ and ‘how’ vary considerably between different disciplines, many of which are already involved in CE-related research, while others are likely to become involved in it in future. In this chapter we are deliberately limiting the use of academic terminology, but the ideas contained herein are immensely important to ensure that debates on developing a CE, as well as the actual development thereof, are based on a sharable evidence base.

Research fundamentally involves the collection, or generation, of data to address specific questions. In social science research the intention is to study the views and/or practices of social actors and other stakeholders (individuals and organisations with a role and/or interest in the phenomenon of interest). Based on previous research experience related to CE, critical realism was selected as a suitable framework for Cresting project. Critical realism was formulated as a compromise between major schools of thought in social science (Bhaskar, 1975). Making no disciplinary assumptions, it is a suitable framework for interdisciplinary research (Dickens, 2003). By seeking the causal factors underlying observations, critical realism provides a foundation not only for understanding the present, but also for bringing about change (Sayer, 1982; Schoppek, 2021). Critical realism acknowledges that academia does not have a monopoly on the generation of knowledge and incorporating other knowledges can add significantly to the value and utility of findings (Sayer, 1982). An important choice within the research, therefore, is how to engage with the relevant social actors. One of the richly developed forms of incorporating non-academic views concerns transdisciplinary research, wherein stakeholders are involved in the co-design of the project and the co-creation of data (Witjes and Vermeulen, 2021). While critical realism does not proscribe methods for stakeholder engagement, the selection needs to be well considered to address any questions at hand that are justified by the circumstances. The involvement of non-academic partners was important to Cresting to underpin the relevance of the research. Different projects built on these connections in different ways; mostly not in a transdisciplinary manner in the strictest sense of co-designing the research, but in some cases by co-producing solutions to specific problems (whether product or policy design, assessment frameworks), or in other cases by collecting data to examine perspectives on a particular topic.

In this chapter we first outline critical realism and explain its usefulness to CE research. Next, we outline the range of approaches to stakeholder engagement used

by the Cresting project. We then present the stakeholder engagement and methods of four projects. Finally we offer some conclusions.

2.2 Critical realism as a philosophy for CE research

Working across and between different academic disciplines is important, if not essential, for CE research. This does not simply broaden the range of topics that can be knowledgeably addressed, but brings assumptions about the nature of reality (ontology) and what constitutes a valid approach to gaining knowledge relating to that reality (epistemology) (c.f. [Schmidt, 2007](#)). Critical realism was formulated as a compromise between major schools of thought in the social sciences which are otherwise difficult to reconcile ([Archer et al., 1998](#)). For a more specialised discussion of critical realism, readers should consult [Sayer \(1982 or 2000\)](#) and [Archer et al. \(1998\)](#). Previous applications of critical realism to CE-related research (e.g. [Deutz and Gibbs, 2008](#); [Deutz et al., 2013](#); [Deutz, 2014](#)) provide examples for the following section.

Critical realism seeks to explain the causal mechanisms and relationships underlying observed events and patterns; it involves consideration of which factors might be necessary to a certain outcome, as well as those factors that might be helpful, hinderances or irrelevant contingent upon circumstances ([Sayer, 1982](#)). This may sound useful without being exceptional, but the underlying assumptions are distinguishing. While critical realism is attuned to the information and insights from empirical findings, it contends that they do not present a complete picture of reality ([Bhaskar, 1975](#)). Helpfully expressed as an ‘iceberg’ by [Fletcher \(2017\)](#), only a small part of reality is observable to empirical effort (Bhaskar’s ‘domain of the empirical’). Explanations drawing solely on that domain might appear to be ‘common sense’ but can be deeply flawed ([Sayer, 1982](#)). Below the proverbial waterline, however, are the actual and real levels. The domain of the actual comprises experiences as well as events, which are happening whether we are aware of them (let alone studying them) or not. Our knowledge is not perfect: research, and indeed experience of living, will have captured certain patterns and perspectives but we know there may be relevant information or ideas that are missing (perhaps reflecting a gap in the data collection, biases in perspectives of participants, or just the impossibility of capturing every salient point). Finally, there is the domain of the real, which includes mechanisms of change as well as events and experiences. Mechanisms (sometimes ‘causal mechanisms’) are the factors causing events to happen, whether or not those events are experienced ([Schoppek, 2021](#)). The mechanisms themselves are social products and can also be the objects of research ([Fletcher, 2017](#)). For example, the outcomes of attempted eco-industrial park projects in the US reflected local circumstances (e.g. access to funding for pollution clean-up for former military bases). At the real level, though, a strong influence on their success was the overall attractiveness of the location to companies, which were only marginally influenced in location decisions by environmental

considerations (Deutz and Gibbs, 2008). At different times, and in different places, the combination of mechanisms in operation and their relative significance can be highly variable; nonetheless, there is more in common between diverse examples than might appear at first sight.

A distinction can be drawn between what is necessary to support an outcome and what is contingent on circumstances (Sayer, 2000). Recognition that circumstances that appear particular or unique (whether relating to a certain place, product or process) are nonetheless responding to wider influences enables critical realism to make connections and generalisations not open to other approaches, thereby emphasising its unique characteristics. Critical realism is therefore better suited to identifying approaches to CE both for specific circumstances and for wider relevance. A pertinent example of this is industrial symbiosis (a strategy for CE using residues from one entity as inputs for another) (Chertow, 2000). Definitions of industrial symbiosis can include an assumption of a local scale. However, the spatial scale of exchanges is better thought of as a contingent circumstance than a definitional characteristic, even though it matches some experiences of industrial symbiosis (Deutz, 2014). Proximity can help to achieve a synergy but openness to arrangements on a larger scale increases opportunity (Sterr and Ott, 2004). Additionally, discussions about industrial symbiosis refer somewhat interchangeably to waste and by-products. However, these terms have spatially variable legal definitions, which are also liable to change over time. We can infer that regulations will influence industrial symbiosis outcomes, but what happens in a certain place will be contingent on the prevailing regulations (which are national rather than local in scope) and other local circumstances. Furthermore, factors such as the price and availability of raw materials, which follow global constraints, may be a limiting factor at some times or an encouraging factor at others and will be influential to different degrees in different places according to the particular conditions (reflecting, for example, the mix of industry present locally or national incentives for different materials/technologies).

A further significant aspect of critical realism is the combination of the realist (objective) ontology with a relative epistemology (acknowledging subjectivity) (Archer et al., 1998). The realist ontology relates to the assumption characteristic of the natural sciences (following a so-called positivist methodology) that there is a reality to study that is independent of the observer (not so trivial a point as might be imagined; see Collier, 1994). Positivist, or objectivist, approaches to the social sciences are seeking to maintain the natural science goal of objectivity in research (so that a different observer would achieve the same results). Researchers in this school would acknowledge that humans may be less consistent or predictable in their behaviour than other objects of research, but seek to minimise the impact of that human variability through the use of large data sets or surveys with enough respondents to be representative of a wider population (albeit that qualitative data might also be used in so far as objectivity can be asserted, or as a prelude to quantitative corroboration) (Crotty, 1998). Objectivists are looking for statistical

regularities and generalisations as a guide to explanations which ideally approach the generality of the ‘laws’ of natural science. This is in contrast to the spectrum of ‘constructionist’, or relational approaches (interpretivism, social constructionism, subjectivism) (Crotty, 1998) according to which our knowledge of ‘reality’ is socially constructed, i.e. irretrievably influenced by human perceptions and biases so that an objective assessment is simply not possible (in extreme approaches the idea of ‘reality’ itself might be questioned). Ethnographic research (in-depth studies of just a few subjects) would be the norm; little of interest around the human experience would be expected to come from trying to reduce complex perceptions/behaviour to numbers. Given the individuality of experience and circumstances, generalisation is difficult and not of value. Such studies risk appearing hopelessly biased or ‘anecdotal’ to objectivists, potentially of some interest but not yielding insights easily extrapolatable into policy or practice. Critical realists concur with the principle that our knowledge of the world is filtered through experience and interpretation, i.e. that knowledge is socially constructed, can contain errors or be swayed by one’s theoretical or political assumptions (Schoppek, 2021). Importantly, though, some knowledge, or social explanations, are closer to the objective reality than others, and we return to this point below.

There is no philosophical bias to different types of data for critical realist research. Types of data, ways of interpreting them and methods of data collection (intensive/extensive) are selected on the basis of their ability to best answer the questions at hand (Sayer, 1982). Critical realism grants that our knowledge of the social world is derived through the subjectivity of respondents, or the perspectives/assumptions behind documents (images, texts, sounds) and is influenced by the researcher’s own positionality. Positivists might question the reliability of an interview as a source of data, as representing one person’s opinions. But interviewees are not seen as sources of facts, so much as they are valued for their interpretation of a situation. What a company representative says about eco-design, for example, is not necessarily a guide to best practice, but it does indicate what a company thinks about the field and what might be influencing their approach (Deutz et al., 2013). Quantitative data is useful to provide a description of circumstances and for indicating areas of interest for further analysis, which might be apparent trends/correlations, or they might be the outliers or exceptions (Sayer, 1982). Even this kind of data comes with assumptions, though. To give a CE-related example, a life cycle assessment (LCA), is an objectivist approach – an effort to quantify (and necessarily simplify), a large volume of information as a decision-making tool to avoid unintended consequences from environmentally motivated changes. Broadening the scope to include other aspects more difficult to quantify (e.g. implications for experience or quality of life) is not just a technical challenge but a potentially contentious move to reducing the objectivity. A critical realist would concur that a LCA is not truly objective as decisions are required as to what to include and the desired data may not be available (Miettinen and Hämäläinen, 1997); there is no fundamental objection to incorporating explicitly subjective criteria which might

contribute to a better understanding of potential impacts. Broadening of the LCA methodology to incorporate social and economic aspects may increase the subjectivities involved. One might also question who has the decision-making powers and what their priorities are.

As mentioned above, while accepting the subjectivity of knowledge relating to society, critical realism's adherence to both independent and layered reality distinguishes it from other subjective approaches. As noted, a critical realist approach lends itself to the identification of causal mechanisms which may be shared between different circumstances, despite differing contingent outcomes. The independent reality further implies that while there may be many interpretations of observations and experiences, some will more closely match the objective reality than others (Sayer, 1982). The advantage of this is that research can build understanding and explanations of the present that provide a foundation for planning change – this does not preclude differences of opinion, or politically motivated preferences, but concurs that there is a reality that we can strive to both explain and change. This is as opposed to facing a range of seemingly disconnected circumstances each of which might have many interpretations and potentially a view that comparing and choosing are not even reasonable steps to take. The critical realist can try to disentangle contrasting views to better explain what is producing observed patterns and relationships and arguably offer insight to the likely future success of different CE approaches (Schoppek, 2021). Critical realists refer to the 'rational judgement' alongside the realist ontology and relational epistemology (Archer et al., 1998).

Progressing from the philosophical assumptions of critical realism to a specific approach to research involves making decisions. Methods may be selected to best address the questions to be asked, but framing the questions involves defining some aspect of reality for study. The archetypal laboratory scientist can construct controlled experiments to isolate the effects of specific variables within systems designed and controlled to be closed. That is, the components of the system can be precisely identified, their impacts on each other isolated and studied. Depending on the nature of the system, there may be external effects, but these are considered distinct from the system itself. Social systems, however, are not closed; the definition of a system is arbitrary. So, for example, the global-level influences on industrial symbiosis mentioned above are not external to local conditions. They are operating on a different spatial scale to other mechanisms but are part of the same reality. Therefore, while a 'system', or case study (which could be a process, or product, or policy, or place, or organisation, or scale, or a CE strategy – or a possible combination of all of these), needs to be defined to establish the empirical scope of the research, it must be remembered that the case study boundaries are strictly conceptual – they do not apply at the actual or real levels. The choice of case study, however, will influence what is observed, casting other aspects to the 'actual' (happening but not experienced) level and influencing the ability to discern causal mechanism at the real level (Ollman, 2003). In this way, for example, a

focus on a specific spatial scale (e.g. regional, national) may give an undue significance to that scale in the interpretations (Jessop et al., 2008). To take the argument one stage further, critical realism is concerned with the *relationships* between ‘objects’ of whatever kind (Sayer, 1982; Collier, 1994). What happens in one place is not independent of what happens elsewhere (Pierce et al., 2011). For example, the development of environmental industries in Europe from 2022 cannot be understood without considering the influence of the US Inflation Reduction Act which creates financial incentives for environmental technology companies to (re)locate in the US; consumers imply producers, and vice versa; a given strategy for the CE is defined as an alternative to disposal and is only viable if certain conditions are in place, which are influenced by multiple relationships that can be global in scale. Of course, everything cannot be studied all at once, especially on the 3–4-year timescale of, for example, a PhD. The task is to justify the choice and be aware of the influences and relationships extending beyond the case study.

Finally, as the objects of study for social science are people and organisations comprising people and the relationships between them, there is a possibility (even probability) of a two-way exchange of knowledge between researcher and researched that may not be available to other fields (Sayer, 1982). Researchers can choose the level of engagement with their research objects, which might vary from a reliance on secondary data collected by others (e.g. provided to a regulatory or industry body) or publicly accessible documents, to a close relationship where the academic and the stakeholder(s) are working together to ‘co-create’ the data or even the design of the project itself (i.e. transdisciplinarity). These options are reviewed in the following section.

2.3 Stakeholder engagement

Stakeholders can be defined as individuals or organisations which have a direct influence on the matter of interest (Freeman and Reed, 1983), and more inclusively can also include those who may be impacted by the matter even if they have no influence (Bryson et al., 2002). The expression ‘stakeholder’ comes from the management literature, where it is used from the point of view of how might this diverse group be managed to achieve a company’s objectives (e.g. Ackerman and Eden, 2011). Stakeholders for a CE transition would include a large and diverse group redesigning business practice, cooperation (or coercion) across supply chains; planning public infrastructure; collaboration in specific territories; policymakers seeking to influence behaviour and outcomes; organisations changing their own behaviour; the public modifying their behaviour either proactively or in response to available options). The list is reduced to a somewhat more manageable number through the choice of case study. The term ‘stakeholder’ has become a shorthand expression for the population of potential research participants for a social science study as the relevant collection of individuals and organisations whose perspectives are considered of interest (e.g. Ho et al., 2023).

Important to the research is understanding the perspectives of different stakeholders, not just by category, but also the variability within categories, e.g. not all companies will be approaching the CE in the same way. Consideration is needed in how to approach different types of stakeholders in terms of their institutional role and national context (Li, 2022). Notably, the selection, and self-selection, of stakeholders for participation in the research (i.e. who is asked and who agrees) may influence the findings (Collett, 2023). Furthermore, as Cresting is concerned with the impact of the CE, rather than adopting a more normative approach to increasing circularity, each stakeholder is simultaneously a potential actor and influenced by the actions of others. As noted above, we are interested in their relationships rather than treating them as separate entities. Within Cresting, all the early stage researchers (ESRs) had a partner (or two) who could provide a window on a particular aspect, as well as practical experience in the form of secondments (sometimes used for familiarisation or making connections, sometimes as a means of accessing interviewees). Partners were variously public (at a local, regional and national level), private or third sector. The approaches taken varied significantly (Table 2.1), with the COVID-19 pandemic reducing face-to-face interactions and changing and generally reducing the level of stakeholder engagement. That it was possible to conduct online meetings and interviews meant that the research questions did not need to be significantly reconsidered.

A key choice for researchers to make is the extent to which stakeholders to the topic of the research are also stakeholders within the research process. Concern to make a difference in solving the complex problems relating to sustainability has encouraged researchers to adopt a transdisciplinary approach (Vermeulen and Witjes, 2021). Definitions vary but here we used the term to mean that one or more (non-academic) stakeholders were actively involved in the research process (Vermeulen and Witjes, 2021). Transdisciplinarity is used beyond the social sciences, e.g. in medical research, but here we are considering it as part of a spectrum of approaches to stakeholders for social science (i.e. research seeking to understand and influence societal arrangements). Vermeulen and Witjes (2021) identify a range of possible forms that transdisciplinary research can take, depending both on the level of engagement (e.g. the extent to which the stakeholder is involved in designing the research, whether they are decision-makers on a par with the academic or merely consulted at intervals) and the approach to identifying relevant stakeholders (e.g. whether the otherwise marginalised are included). There is a power dynamic, as it is likely that the researcher is more experienced in research and may have particular funding expectations to meet. Conversely, the non-academic is highly likely to be more experienced and knowledgeable about the field in question. The academic and/or lead partners need to decide how to include a range of voices to safeguard against variations in influence or conflicts of interest if there is a desire to reflect diversity including the voices of marginalised groups. While transdisciplinary research can provide close access to the diverse perspectives of stakeholders, the co-creation of ideas, and its ownership, legitimacy and implementation could

TABLE 2.1 Research focus, methods and stakeholder engagement for each project

<i>Researcher</i>	<i>Focus</i>	<i>Methods</i>	<i>Stakeholders</i>	<i>Engagement</i>	<i>Issues</i>
Martin Calisto Friant	CE discourses: European Union (EU), the Netherlands, plastics sector, city scale (Amsterdam, Netherlands, Copenhagen, Denmark, and Glasgow, UK).	Interviews, participatory workshops, online surveys, discourse analysis, policy analysis, literature review.	<ul style="list-style-type: none"> Dutch government and private actors involved in the management of the Dutch extended producer responsibility (EPR) system for tyres, plastics and packaging. Citizens and people interested in circular economy to answer the survey (n = 1150 in 77 countries). 	<ul style="list-style-type: none"> Collaborated with two other WP 1 students and one master's student to do the interviews and workshops on EPR. Collaborated with NGO Revolve Circular to create the survey and worked with 20+ organisations to disseminate it. 	<ul style="list-style-type: none"> The COVID-19 pandemic restricted the methodological choice and led to stronger focus on desk research methods such as policy and discourse analysis rather than more inclusive transdisciplinary research methods. Difficulty finding sufficient participants for online surveys.
Kieran Campbell-Johnston	CE policy – EU, Netherlands, specifically product and recycling policy and its effectiveness.	Exploratory field visits, Delphi survey, workshops, interviews, literature and policy analysis, exergy thermodynamic rarity assessment.	Dutch, French, Italian and broader European actors engaged in the implementing, monitoring and running of extended producer responsibility systems, including policymakers, recyclers, producer responsibility organisations, auditing agencies, academics and industry.	<p>Participatory observation during secondment at the Dutch government agency involved in monitoring and enforcing waste policy.</p> <p>Workshops and interviews with Dutch and European actors involved in EPR systems. Focus on how to improve and align the policy instrument with CE goals.</p> <p>Presentation to policy (Dutch parliament) and research organisations including the Organisation for Economic Co-operation and Development and the Dutch environmental agency (PBL), on EPR and critical raw materials and their losses within waste.</p>	<p>Competing interests and agenda particularly regarding the responsibility to lead and develop new CE activities, e.g. reuse of products.</p> <p>Data quality issues, particularly regarding the quality of waste data and reporting data, partly due to the COVID-19 lockdowns.</p> <p>Challenging to present results in the correct environments.</p>

(Continued)

TABLE 2.1 (Continued)

<i>Researcher</i>	<i>Focus</i>	<i>Methods</i>	<i>Stakeholders</i>	<i>Engagement</i>	<i>Issues</i>
Kaustubh Thapa	CE governance focusing on the EU's international waste trade in the EU, China, Nigeria and Vietnam.	Exploratory field visits and observation, Delphi survey, workshops, interviews, relationship-building, literature and policy review.	Stakeholders in the waste trade value chain, including policymakers and implementors, waste traders, processors and recyclers (formal and informal), exporters, importers, national and international non-profit organisations, universities, including these actors in waste importing countries.	Transdisciplinary: fairness-driven and solution-oriented transdisciplinary research focused on co-creating solutions.	Some challenges: navigating diverse socio-economic and cultural contexts, facilitating diverse stakeholders with different power relations, accessing waste trade data and some stakeholders for interview, adapting to online research during the COVID-19 pandemic.
Tomas Santa-Maria	Circular Business Model Innovation in incumbent firms.	Multiple case study (semi-structured interviews, on-site observation, document analysis); action design research; systematic literature review.	Ten CE pioneer incumbent firms from Austria and the Netherlands; 16 CE and innovation experts; 107 workshops participants (i.e. academics, sustainability professionals, students, start-up members and CE corporate project members); leading Austrian waste management firm and Austrian green technology economic cluster.	In-person interviews with CE pioneers; in-person secondments with leading Austrian waste management firm and Austrian green technology economic cluster; six online workshops; online feedback from CE and innovation experts.	Due to the COVID-19 pandemic all workshops were held online.

(Continued)

TABLE 2.1 (Continued)

<i>Researcher</i>	<i>Focus</i>	<i>Methods</i>	<i>Stakeholders</i>	<i>Engagement</i>	<i>Issues</i>
Anna Diaz	Circular product design in manufacturing industries.	Interview, case study, support design, experimental design.	Sustainable product managers from 15 EU-based multinational enterprises linked to the manufacturing sector; R&D managers from two multinational enterprises linked to the manufacturing sector, MSc course students.	Semi-structured interviews, in-person, 1-hour duration; semi-structured interviews, in-person, 3-hour duration; workshop participation for method testing, 3-hour duration.	The COVID-19 pandemic prevented in-person secondment at iPoint-systems GmbH and the return stay at the University of Troyes, although the deliverables of both projects were completed remotely.
Estephania Delgadillo	Circular and territorial product-service systems (PSS).	Case study including semi-structured interviews, participatory social network analysis, PSS design workshop observations.	Start-up and small and medium-sized companies (SMEs) from France (3), Switzerland (1) and Taiwan (2) (start-ups and SMEs) with pre-existing intention to innovate for sustainability a current product-service system offering or develop a new one. Participants included company directors, production managers and marketing representatives.	Two case studies were employed to explore the implementation of territorial PSS. One case study was conducted in-person (France), while the other was conducted remotely (Switzerland). In the four additional case studies (France and Taiwan), companies tested a new participatory design method to conceptualise a territorial PSS offering. These case studies were conducted remotely.	Most case studies were conducted online, and a secondment in Taiwan was impossible due to COVID-19 restrictions.

(Continued)

TABLE 2.1 (Continued)

<i>Researcher</i>	<i>Focus</i>	<i>Methods</i>	<i>Stakeholders</i>	<i>Engagement</i>	<i>Issues</i>
Natacha Klein	CE implementation in public sector organisation – national scale, Portugal.	Online survey and semi-structured interviews; document analysis.	National-scale public organisations (ministries of the Portuguese government).	Secondment with Portuguese Environmental Agency of the Ministry for the Environment and Climate Action; online survey of multiple departments; interviews for employee perspectives on CE implementation.	The COVID-19 pandemic prevented an international comparison.
Hinrika Droege	CE assessment in public sector organisations.	Document analysis, including the review of press and policy documents; semi-structured interviews; participatory workshops.	National-scale public organisations (ministries of the Portuguese government);	Secondment Portuguese Environmental Agency of the Ministry for the Environment and Climate Action; interviews for employee perspectives on CE assessment; participatory workshops to discuss and co-develop solutions for CE assessment.	
Aodhan Newsholme	Regional CE; relationship between public bodies and companies, N. Humberside, UK, Styria, Austria.	Critical discourse analysis; observations; semi-structured interviews, survey.	Local authority, economic development agencies, business organisations, large companies.	Secondment with local authority; participated in local business network in N. Humberside during the period of research; interviewed corporate and public body representatives in both locations; findings shared with national and local policymakers in the UK.	Online interviewees worked well for contacts through the network; the COVID-19 pandemic prevented a return visit to Austria.

(Continued)

TABLE 2.1 (Continued)

<i>Researcher</i>	<i>Focus</i>	<i>Methods</i>	<i>Stakeholders</i>	<i>Engagement</i>	<i>Issues</i>
Heather Rogers	Repair sector, city-scale, public opinion and self-employment, Hull, UK.	Online survey, semi-structured interviews; document analysis.	Local authority; self-employed repairers, sole traders and very small-scale employers.	Secondment with local authority, resulting in collaboration on public survey circulated by local authority (n = 740); interviewed self-employed repairers; findings shared with national and local policymakers in the UK.	Lockdowns disrupted engagement with small employers and prevented a potential international comparison. Larger companies not responsive on repair.
Malgorzata Pusz	Social enterprises and public agencies, Hull, Graz, Austria, and Santiago, Chile.	Document analysis; participant observation, semi-structured interviews; stakeholder mapping, social network analysis.	Social enterprises with a wide range of specialisms (e.g. food, textiles, furniture); some directly promoting CE activities (recycling/upcycling); others fund raising e.g. for mental health support.	Secondment with a social enterprise in Hull – part-time for 1.5 years prior to the COVID-19 pandemic; detailed stakeholder mapping in Hull and Graz, interviews in Santiago; findings shared with national and local policymakers in the UK.	To some extent, the COVID-19 curtailed the Chile case study, although some interviews were possible online.
Santiago Perez	Industrial ecology implementation and impact on sustainability of a territory, Strasbourg, France.	Case study, semi-structured interviews.	Local authority and local companies.	Secondment with the local association in charge of industrial ecology promotion and implementation.	Significant delays in research owing to the COVID-19 pandemic.

(Continued)

TABLE 2.1 (Continued)

<i>Researcher</i>	<i>Focus</i>	<i>Methods</i>	<i>Stakeholders</i>	<i>Engagement</i>	<i>Issues</i>
Erik Roos Lindgreen	CE measurement; sustainability measurement; private sector; LCA.	Case study; survey and semi-structured interviews; expert panel survey and focus groups.	CE businesses (end-users), CE measurement experts from academia and consultancies, businesses.	Experts from academia and sustainability/ CE consultancies provided feedback to the proposed framework, end-users (CE businesses) validated the application in focus groups.	Different interpretations of CE lead to a variety of understandings of what CE measurement should be; available impact assessment methods (such as LCA) are often considered as complex while simpler methods (CE metrics) do not capture an accurate estimation of all impacts.
Anna Walker	Understanding company approaches to CE as a guide to the design of assessment approaches; the Netherlands and Italy.	Online survey, semi-structured interviews.	Companies from CE networks, CE network coordinators in countries where collaborating researchers are based.	Worked with network coordinators on questionnaire design; survey distributed by networks; online interviews carried out with volunteer companies from the survey. Circulated updates and articles.	Response rate helped by engagement with networks – built up a connection with the coordinators and subsequently with the interviewees. Linguistic abilities of the team used to best advantage (Dutch, English and Italian).
Katelin Opferkuch	Development of a framework for corporate disclosure of circular CE.	Online survey, semi-structured interviews, focus groups.	Companies from CE networks.	Stakeholders help to develop recommendations that support the integration of CE within corporate sustainability reports.	Survey was not conducted in Taiwan and Portugal due to the COVID-19 pandemic and difficulties with contacting companies.

be hijacked by the powerful parties to the research. The researcher needs to navigate these challenges fairly while balancing academic roles, being accountable to the research funder, and managing stakeholders' expectations, all while constantly checking one's biases in order to stay critical (Thapa et al., 2022a). Within Cresting, Thapa's research (see Table 2.1 and section 2.4.1 below) employed a transdisciplinary approach.

If research is not transdisciplinary, there is still a range of possible levels of stakeholder engagement. Different types of stakeholders allow different possibilities. At one extreme, governmental bodies and other interest groups produce copious documents that can be studied for a representation of their views without any direct contact with the authors. Large companies and business organisations can have a significant online presence which can be a useful guide to how they want to be seen. Quantitative data can be accessed from databases providing a number of respondents and/or a timeseries far beyond the practicalities of research defined by the duration (or budget) of for example a PhD (i.e. secondary data). Public documents and data sets yield information without the complexities of directly engaging with stakeholders, but can nonetheless provide rich insights from the analysis and comparison of interest to the stakeholders as well as the researchers (Calisto Friant, 2021, 2023; Newsholme et al., 2022; Opferkuch et al., 2022; see Chapter 3 in particular and also Chapters 5 and 6 in this volume), and can be a guide to subsequent primary data collection.

Some types of stakeholders have a much smaller digital footprint, so the researcher will need to collect the data directly (i.e. primary data) to capture their views and experience. In any case, collecting primary data allows the researcher to customise the research questions and to solicit opinions from stakeholders who may be happier to share anonymously than they are to report in public documents (e.g. why certain actions were undertaken, what were the challenges, what might they have tried that was not successful). Most Cresting ESRs used a combination of methods including interviews (primarily semi-structured) as a data source (Table 2.1). Several researchers additionally, or alternatively, used a form of workshop or focus group as a means to either co-creating data or testing CE assessment of action on potential users (Table 2.1 and discussed below). In all these approaches there is a direct meeting of researcher and research participant (in some cases online because of public health restrictions). An intermediate level of engagement comes with questionnaire surveys, where individual respondents are aware of the research but generally are not in direct communication with the researchers. In some cases, partners facilitated the distribution of online surveys e.g. to governmental colleagues or, at the other end of the power scale, to members of the public. Surveys can be a gateway to a closer level of communication, e.g. with the possibility to volunteer to be interviewed or to receive follow-up information.

The COVID-19 pandemic had notable effect on the research. The government-enforced lockdowns in 2020–2021 considerably reduced engagement, especially face to face. Secondments and other participatory experiences were reduced along

with use of face-to-face workshops that could have been excellent occasions for personal network building for all involved. Conversely, the switch to online activities, especially for focus group activity, broadened participation allowing participation from different regions and locations. However, while large organisations (public and private sector) remained accessible for interviews, small organisations and individuals were more difficult to reach than might have been the case in person. This does impact on the balance of perspectives obtained. We try to make some allowance for the impact in our analysis, but equally we endeavour to avoid over-interpreting the minority perspectives obtained.

The following section provides an insight to the methods and stakeholder engagement of four projects. For full details of the methods employed by the various projects, publications and/or theses can be consulted. [Table 2.1](#) provides a summary of all the approaches used across Cresting. Each chapter briefly indicates the methods used for the relevant work.

2.4 Examples of stakeholder engagement and data collection

2.4.1 *The case for just and circular management of the EU's exported e-waste in Nigeria*

This research aimed to understand the practices and challenges posed by used electronic and electric equipment (UEEE) imported to Nigeria from the European Union. 'Reuse' is a circular value retention option that offers major environmental benefits through minimal processing and extends the functionality and, thus, the durability and lifespan of products ([Reike et al., 2018](#)). The research aimed to assess the extent to which these benefits apply when items for reuse are being transferred to a different spatial context and to understand the environmental and social implications of such international-scale trade for reuse. Together with stakeholders, researchers explored this UEEE value chain and mapped actors and policies to get an overview of its governance.

The study used a transdisciplinary approach to integrate interdisciplinary scientific knowledge with the knowledge of the societal actors to co-create solutions ([Brown et al., 2010](#); [Vermeulen and Witjes, 2020](#); [Thapa et al., 2022a](#)), which could be useful for navigating sustainability challenges ([Brown et al., 2010](#); [Vermeulen and Witjes, 2020](#); [Thapa et al., 2022a](#)), in addition to change-making ([Gibbons et al., 1994](#); [Leavy, 2011](#)). Various transdisciplinary principles ([Witjes and Vermeulen, 2021](#)) and insights from the transboundary waste movement literature ([Thapa et al., 2023a](#)) guided the research. Using the emergent transdisciplinary process, we relied on hunches to adapt the research to contextual needs and challenges whenever necessary ([van Breda and Swilling, 2018](#), [Thapa et al., 2022a](#)). Hunches are a culmination of researchers' intuition and positionality, past knowledge and experiences, theoretical knowledge and embeddedness in the research context that guides the research forward – equivalent to retroduction in critical

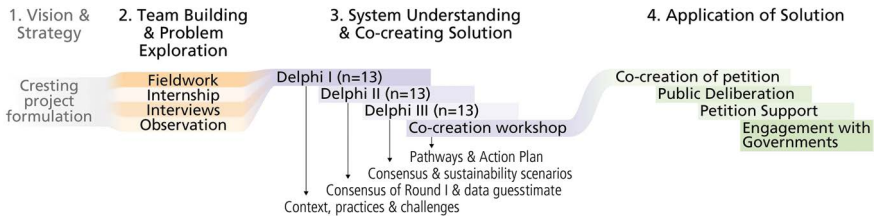


FIGURE 2.1 Stakeholder engagement in the research process to enable team building and problem exploration, system understanding and co-creation of solutions, and application of knowledge

Source: Figure 1 in [Thapa et al. \(2023b: 35\)](#) used under CC 4.0.

realist terminology (see [Fletcher, 2017](#) for an example). Researchers took on multiple roles as the need arose, including facilitator, coordinator, mediator, co-learner and researcher. Rather than imposing non-contextual solutions, this fairness-driven research aimed to foster a safe space for collaborative engagement, learning and collectively envisioning a circular and just future within the specific context.

The research can be divided into four phases (see [Figure 2.1](#)). The vision and strategy phase, writing and securing a grant to start the Cresting project and hiring a PhD, enabled other phases. Phase 2 involved a month-long exploratory field visit to Nigeria in August 2019 to immerse in the research context and to identify stakeholders and build relationships. This consisted of interactions with government, businesses, formal and informal recycling centres and academic institutions in Ibadan, Abuja and Lagos and a short internship with the Basel Convention Coordinating Centre for the African Region responsible for e-waste management in West Africa.

Phase 3 lasted from June 2020 to December 2022, during which time the COVID-19 pandemic rendered it impossible to return to Nigeria to undertake the originally planned fieldwork. Thus, we adapted the research online to engage with stakeholders. Three Delphi ([Dalkey and Helmer, 1963](#)) rounds ($n = 24$) and three Art of Hosting guided workshops ($n = 16, 8, 5$) facilitated multiple consultations and confirmation rounds. In addition to academic knowledge creation, this research phase was designed to foster consensus among stakeholders, aiming to generate both social and scientific legitimacy. Guided by these legitimacies, Phase 4 of the research involved taking the co-created knowledge and solutions to society for the generation of actionable measures. This took the form of (a) a petition co-written with stakeholders to recommend and demand necessary changes ([Thapa et al., 2021](#)), (b) a policy brief for policymakers advocating change ([Thapa et al., 2022b](#)), and (c) a YouTube video ([Utrecht University, 2021](#)), a press release ([Utrecht University, 2022](#)), and articles and interviews to inform a wider audience about the research, its findings and the implications thereof.

Looking back, this fairness-driven transdisciplinary approach enabled us to address an unequal trade scenario where influential actors exploit structural inequalities.

In this case, Nigeria's reliance on UEEE imports for digitalisation results in the externalisation of toxic e-waste from the Global North to a less equal country already struggling with domestic waste management. Despite European producers being responsible for their waste through Extended Producer Responsibility (EPR) policy, about one-third of all EU-shipped UEEE is e-waste in disguise, and the rest becomes e-waste after a relatively short lifespan, disproportionately affecting poor and marginalised workers in the informal waste sector and causing socio-ecological harm in Nigeria. In this context, transdisciplinary research enabled us to integrate interdisciplinary perspectives of justice and equity into the CE transition research through facilitated collaboration with various value chain stakeholders globally for change-making, and thereby being guided by local social, cultural, economic and political contexts. This contextual and nuanced understanding with scientific and social legitimacy guided the co-creation of recommendations such as ensuring that the EU exclusively trades functional and durable UEEE; integrating circular opportunities like repair, reuse and refurbishment across the value chain; holding European producers accountable for their UEEE exports through circular and ethical policy, as discussed in Ultimate Producer Responsibility (UPR); and incorporating consideration for global socio-ecological impacts of the EU's circular economy transition in discourse, policies and practices. UPR and its aspects are incorporated in university lectures, UN reports, politicians' and policymakers' discussions, and government and non-governmental actors' programmes. Without the transdisciplinary ethos which emphasises the societal impact of academic research, it is likely that the research output would be limited to the thesis chapter and academic publications. Implementation, however, requires uptake by the Global North parties at least implicitly benefiting from the current arrangements.

Relationship building including trust is fundamental to engagement with stakeholders for co-creation. In our case, we had to navigate different cultural and socio-political contexts first. For this, we partnered with the University of Ibadan in Nigeria for the research collaboration, which hosted us and helped us to build legitimacy and trust. Adapting the research online enabled wider participation and flexibility. However, the embeddedness of the researcher in the research context was virtual, which compromised enabling qualities for transdisciplinary research like trust building and using abductive reasoning. The researchers consider in-person month-long field visits essential for the co-created solutions (see Thapa et al., 2023) and doubt that the research would be rich and socially legitimate without the relationship built during the month-long field visit. The output could have been more robust if some of the stakeholders were in the informal sector, to whom some of European waste management responsibilities are shifted unfairly. Even with an explicit focus on fairness, our research failed to incorporate the marginalised informal sector. Since most of the research work was adapted online during the COVID-19 pandemic, it posed a challenge to incorporate informal sector workers, who have limited access to technology. Without a physical presence, building relationships and trust online seemed impossible. Even though some stakeholders who closely worked with the

informal sector represented their voices, the research lacked their active participation. See [Chapter 6](#) for further consideration of the findings from this research.

For the benefit of fellow transdisciplinary researchers, we outline six interconnected challenges and lessons learned from this research. These encompass building trust, adapting to the research process, navigating institutional and academic epistemic cultures, balancing the researcher's role, and monitoring progress and legitimacy ([Thapa et al. 2022a](#)).

2.4.2 *The case of Dutch and Italian companies from circular networks*

A major task of the Cresting project was establishing and selecting the most suitable assessment procedures for circular inter-firm networks. Therefore, a literature review of the available approaches was conducted first ([Walker et al., 2021c](#)), featuring assessment approaches that were developed in the fields of circular supply chain management and industrial ecology, due to the conceptual proximity of the fields. In parallel, a survey was developed to capture the assessment approaches of companies in CE networks in Italy and the Netherlands. The aim was thereby to juxtapose academic propositions with actual practice. This research has a normative motivation which is to facilitate the assessment processes in companies. Companies therefore had the role not only of providing the information to help to develop the assessment process, but also to understand how they would approach using it. As part of this research process, companies were surveyed for their understanding of CE and its relationship to sustainability, which provides a more general insight to their attitudes and constraints that can be useful to contribute to our understanding of the causal mechanisms influencing them (i.e. an analytical goal alongside the normative one). This level and form of stakeholder engagement is not a transdisciplinary approach as there was no joint setting of questions or analysis ([Vermeulen and Witjes, 2021](#)), albeit that such engagement can be a useful preliminary to a more collaborative phase of research. When interacting with companies, special attention was attributed to the style of communication (bi-directional or unidirectional/formal and informal) as proposed by [Jolibert and Wesselink \(2012\)](#). Below, the stakeholders as well as the ways of interacting with them are presented.

The research combined both quantitative and qualitative approaches: a semi-quantitative survey and semi-structured interviews. The questionnaire survey gauged how companies perceive the relationship between CE and sustainability; how they assessed these two concepts in their operations and products; and what barriers and drivers to CE they observed. Purposive sampling was used to identify companies actively engaged with CE practices in Italy and the Netherlands ([Hibberts et al., 2012](#)). Thus, only companies that were members of existing national and international CE networks were included, as it was assumed that these companies engaged with CE. Web-based surveys distributed via pre-defined lists have been shown to have the highest respondent rates, as following up with reminders is facilitated and invitations can be personalised ([Lozar Manfreda et al.,](#)

2008). Drawing on the language capabilities of the team, the survey was delivered in English, Italian and Dutch through the online survey tool SurveyMonkey (2021), with personalised email invitations and was open for three months in 2019. To distribute the survey, contact was established with the coordinators of the CE networks. A total of 155 valid responses were received, a response rate of 19%. Certain features were added to make the online survey more accessible: an official letter of invitation, signed by two professors, and a brief introduction, structured in short paragraphs, underlining the main aims of the survey, the information required from the respondents as well as data confidentiality, complemented with a data privacy form (Manzo and Burke, 2012). In keeping with the ethical guidelines that Cresting followed, respondents could skip any questions that they did not wish to answer, which furthermore reduced the chances of people pre-emptively abandoning the survey (ibid.). It is likely that the overall and individual question response rates were supported by the relevance of the survey to the target group (Albaum and Smith, 2012); automatised reminders sent two weeks later also elicited further responses. At the end of the survey, respondents had the option to stay informed about the results of the research (i.e. including insights from their business peers) which probably provided a further incentive for participation (Andrews et al., 2003), as well as comprising a step towards direct engagement between the stakeholders and the researchers.

The qualitative research comprised interviews with survey respondents who volunteered via the survey. This phase of the research provided insight to the survey responses, which helped to identify the underlying reasons for responses (Flick, 2009). It was important to understand how companies perceived the relationship between CE and sustainability, how they assessed these two concepts in their operations and products, and what barriers to and drivers of CE they observed. The interview sample ($n = 43$) consisted of a subset of the survey respondents, i.e. all those who, at the end of the survey, opted in for an interview. These interviews were conducted during a two-month period in 2020 through video calls. Drawing on the language strengths of the research team, interviews were held in English, Dutch and Italian. Loubere's (2017) Systematic and Reflexive Interviewing and Reporting method was therefore applied. This method requires scholars to hold frequent meetings to discuss the findings and impressions of the individual interviews, instead of writing and analysing full transcripts. To avoid interviewer-related errors, the interview recordings were then revisited, and the notes revised, if necessary, and translated into English. Thereafter, the notes were jointly analysed and coded inductively, while quotes which encapsulated the major themes emerging were selected. These *ad verbatim* quotes were then verified with the interviewees, creating another point of interaction through email.

This research process provides a good example of two-way exchange with research subjects (Sayer, 1982). The survey provided the pretext for the researchers to get in contact with CE network coordinators as well as their members, building relationships through preliminary meetings and offering the survey respondents updates on the progress of the research. During the interviews researchers

were able to form closer relationships with the companies. Many companies were interested in the final research results and reiterated their wish to stay informed. Therefore, the survey has established a communication channel to directly provide the companies with updates on CE and sustainability assessment research. Some respondents have also become personal contacts on LinkedIn. They are informed periodically when a new research output becomes available, such as an interim survey report, a blogpost on CE companies and COVID-19, as well as scientific articles (Roos Lindgreen et al., 2022; Walker et al., 2021b, 2021a). This research has also enlarged the pool of potential case study companies for the next research steps or members of focus groups as discussed in the following section. Chapter 4 in this volume includes a discussion of the results.

2.4.3 *The case study CE assessment framework: SCEIA*

One of the Cresting projects (see Roos Lindgreen in Table 2.1) undertook to design and validate an assessment framework that guides companies with the measurement of their CE impacts. The basis of the Strategic Circular Economy Impact Assessment (SCEIA) framework was established through a critical literature review on the links between CE and sustainability, also utilising strategic decision-making literature. A set of five framework objectives were formulated, and appropriate methods selected that made it possible to fulfil these objectives. These five objectives were (1) to facilitate a holistic (multidimensional) assessment; (2) to prevent burden shifting to other parts of the supply chain or life cycle (life cycle perspective); (3) to provide flexibility in terms of (a) scale and (b) sustainability maturity; (4) to build on existing assessment tools such as LCA; and (5) to assist in strategic decision-making processes. For this stage of the research, a more active kind of stakeholder engagement was needed.

A fundamental aspect of the design of the framework was, as is reflected in the framework's objectives, to guarantee methodological soundness and practical feasibility. In other words, the challenge was to balance the tension between giving an accurate picture of sustainability impacts, while remaining usable for companies. We aimed to incorporate these principles through validating the preliminary framework through two forms of collecting qualitative data on its practical usefulness through dual triangulation, thereby enhancing its effectiveness (Cornwall and Jewkes, 1995): an expert panel survey and focus groups.

A survey was designed to collect feedback from a specific group of knowledgeable participants: an expert panel of private sector and academic experts in CE assessment at corporate level (Blessing, 2002; Kravchenko et al., 2021). The four private sector experts had experience of designing and applying CE assessment frameworks for consultancy companies, while the seven university experts had been involved with building the scientific foundation of CE and sustainability assessment through the publication of scientific articles.

The feedback process focused on the methodological set-up of the framework, and was structured according to the expert panel validation steps as described in

Beecham et al. (2005): (1) defining the objectives of the assessment framework; (2) designing the validation instrument, namely a written survey that presented the framework and allowed the participants to provide feedback; (3) composing a relevant expert panel; (4) providing the participants with the survey and an 'information package'; (5) collecting and analysing the responses; (6) interpreting the expert survey results to gain an impression of the strengths and weaknesses of the framework, and adjusting the framework accordingly. The expert survey itself consisted of three parts. First, a covering letter explained the research objective of the project and the expected role of the expert survey participants. Then, the CE assessment framework itself was detailed in a PDF of the 'information package'. The survey was presented in Microsoft Excel and sent by email. It contained open fields to collect expert's comments or amendment proposals related to the proposed methodology for each of the application steps. The closing part of the survey was designed to collect feedback on the five objectives of the framework. All the collected feedback was evaluated, and suggestions were incorporated when indicated by a majority (>50%) of participants.

In the second triangulation step, the revised framework was validated using feedback from its envisioned end-users through focus groups: a selection of five companies motivated to assess their CE impacts. They delivered their considerations to the different parts of the framework through various online focus group sessions (Nyumba et al., 2018). This method comprises a form of 'consultative participation', as practitioners are asked for their opinions and are consulted by researchers before interventions are made (Cornwall and Jewkes, 1995). The focus group approach was conceived as a strategy to bridge scientific research and 'local' knowledge, with local referring to companies that might be interested in applying the framework (Nyumba et al., 2018). The companies that were selected are both European (Italy and France) and African (Tanzania, Ghana). They consisted of a mix of limited and wide experience with CE and sustainability assessment. For practical reasons, the online focus groups were divided over different sessions, each with 1–2 participating companies. Before each focus group, 30- to 60-minute interviews were held with each company to better understand their business context and assessment experience. The focus group consisted of the following parts: (1) 15-minute introduction and context; (2) 5-minute explanation of the objectives of the framework; (3) 20-minute outline of the framework's application steps and test case example; (4) 15-minute clarification questions; (5) 15-minute discussion of the objectives of the framework; (6) discussion of the framework's feasibility; and (7) round-up and conclusion.

The sessions were recorded and viewed afterwards to complement the coding notes taken during the focus groups. The results were obtained by applying thematic analysis on two levels (Guest et al., 2014; Massey, 2011): using (i) articulated data and (ii) emergent data. The first level of data was acquired by asking the participants direct questions related to the framework. These questions focused on the framework's clarity, its ability to respond to the set objectives, and the company's

barriers to application of the framework – and of CE and sustainability assessment in general. The answers to these questions were addressed directly and then coded for analysis. The second level of data, emergent data, was acquired through analysing and interpreting the information provided by the companies ‘in between’ the direct questions that were asked – through, for example, stories and anecdotes. Emergent data therefore capture themes that are important to the participants, but that are invisible prior to the study (Massey, 2011). Chapter 4 in this volume includes further discussion of the framework.

As stated above, the validation exercise was undertaken with companies which had at least limited (in some cases extensive) experience of assessment and a prior interest in CE. While that was important in refining the framework, further work is needed consider support for inexperienced companies and to produce a self-assessment process to assist companies in understanding which capabilities they need to develop further.

2.4.4 Contribution of social enterprises to the CE

This project sought to examine the actual and potential contribution of social enterprises to CE activity using the city of Hull, UK, as the case study location (Pusz, 2023).

2.4.4.1 Social Network Analysis

Social Network Analysis (SNA) seeks to identify and study, both qualitatively and quantitatively, complex relationships among organisations (Wasserman and Faust, 1994). Complementary to the critical realist approach, SNA can enable researchers better to investigate (through a combination of extensive and intensive methods) causal relationships and power structures underpinning networks for the CE, knowledge of which can result in more informed policymaking. Following Sayer (1982), extensive methods seek to identify patterns and properties (typically drawing on quantitative approaches, providing concise data on multiple examples). Intensive research seeks addresses ‘how’ and ‘why’ questions, for which qualitative methods are preferred as they provide greater in-depth insight from typically fewer examples than extensive research. Whereas extensive research enabled Pusz et al. (2023) to identify general patterns and characteristics of the mapped *social circular enterprise ecosystem* landscape in Hull, intensive research enabled them to identify causal relationships behind particular attributes of organisations in that ecosystem. Intensive research also enabled them to uncover the contingent conditions prompting those organisations to undertake activities aimed at fostering local development of the CE. SNA hence provides an additional route to engage stakeholders in research relating to the application of CE principles in particular organisations.

In Pusz (2023) and Pusz et al. (2023) SNA involved a combination of semi-structured interviews with a visual method of mapping inter-organisational flows

of (in)tangible resources, actors and values, which enabled the researchers to uncover structural properties of organisations' individual connections (i.e. 'ties') with external actors, i.e. ego networks. The data, comprising respective ties between social enterprises (SEs) and other actors, was obtained via semi-structured interviews. Out of approximately 74 SEs identified using snowball sampling and an online search, 40 agreed to participate in the study and it was possible to map the ego networks of 31 of these SEs to the researcher's best ability. Those SEs were categorised into the following key ten clusters/categories to highlight cross-cluster linkages for the development of a socially inclusive CE: (1) food; (2) furniture; (3) clothing and other textiles; (4) arts and crafts (wooden/textile/cardboard/other); (5) construction/housing; (6) hygiene; (7) electronics; (8) disabled; (9) elderly; and (10) mixed/other (in terms of materials). Some 'clusters' were hence distinguished on the basis of client/beneficiary (e.g. elderly). Some of the less dominant categories represented by the same SEs, and which were likewise distinguished on the basis of client/beneficiary, were as follows: mentally struggling; ethnic minorities; homeless; ex-offenders; prisoners; vulnerable youth; children; refugees and asylum seekers; unemployed; vulnerable women; and alcohol addicts (Pusz 2023). Crucially, these clusters with underlying cross-sector interlinkages and respective ego networks served as a departure point for disclosing many other existing and potential cross-sectoral linkages for the CE.

When collecting data, researchers asked interviewees to report their ventures' links to particular actors based on (1) (in)tangible resources being accessed/shared, i.e. using the 'resource-generator technique' (Hansen, 2009), (2) levels of trust, and (3) frequency of interaction (to some extent). Some interviewees were provided with a roster showcasing approximately 130 social sector organisations to aid identification of ties. They were also asked about their most important connections to social, public and private sectors, respectively. The network data were additionally complemented with secondary data sources, particularly social media websites of respective enterprises. Identified ties were then transferred into a matrix in Excel spreadsheets and converted into a graph using online kumu.io software, which additionally enabled researchers to calculate the strength of relationships and organisations' relative level of connectedness (see Pusz et al. 2023). The generated network graph was complemented with a geographic map showcasing spatial positioning of respective SEs under study (see Pusz et al. 2023). Nonetheless, given that SNA is data-intensive, the network map is not exhaustive, but strongly indicative of the broader social circular enterprise ecosystem in Hull at the time of the research. For example, some SE managers were unwilling to share all the names of their connections due to confidentiality reasons and time constraints. Moreover, as interviewees probably identified the most important collaborations in their view, potentially unidentified ties could be significant to the diffusion of CE innovations across the wider network. Furthermore, some of the mapped ties are temporary (though they may occur periodically over an extended period of time). Information on past connections is especially difficult to retrieve from 'mental archives' of

research participants (Walsh and Ungson, 1991), some of whom had not necessarily worked for a given SE since its conception. Finally, another SNA-related issue concerns legacy meaning that the co-created social network map requires maintenance and updates to render further benefits in the future.

Key outcomes of this method fostered the understanding of key structural characteristics of the social circular enterprise ecosystem in Hull, including positions of influential actors within the network. SNA helped to explain how particular network ties not only enable the development of CE, but also how they could potentially be instituted to foster the adoption of CE thinking and practice. SNA thus helped to better assess the (collaborative and organisational) capacity of respective SEs to incorporate CE principles into their mainstream activities through (existing and potentially existing) network connections. SNA also enabled researchers to identify structural holes within a given network (i.e. potential connection links between specific actors/organisations), as well as brokers who (could) foster knowledge spillovers and formation of cross-sectoral networks (cf. Burt 2004). Such information is vital to know how to foster (re-)circulation of relevant resources (e.g. materials and knowledge), and hence diffusion and development of social circular innovations. SNA also helped to demonstrate the formation of (inter-)organisational social capital (i.e. differential levels of trust), which impacts the collaborative capacity for CE development. Nonetheless, considering the data-intensive nature of SNA, it was impossible for the researchers to obtain levels of trust for each tie (i.e. when using the Likert scale from 1–5, whereby 5 indicated the highest level of trust). Trust was thus not measured quantitatively but, instead, qualitatively (through semi-structured interviews). By adopting SNA, it was also possible better to demonstrate the interplay of actors across formal/mainstream-informal/alternative economic spheres (see Lekan et al. 2021). However, as SNA does not enable researchers to depict the broader social, economic and environmental settings in which organisations are embedded, this approach was complemented and enriched with a critical realist approach (Pusz, 2023).

Overall, SNA results helped researchers to discover a collaborative common ground and connectivity within the broader complex ecosystem whereby the mapped SE ecosystem in Hull can help to challenge any possible ‘silo mentality’ that often prevents diverse actors from noticing broader existing and potential cross-sectoral interconnections. Presumably, such ‘systemic awareness’ could motivate diverse stakeholders to stay connected and work towards shared goals (cf. Staicu and Pop, 2018). Linked to this, the results are expected to encourage decision-makers to invest in social infrastructure in such a fashion that it is possible to unlock the potential for more local and community-driven circularity in the city.

2.4.4.2 Value mapping

SNA-related mapping of actors and resource flows can be complemented with value-mapping sessions. Pusz (2023) used this method to map value outcomes associated

with the performed activities of respective enterprises in order to improve knowledge of circuits of value underpinning the local development of the CE (see also [Lekan et al., 2021](#)). [Lee et al.'s \(2004\)](#) circuits of value draw on ideas from the diverse economy literature ([Gibson-Graham, 2008](#)), which examines the potential of non-financially driven transactions (i.e. based on social desirability and usefulness, rather than economic value). Examples include voluntary work, product/time sharing either within the formal charity/social enterprise sector or individual/community arrangements. These social flows of value comprise Lee's circuits of value (2013). Within Cresting, [Lekan et al. \(2021\)](#) undertook value mapping to examine the role of circuits of value in the development of a local CE.

Value mapping was applied by [Pusz \(2023\)](#) to two case study SEs, namely *heidenspass* (Graz, Austria) and Rooted in Hull (Hull, UK), and was facilitated by the Value Mapping Tool (VMT). Developed by [Rana et al. \(2013\)](#), VMT is a subjective value-mapping technique used better to identify value creation, delivery and capture, and hence value outcomes associated with organisations' activities. VMT distinguishes four conceptions of value: (1) current value proposition of a company; (2) value destroyed (i.e. negative social or environmental impacts) that may be reconceptualised as (3) value missed (i.e. under-utilised assets, resources, capabilities and failure to capture value, e.g. due to competitors); and (4) opportunities for new value creation (i.e. new value-generating activities, complementary relationships, and network reconfigurations). In [Pusz's \(2023\)](#) research, the VMT aided the mapping of use and exchange values attached to flows of labour, materials and money in the local CE, and ensured that the study incorporated perceptions of value outcomes across the social, environmental and economic dimensions of sustainability.

Entrepreneurs were additionally asked to identify the desired value in their actions to prompt them to think about a desired future prior to exploring respective circular scaling pathways and feasibility of pursuing thereof. Overall, VMT painted a largely enterprise-centric picture as the mapping exercise highlighted *heidenspass* and Rooted in Hull employees' perceptions of value outcomes associated with their activities for (1) young employees, (2) private firms, (3) customers, (4) the environment, (5) society and (6) local authorities. Such an approach illuminated the more intangible aspects associated with participants' perceptions on their work environment and work activities. More specifically, the VMT served as a means of untangling and interrogating circuits of value underpinning tangible and intangible resource flows whilst identifying any potential and existing threats/risks associated with respective stakeholders and external conditions in the local CE development (see [Lekan et al., 2021](#)). The outcomes of this approach are considered in [Chapters 6 and 8](#) in this volume.

2.5 Conclusions

This chapter has presented the overarching philosophy of the project, discussed the approaches to stakeholder engagement and provided some in-depth examples

of those approaches and associated methods of data collection, co-creation and the validation of ideas emerging from the research.

Critical realism provides the philosophical approach through which we seek to identify the underlying causal mechanisms and relationships which are influencing our empirical observations. By acknowledging and contextualising diverse perspectives, while simultaneously seeking to judge their reflection of an objective reality, critical realism provides an ideal foundation for both understanding the present and steering a path to a desired future. This approach does not presuppose particular methods; the examples presented in this chapter have illustrated some of different approaches that can be used to build an understanding of the wide range of issues relevant to a CE.

Research enables the building of knowledge relating to stakeholders to different aspects of the CE. Stakeholders were variously involved in the co-design of a project (transdisciplinary approach), and as questionnaire survey and/or interview respondents providing insights to their behaviour, motivations and constraints. Stakeholder groups also help to refine and validate normative frameworks for CE implementation (including assessing impacts). The approaches used with large organisations (public and private sector) have demonstrated the benefits of combining the extensive (e.g. survey of opinions/behaviour) with intensive methods (e.g. interviews to explore motivations and understandings). This combination allows a rich picture of what is happening as well as a route to developing/maintaining a relationship with a number of stakeholders. The style of engagement was impacted by the outbreak of the COVID-19 pandemic; some aspects of the research survived the switch to online working with little alteration, others required adaptation. This exacerbated the already challenging take of reaching the most marginalised stakeholders, e.g. the informal sector in Nigeria.

Each individual project within Cresting offers insights to a particular aspect of the implications of implementing a CE. They cast light on the issues through the lens offered by the perspectives of certain stakeholders in certain locations and operating at various scales from local to global. In this volume we are seeking to deepen comprehension of the mechanisms mediating the societal impacts of a CE, and simultaneously the societal influences on a CE, by drawing on the multiple perspectives offered by the different projects.

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3

NAVIGATING DIVERSE UNDERSTANDINGS OF A CIRCULAR ECONOMY

*Walter J.V. Vermeulen, Martin Calisto Friant,
Kieran Campbell-Johnston and Natacha Klein*

3.1 Introduction

The meaning of the circular economy (CE) has recently become an important facet of the sustainability debate. It proposes a new economic model, in which material resources are circulated with various aims and intentions for those involved, including ecological balance, economic prosperity and social fairness. However, the CE concept is not a new one, as we will elaborate in section 2. Instead, the CE is to be understood as an evolutionary concept. Various authors have described at least three historical periods with specific interpretations of the concept ([Blomsma and Brennan, 2017](#); [Reike et al., 2018](#); [Schögl et al., 2020](#)). The current framings of the CE build on various interrelated aspects of waste management and product policy over the past 30–40 years. These framings also vary in relation to their practical manifestation of the CE at the macro, micro and meso level ([Ghisellini et al., 2016](#)). Commonly a distinction is made between the *macro-level CE*, e.g. a city, province, region or nation, where we see zero waste programmes, municipal and national solid waste strategies, among others; the *meso-level CE*, e.g. the interplay between multiple firms in a defined geographical location or territory, often through industrial symbiosis exchanges, e.g. energy, waste and water in eco-industrial parks; and the *micro-level CE*, with a focus on products, the producing companies and consumers, with topics like circular eco-design and cleaner production practices, cradle-to-cradle design, and consumer behaviours. One can ask whether this distinction is adequate or not; for example, where specifically do we put the global flows of waste and to-be-recycled materials and products from the global-scale metabolism? But the key point here is that an understanding of what the CE is depends on (i) where one looks in the complex socio-economic ecological system and (ii) which disciplinary perspective one takes ([Reike et al., 2018](#)).

R0 → R9:
Hierarchy of CE options for consumers and business

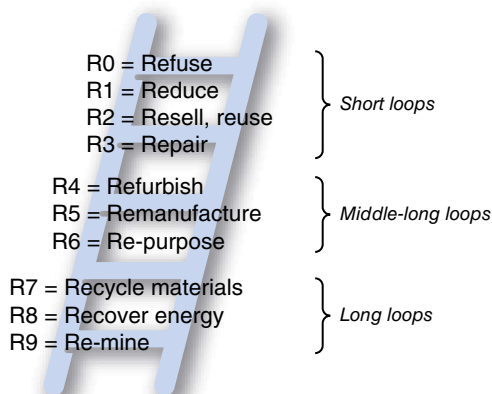


FIGURE 3.1 Hierarchy of value retention options: The 10 R's

Source: Reike et al. (2018).

These are the key themes for this chapter ([Chapter 6](#) in this volume addresses the relevance of places and in particular the complexities of scale drawing on interactions with a range of stakeholders).

Efforts have been made to synthesise the views on the wide range of practices now considered to comprise the CE. In their review, [Reike et al. \(2018\)](#) combined the diverse practices from various related disciplines into the hierarchy of the 10 Rs (Refuse, Reduce, Reuse/Resell, Repair, Refurbish, Remanufacture, Repurpose, Recycle materials, Recover energy, Re-mine), ten strategies for potential action by producers and consumers (see [Figure 3.1](#)). Conceptualising the CE as comprising these diverse activities, which previously were seldom considered to be closely related, helps to progress the transition to a CE by acknowledging its roots. One of their main observations is that attention so far has been focused on mass material recycling, often in the form of downcycling (R7, R8), and that more attention on the shorter and slower loops is needed (R0, R1, R2, R3). We address this further below, and discuss the framework created for the Cresting project in [section 3.2](#).

The diversity in historical, contextual and ontological starting points in CE analysis further explains the extensive diversity in the definitions of a CE. According to [Kirchherr et al. \(2017, 2023\)](#), currently there are 221 definitions. One can say that the concept is confusing, vague and/or contested. This does not help companies and governments to take substantial steps in the right direction and to develop coherent strategies and practices (a similar problem exists with comparable concepts, such as sustainable development; see [Vermeulen, 2018](#), p. 60). One of the most well-known definitions of a CE stems from the context of advising the business world

(Ellen MacArthur Foundation, 2013). This definition focuses on material cycles, emphasising the closing, slowing and narrowing of material and energy loops and the potential economic gains (Geissdoerfer et al., 2017). Other definitions, often from academic communities, more explicitly connect the CE to sustainability, including economic, social and environmental considerations (Kirchherr et al., 2017; Korhonen et al., 2018; Leipold et al., 2023; Murray et al., 2015; Prieto-Sandoval et al., 2018).

This connection between sustainable development and the CE has been examined widely, with researchers arguing that both concepts emphasise notions of intra- and intergenerational equity as a consequence of environmental hazards (Genovese and Pansera, 2021; Padilla-Rivera et al., 2020; Thapa et al., 2023, 2024; Velenturf and Purnell, 2021). Views on both sustainable development and the CE emphasise the role of regulation and private actors as essential for driving change. But dominant CE discourses have focused on closing resource and material loops in value chains (R4–R9), at the risk of neglecting the broader goals of sustainable development. The benefits of mainstream CE approaches are framed in a narrative of economic and environmental ‘win-wins’, while sustainable development is inherently more holistic regarding its three social, environmental and macro-economic pillars (Geissdoerfer et al., 2017). Consequently, these approaches have been criticised for failing to explore the basic assumptions, values, societal structures, cultures and underlying worldviews that underpinned the discursive and practical manifestations that call themselves the CE (Korhonen et al., 2018). This has led others to focus on the social and institutional contexts that shape CE practices (Moreau et al., 2017).

In this chapter, we present recent developments on understanding the CE in this broader context based on a discourse analysis of documents representing national- and city-scale public and private sector perspectives. We also report on a global survey of public opinion on the CE. The discussion connects the CE discourse to broader sustainability issues and issues of social justice.

3.2 The four main views of the circular economy

In the introduction to this chapter we claimed that the notion of the CE is not new. One can indeed state that for the large part of humanity’s presence on Earth we have lived in circular societies, where material and energy flows circulated sustainably, in harmony with the natural cycles of the Earth. It was only during the Industrial Revolution, and more intensely after the Second World War, that this balance was broken through the creation of growth-dependent economic structures and the increasing use of fossil fuels.

Shortly after the end of the Second World War, scholars started to investigate the consequences of industrial capitalism on the Earth and its human and natural ecosystems. This is when the modern precursors to the CE concept emerged, with

key publications such as *Economy of Permanence* (Kumarappa, 1945), *The Limits to Growth* (Meadows et al., 1972), *Small is Beautiful* (Schumacher, 1973), *Post-scarcity Anarchism* (Bookchin, 1971) and *Tools for Conviviality* (Illich, 1973). Barry Commoner's *The Closing Circle* (1971) is perhaps the first book in which the idea of a circle is used to illustrate a sustainable society, one where material and resource flows circulate in an environmentally sustainable and socially equitable way.

Another key historical period for the development of the CE was the 1990s, especially with the emergence of the field of industrial ecology (Frosch and Gallopoulos, 1989). During this period new concepts were established, such as industrial symbiosis (Chertow, 2000), biomimicry (Benyus, 1998), product-service system (Goedkoop et al., 1999), reverse logistics (Rogers and Tibben-Lembke, 1998), and extended producer responsibility (Lindhqvist, 2000). This literature emerged at the same time as neoliberal economic thinking, therefore most of these concepts connected to market-driven approaches and gave little attention to key social justice and equity considerations. Nonetheless, they brought important insights into new technologies and innovations to recover industrial and household waste and to improve the environmental performance of products and services.

During the 2000s many new CE concepts emerged, with a more holistic and socially inclusive approach to consumption and production such as the natural step (Robèrt, 2002), performance economy (Stahel, 2010), cradle to cradle (McDonough and Braungart, 2002), degrowth (Latouche, 2009), permacircular economy (Arnsperger and Bourg, 2017), symbiotic economy (Delannoy, 2017), simple living (Alexander, 2015), buen vivir (Gudynas and Acosta, 2011), ecological swaraj (Kothari et al., 2014) and doughnut economics (Raworth, 2017). Considering the above history and diversity, the CE can be best understood as an umbrella concept, which combines and embraces many key elements of sustainability thinking.

To help navigate this plurality in CE thinking, Calisto Friant et al. (2020) developed a 2×2 typology of circularity discourses (see Table 3.1).

This typology divides circularity discourses in two main criteria. First, it distinguishes *segmented* discourses, which focus on the technical and business components of circularity, from *holistic* discourses, which include social justice and political empowerment. Second, it divides *optimistic* and *sceptical* perspectives regarding the possibility of decoupling environmental degradation from economic growth (eco-economic decoupling). Different combinations of these two criteria lead to four main circularity discourse types:

- *Reformist Circular Society* (RCS) (*optimistic* and *holistic*) discourses such as cradle to cradle (McDonough and Braungart, 2002), the blue economy (Pauli, 2010), natural capitalism (Hawken et al., 1999) and doughnut economics (Raworth, 2017), which seek to create an inclusive and sustainable circular future through a combination of innovative business models, social policies and technological breakthroughs.

TABLE 3.1 Circularity discourse typology

<i>Technological innovation and ecological collapse</i>	<i>Approach to social, economic, environmental and governance considerations</i>	
	<i>Holistic</i>	<i>Segmented</i>
Optimist	<p>Reformist Circular Society (RCS)</p> <ul style="list-style-type: none"> Assumptions: eco-economic decoupling is possible and social justice and democracy is key for a circularity transition. Goals: human prosperity and wellbeing within the biophysical boundaries of the Earth. Means: Technological breakthroughs and social policies that benefit humanity and natural ecosystems. Examples of concepts: natural capitalism, cradle to cradle, the performance economy, the natural step, the blue economy, regenerative design. Proponents: International organisations, large foundations and some governments. 	<p>Technocentric Circular Economy (TCE)</p> <ul style="list-style-type: none"> Assumptions: eco-economic decoupling is possible and social justice and democracy are not key for a circularity transition. Goals: economic prosperity and development without negative environmental externalities. Means: economic innovations, new business models and unprecedented breakthroughs in CE technologies. Examples of concepts: industrial ecology, reverse logistics, biomimicry, industrial symbiosis, cleaner production, bioeconomy. Proponents: corporations, some national and city governments, and international organisations.
Sceptical	<p>Transformational Circular Society (TCS)</p> <ul style="list-style-type: none"> Assumptions: eco-economic decoupling is impossible and social justice and democracy are key for a circularity transition. Goals: a world of conviviality and frugal abundance for all, while fairly distributing the biophysical resources of the Earth. Means: complete reconfiguration of the current socio-political system and a shift away from productivist and anthropocentric worldviews. Examples of concepts: conviviality, steady-state economics, permacircular economy, degrowth, social ecology, Buddhist economics, Buen vivir, Ubuntu. Proponents: social movements, bottom-up circular initiatives and indigenous movements. 	<p>Fortress Circular Economy (FCE)</p> <ul style="list-style-type: none"> Assumptions: eco-economic decoupling is impossible and social justice and democracy are not key for a circularity transition. Goals: maintain geostrategic resource security in global conditions where widespread resource scarcity and human overpopulation cannot provide for all. Means: innovative technologies and business models combined with rationalised resource use and migration and population controls. Examples of concepts: the tragedy of the commons, the population bomb, overshoot, disaster capitalism, capitalist catastrophism. Proponents: geostrategic think tanks and state policies.

Source: adapted from [Calisto Friant et al. \(2020\)](#) under Creative Commons CC-BY license.

- *Technocentric Circular Economy* (TCE) (*optimistic and segmented*) discourses such as cleaner production (Baas, 1995), reverse logistics (Rogers and Tibben-Lembke, 1998) and industrial ecology (Frosch and Gallopoulos, 1989), which seek to reconcile economic development with ecological sustainability through innovative business models and technologies.
- *Transformational Circular Society* (TCS) (*sceptical and holistic*) discourses such as degrowth (Latouche, 2009), buen vivir (Gudynas and Acosta, 2011) and steady-state economics (Daly, 1977), which seek to re-localise, democratise and redistribute power, wealth and knowledge to create a sustainable post-capitalist future, in which humanity and nature coexist in mutual harmony.
- *Fortress Circular Economy* (FCE) (*sceptical and segmented*) discourses such as the tragedy of the commons (Hardin, 1968), the population bomb (Ehrlich, 1968) and overshoot (Catton, 1980), which seek to ensure biophysical stability and geostrategic resource security through top-down migration control, technological innovations and economic rationalism.

This typology has proved to be useful in analysing discourses on the CE in various fields (Arai et al., 2023; Melles, 2021a; Palm et al., 2022).

3.3 An analysis of the way the circular economy is perceived in specific contexts

In this section we present the main findings from various CE case studies to examine which circularity discourse types and value retention options (the 10 Rs) are prevalent in these contexts. In some studies the typology has been applied explicitly, while other studies can be reviewed retrospectively, identifying the dominant views of the actors in these studies. We applied this to various contexts, namely European and national governments, industry and the general public.

3.3.1 Circular economy perceptions in (inter)national contexts

3.3.1.1 The European Union

We first discuss policies adopted by the European Union (EU). The EU has taken many actions on the CE since the implementation of its CE action plan in 2015 (European Commission, 2015). The Juncker Commission (2014–2019) enacted ten communications, seven directives and eight regulations on the CE, making the EU a global frontrunner on the topic. A review of the content and CE vision portrayed by these policies reveals that the Juncker Commission has a rather *holistic* discourse on the CE with some social elements in its language regarding a just, collaborative and inclusive circularity transition (Calisto Friant et al., 2021). However, its concrete CE policy measures, directives and regulations lack social components and instead focus on *segmented* technological solutions and resource efficiency.

There is thus a dichotomy between the EU's discourse and actions on the CE. The CE discourse and actions of the EU are also characterised by a strong focus on decoupling economic growth from environmental degradation thanks to new CE technologies and innovations. The Juncker Commission's discourse on the CE is thus clearly *optimistic* and *holistic* regarding growth, thereby falling in the RCS discourse type, while the EU's actions are *optimistic* and *segmented*, which places them in the TCE discourse type.

A second EU CE Action Plan was enacted in 2020 by the Von der Leyen Commission, as a key component of the European Green Deal (European Commission, 2020). The new action plan takes a more holistic and integrated approach than its predecessor, by including many biodiversity conservation, social justice, consumer empowerment and climate neutrality proposals. On the other hand, it remains strongly growth optimistic as it still seeks to decouple economic growth from environmental degradation and focuses strongly on generating greater competitiveness for EU businesses. Its vision and language thus seem to fit well with a RCS discourse type. However, so far very few CE-related directives and regulations have been implemented by the Von der Leyen Commission. Thus, it is too early to judge the actual policy direction taken by the new action plan.

3.3.1.2 The Netherlands

The Netherlands is often seen an early mover in earlier versions of the CE, with the introduction of initiatives such as landfill prevention and recycling practices from the 1970s and the development of waste prevention programmes (Vermeulen, 2002) and extended producer responsibility policies in the 1990s (Vermeulen and Weterings, 1997). The Dutch national government adopted the term CE in 2016 and outlined a government-wide programme entitled 'A Circular Economy: The Netherlands by 2050' (Ministry of Infrastructure and Environment and Ministry of Economic Affairs, 2016). This strategy connected various topics to the necessity of a CE, linking it to reducing carbon dioxide emissions, reducing dependency on raw materials from other countries and the broader issue of a global increase in material consumption and, finally, the economic opportunities presented by a CE. The benefits have been displayed in terms of job creation, climate policy, and start-up opportunities for actors involved in CE activities. The Dutch CE approach prioritises five specific sectors: biomass and food; plastics; manufacturing; the construction sector; and consumer goods. An interim objective of a 50% reduction in the use of primary raw materials (minerals, fossil fuels and metals) by 2030 has been established. With this objective for the use of raw materials, the Netherlands will raise its ambitions to one of the highest levels of all countries. This policy is evaluated regularly. In the most recent assessment of material resource use, its effects and the transition focus, the Dutch Environment Assessment Agency observed that many CE activities focus on recycling, with little focus on socio-economic reform to make production and consumptions chains circular, and with limited attention

to the lower R strategies (this is also confirmed in other studies; see [Calisto Friant et al., 2022b, 2022a](#); [Campbell-Johnston et al., 2020](#)). The transition to a CE in the Netherlands is thus still in an early phase and requires greater inter-governmental and departmental collaboration. There is a distinct material focus on the CE, i.e. the material flows throughout the Dutch economy, but as a means of achieving greater ecological and societal prosperity; consequently, the CE requires new forms of cooperation and responsibility between actors ([Campbell-Johnston et al., 2021](#)). In terms of the discourse typology ([Table 3.1](#)), this strategy sits between the RCS and the TCE discourse types. This means that it is optimistic about technological innovation and preventing ecological collapse. Innovation and new business models are stressed, as a means to improve ecological health, resource security and material prosperity for people in the Netherlands and around the world, which also creates benefits such as job creation.

3.3.1.3 *Circular economy perceptions in the public sector: the Portuguese Central Public Administration*

In this section we review how the Portuguese Central Public Administration (PCPA) perceives the idea and principles of a CE. The results of a 2020 survey carried out among individuals in the PCPA, asking which of the three Rs (Reduce, Reuse, Recycle) were most frequently mentioned, showed a preference for Reuse and then Recycle ([Klein et al., 2022a](#)). The answers mostly indicated that the CE is associated with resources, products and materials, with an emphasis on waste reduction. Other keywords, such as consumption, sharing and sustainability, were also stated but to a lesser extent, thereby highlighting some awareness of the CE as an ecosystem in need of more holistic sustainability transformations. Changes in consumption practices in terms of sharing and the need to modify individual behaviours and organisational cultures were also mentioned ([Klein et al., 2022a](#)). According to the researchers' typology of CE discourses ([Calisto Friant et al., 2020](#)), this description of the PCPA seems to be closely aligned with the TCE view of the CE, although with some nuances of a more holistic RCS view, because there are also signs of an awareness of the importance of changing people's mindsets and cultures with regard to consumption and resource use.

Further interviews with employees working on environmental or sustainability issues in the PCPA showed that public employees view the existence and potential of CE practices mainly in the area of public procurement, but also in resource efficiency and optimisation, dematerialisation and in practices related to the 3 Rs, especially Reduce and Reuse ([Klein et al., 2022b](#)). Technology-oriented practices aimed at achieving resource efficiency, as well as human-centred practices targeted at reducing consumption and sharing resources have also been identified. Thus, we also found through the interviews a rather *technocentric* view of the CE with some elements of a RCS view as well, but the social goals pursued are not explicitly connected to the CE agenda.

3.3.2 *Circular economy perceptions in city contexts*

We can also look at the local public sector level, reflecting on the CE strategy of three European cities, often considered to be at the forefront of the transition to a CE: Amsterdam (Netherlands), Copenhagen (Denmark) and Glasgow (UK) (Calisto Friant et al., 2023). The ‘Amsterdam Circular Strategy 2020-2025’ was published in 2020 and follows Kate Raworth’s doughnut economics approach to a CE (Municipality of Amsterdam, 2020). The doughnut model is a RCS discourse according to the circularity discourse typology and this is very much reflected in Amsterdam’s vision of the CE. Indeed, the municipality’s discourse has a progressive and inclusive vision of broad prosperity for all its citizens and seeks to improve their social and environmental wellbeing in a holistic manner. Moreover, the municipality is very much aware of the impacts of its high consumption levels on people and ecosystems in the Global South. The city of Amsterdam also strives towards ‘separating economic growth from the pressure on the environment’ (Municipality of Amsterdam, 2020, p. 11). It therefore takes a growth optimistic approach that places a good deal of importance on economic competitiveness and innovation. Considering its holistic social vision and its growth optimistic economic vision, the discourse of the city of Amsterdam falls well within the RCS discourse type. Nevertheless, by taking a more detailed look at the type of policies that the city of Amsterdam is implementing as part of its CE strategy (see Chapter 6 in this volume), we see a slightly different picture. Indeed, Amsterdam’s CE policies are loosely linked to its social policy, as these focus on small projects such as fostering sharing economies and promoting urban agriculture. Stronger social actions to redistribute wealth and resources or reduce spatial and environmental injustices in terms of access to housing, green space and social services are thus lacking. Amsterdam’s holistic social justice discourse is thus not entirely reflected in concrete policy actions. Overall Amsterdam’s discourse fits the RCS discourse type, while its policies fall in the middle of the TCE and the RCS discourse types.

The ‘Circular Economy Route Map for Glasgow’ was published in 2020 by Glasgow City Council. It follows the cradle-to-cradle approach to a CE (McDonough and Braungart, 2002), which fits the RCS discourse type according to the typology of circularity discourse developed by Calisto Friant et al. (2020). This socially holistic and growth optimistic approach to circularity is very much reflected in Glasgow’s CE roadmap. Indeed, the policy is critical of neoliberal capitalism for the social, environmental and social impacts that it has generated in the past few decades (Glasgow City Council, 2020). As an alternative, it seeks a reformed capitalist model with a strong focus on social justice and environmental sustainability. Moreover, the roadmap is critical of the globalised economy and the socio-ecological externalities of the city’s consumption practices beyond its borders. To address these issues the CE roadmap seeks to implement a wide range of social and economic policies that will lead to increased citizen empowerment and to ‘the decoupling of economic growth from the consumption of finite resources’ (Glasgow

[City Council, 2020](#)). Glasgow's CE roadmap is thus well within the RCS discourse type as it has both a growth optimistic approach to circularity and decoupling and a holistic inclusion of a wide range of social considerations. By looking at the actual social policies that Glasgow is supporting in its CE strategy, it becomes clear that there is no explicit connection to redistributive local social policies. Indeed, most of its policy actions are focused on small pilot projects and many promising approaches described in the strategy have not been translated into concrete policy actions. The policies of Glasgow's CE roadmap are thus less strongly within the discourse type than its discourse would suggest.

The 'Circular Copenhagen: Resource and Waste Management Plan 2024' was published as Copenhagen's CE strategy in 2019 ([Municipality of Copenhagen, 2019](#)). Copenhagen's approach recognises the high resource consumption of its inhabitants (currently double that of the EU annual average per capita), yet it does not blame over-consumption as the problem but rather the fact that resources are not ploughed back into the economy. The plan has no social justice components and instead focuses on resource efficiency, new CE technologies and innovations as avenues for fostering 'green growth'. This growth optimistic approach to the CE, which does not include social components, falls perfectly within the TCE discourse type. When looking at the concrete policies implemented by the CE strategy in Copenhagen, it is clear that this TCE approach is consistently enacted through actions aimed at improving resource recovery, and economic competitiveness and innovation in CE technologies, all of which fall within a TCE vision of circularity.

3.4 Circular economy perceptions in industry

Following on from the discussion of public policy examples, this section looks at discourses around two industry sectors related to the CE: plastic packaging and the recycling of passenger car tyres (both of which were the subject of Dutch case studies).

With respect to plastic packaging, results from media analysis, stakeholder analysis, policy analysis, semi-structured interviews and a Q-Method survey revealed that the Dutch plastic discourse is dominated by a TCE vision that focuses on economic growth and technological innovations, such as bioplastic alternatives and chemical recycling ([Calisto Friant et al., 2022b](#)). The discourse is also dominated by a TCE approach, as it is governed by an extended producer responsibility (EPR) mechanism that provides a lot of leeway for industries to choose their recovery and recycling mechanisms, so long as they comply with the government's recovery targets. This focus on resource efficiency leads industrial actors to choose the cheapest possible recovery option, without regard for actual socio-ecological impacts. Our analysis thus shows that both national policies and most societal stakeholders take a TCE approach to the CE by focusing on developing new CE technologies and innovations to increase economic competitiveness and environmental sustainability

with a ‘green growth’ approach and accords little to no importance to social considerations (Calisto Friant et al., 2022b).

The same TCE approach can be observed in the case of the management of end-of-life passenger car tyres in the Netherlands (Campbell-Johnston et al., 2020). This case study research looking at the Dutch EPR policy, including semi-structured interviews with key stakeholders, revealed that the EPR system for end-of-life tyres also has delegated decisions about preferred recovery mechanisms to industrial actors, within the regulatory context of promoting efficiency. There is therefore a focus on achieving the government’s recovery targets by choosing the cheapest possible recovery option, with less attention for socio-ecological impacts. Although collection targets have generally been met, the main form of treatment has resulted in a form of downgrading (i.e. converting end-of-life products into lower value items).

3.5 Global responses to the discursive nature of the concept of the circular economy

In contrast to the available research on national policies and business strategies, we observed a lack of academic research on citizens’ perceptions of the CE. Cresting research included a city-scale survey of citizens’ views on repair in Hull, UK (see Chapter 6 in this volume), while and other research has been conducted on consumer habits relating to the CE in Finland (Mykkänen and Repo, 2021). Cresting researchers have also conducted specific surveys on the CE to examine, for example, perceptions about the CE upheld by different companies (see Chapters 3 and 7). However, previously no research had been carried out at a global level into citizens’ perceptions of the CE.

The ‘Global Circular Economy Perception Survey’ was created to fill this gap. The survey sought better to understand how a variety of societal actors imagine a CE (Calisto Friant et al., 2022c). This joint initiative was carried out by different partners led by the non-governmental organisation Revolve Circular based in Vienna, Austria, and the Copernicus Institute of Sustainable Development, Utrecht University. The survey was translated into 18 languages (including Arabic, English, French, German, Spanish, Italian, Japanese, Portuguese, Russian and Turkish). From its launch in April 2021 to its closure on 1 June 2022, the survey received 1,150 responses from people in 77 different countries.

The findings of one of the main questions posed by the survey are presented below (see Table 3.2). We asked what definition of circularity respondents found most and least appealing. The four definitions of circularity in the question were based on the typology of circularity discourses developed by Calisto Friant et al. (2020) (see Table 3.1). The discourses which were most appealing to respondents were TCE with 33.7% of the total, closely followed by TCS with 29.0% (see Figure 3.2). The least appealing discourses are FCE with 41.8% of the total. An interesting result is that socially inclusive holistic discourses like TCS and RCS combined were slightly more preferred (51.6%), compared with segmented discourses like FCE

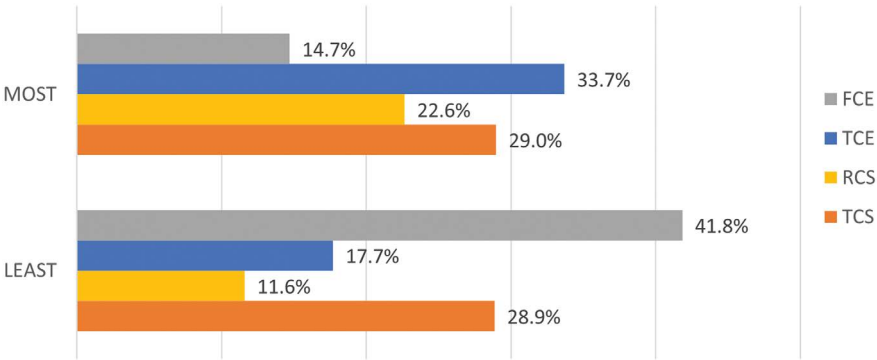


FIGURE 3.2 Findings of the ‘Global Circular Economy Perception Survey’ showing the most and least preferred visions of circularity, n = 932

Source: Based on Calisto Friant et al., 2022c used under CC license 4.0.

and TCE (48.4%), which do not include social justice and political empowerment considerations.

Another survey question asked participants how relevant they found 28 socio-ecological topics for their visions of a CE (from 0 = not relevant to 5 = extremely relevant). These topics were derived from the available literature. Table 3.2 shows that topics related to environmental protection and pollution reduction are found most relevant (like water management, climate change, biodiversity conservation, cleaner production methods, eco-design, reducing consumption and harmony with nature). Socio-political topics are found second most relevant (e.g. education and awareness raising, responsible and ethical consumption, human health and safety, social justice and equity, fair distribution of resources and democratic citizen participation). Finally, topics related to economic competitiveness and technological innovation were found least relevant (e.g. sustainable business models, resource security, nature-based innovations, economic prosperity, job creation, economic prosperity). Nonetheless, it is worth noting that the majority of topics have mean score of at least 3.5 (indicating a medium/high relevance). This suggests that all the topics are found to be important by participants and that no social, environmental or economic considerations should be ignored when implementing CE actions.

Various studies on the CE have found that the dominant discourse about the CE in public and private institutions is the TCE approach (Berry et al., 2021; Calisto Friant et al., 2021; Calisto Friant et al., 2022b; Campbell-Johnston et al., 2020; Melles, 2021b; Ortega Alvarado et al., 2021; Palm et al., 2021). The findings of this survey suggest that the TCE vision also has some support from respondents; however, participants have a much more diverse outlook on the CE. Holistic discourses that include social justice and political empowerment considerations like the TCS and the RCS approaches were in fact slightly preferred over the segmented discourses, which focus on resource efficiency like TCE and FCE. Moreover, various topics were considered important for respondents such as ‘consumption reduction’, ‘social justice and equity’, ‘sharing and solidarity economies’, and ‘fair

TABLE 3.2 Mean scores and ranking of 28 socio-ecological topics (derived from Calisto Friant et al., 2022c)

<i>Socio-ecological topics</i>	<i>World n = 881</i>
Sustainable water management	4.5 (1)
Education and awareness raising	4.4 (2)
Fight against climate change	4.4 (3)
Biodiversity conservation and ecosystem restoration	4.4 (4)
Waste management	4.4 (5)
Green and renewable energy	4.4 (6)
Sustainable food	4.3 (7)
Clean production methods and technologies	4.3 (8)
Eco-design of products and services	4.3 (9)
Responsible and ethical consumption	4.3 (10)
Sustainable business models	4.3 (11)
Human health and safety	4.2 (12)
Reducing consumption	4.2 (13)
Harmony and connection with nature	4.2 (14)
Resource security	4.2 (15)
Drawing inspiration from nature for innovations	4.0 (16)
Social justice and equity	3.9 (17)
Social harmony and community building	3.9 (18)
Sharing and solidarity economies	3.9 (19)
Open-source innovations	3.8 (20)
Fair distribution of resource use between rich and poor countries	3.8 (21)
Economic prosperity and development	3.7 (22)
Job creation	3.7 (23)
Democratic citizen participation	3.7 (24)
Cultural diversity and pluralism	3.6 (25)
Wealth redistribution	3.5 (26)
High-technology innovations such as artificial intelligence, 3D printing and automation	3.3 (27)
Economic competitiveness	3.3 (28)

Note: Environment-related topics shown in green, economic and technological topics in red and socio-political topics in blue.

distribution of resource use between rich and poor countries’ (see Table 3.2). Thus, respondents value more socially inclusive and ecologically systemic approaches to the CE compared to the TCE approach that currently dominates policy debates.

Another interesting result is that people with more knowledge of the CE and higher levels of education tend to prefer more radical TCS discourses. This reveals that a more inclusive and systemic vision of the CE could grow in time as people learn about the concept, or may indicate the impact of people’s wider views of society on their understandings of a CE. These results are in line with those of academics who speak of the need to increase ‘circular literacy’ to go beyond technocentric CE solutions and ensure that the transition to a CE brings about tangible

reductions in humanity's socio-ecological footprint in a socially fair and equitable manner (Zwiers et al., 2020).

Efforts to continue increasing circular literacy are hugely important, considering the rising impacts of climate breakdown and biodiversity collapse caused by the over-consumption of planetary resources by the wealthiest inhabitants of the Earth (Chancel et al., 2022). More systemic, redistributive and post-growth circular visions are thus imperative to ensure the wellbeing of current and future generations and to prevent the collapse of the biosphere. Our findings suggest that more democratic deliberations about the CE and greater participation of citizens and scientists in the construction and implementation of CE policies could lead to more transformative actions than those that are currently being implemented. Indeed, pluralism and diversity in the CE debate is largely lacking and this is hampering a democratic and free discussion about the shape of the CE transition.

3.6 Conclusions

In this chapter we examined discourses about the meaning of the concept of the CE. The CE has been conceptualised in academic and policy discourses, at both the national and international level. These discourses initially focused on the material resource inputs of products, services, regions and businesses. More recently, they have expanded to pay more attention to the wider contexts in which these resource use processes take place (Campbell-Johnston et al., 2020) and broader societal discussions concerning justice, equity and fairness (Calisto Friant et al., 2020).

Capturing the core points of agreement and disagreement on the meaning of a CE requires a systematic analysis of the academic and public debate. Various frameworks have been developed for this. In this chapter we have taken the framework developed by Calisto Friant et al. as a starting point and looked to what extent the four discourse types could be recognised in other research undertaken by the Cresting project. We see a dominance of the TCE views and to a lesser extent of the RCS approach. In section 3.1 we observed that this was particularly the case for the EU's Juncker Commission, showing a dominance of the TCE views while the more recent von der Leyen Commission includes more elements and policies of the RCS vision. We also saw this mixture in the recent Dutch policies and practices applying extended producer responsibility. In section 3.2 research on perceptions among the Portuguese public sector also showed a rather technocentric view of the CE, with smaller elements of a RCS. Reviewing some of the studies in industry in section 3.4, the analysis showed for this actor group a stronger dominance of the TCE views in discourses and practices concerning plastic packaging and the recycling of passenger car tyres.

Another vital source of information has been a global survey of public opinion. The results of this are more nuanced. The dominance of the TCE view was not so evident, as people showed a slight preference for socially inclusive discourses such as to TCS and RCS approaches compared to technocentric discourses. This

suggests that the views of individuals are somewhat out of step with the preferences of policymakers.

Our research work shows that the typology of CE discourses is very helpful when analysing and comparing the CE discourses in policy and in economic practices. It has enabled us to identify the dominance of a TCE view in policy and market initiatives. We also see social justice considerations discussed through RCS discourses, but they are usually not thoroughly implemented and followed through (as in the EU, Amsterdam and Glasgow). Moreover, there is a clear focus on growth-promoting approaches to the CE such as TCE and RCS discourses. This reliance on growth can be problematic, and it has been posited that decoupling economic growth from environmental degradation is realistic and would occur on a scale sufficient to reverse the strong ecological decay (Haberl et al., 2020; Wiedenhofer et al., 2020).

One of the key challenges is whether and how CE initiatives will be more practically connected to the sustainable development agenda with its clear social fairness and shared prosperity aspirations, (expressed in the 17 UN Sustainable Development Goals), as many scholars have suggested, or if it will remain a narrower, mainly economic and environmental concept. In many ways, the contested and diverse nature of CE discourses means that they can easily be instrumentalised by public and private actors to mean whatever fits their social, political and economic goals. This is why further research on CE practices and policy actions in the private and public sphere is important to unmask the real sustainability implications of different CE discourses and practices. In this chapter we presented the typology of CE discourses which has proved to be very suitable for *ex post* as well as *ex ante* critical evaluations of CE policies at all levels and can guide scholars navigating the discourses around the concept of a CE.

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4

EXPLORING THE ROLE OF COMPANIES IN TRANSITIONING TO A SUSTAINABLE AND CIRCULAR FUTURE

Insights and Reflections

*Rupert J. Baumgartner, Pauline Deutz,
Estephania Delgadillo, Anna Diaz Tena,
Aodhan Newsholme, Erik Roos Lindgreen,
Tomas Santa-Maria, Anna M. Walker
and Tatiana Reyes*

4.1 Introduction: companies as contributors to a CE

In recent years, the circular economy (CE) has emerged as a promising avenue for sustainable development (Geissdoerfer et al., 2017; Schroeder et al., 2019). Companies are a special form of social system with the goal to produce economic value by transforming tangible and intangible inputs to outputs for which customers will pay. Recent decades have seen the emergence of the ‘triple bottom line’ (Elkington, 1998) and other conceptualisations suggesting that companies also have social and environmental responsibilities (Baumgartner, 2014) (i.e. as part of a sustainability agenda and more recently specifically to help society to reach net zero). National and European Union (EU) policies set the regulatory context for companies, i.e. determining the minimum threshold of social and environmental standards they need to meet (see Chapter 9 in this volume for a discussion of CE policy). Companies may exceptionally take voluntary measures that exceed requirements, even to their own financial disadvantage (albeit potentially offset by reputational benefits) (Baumgartner, 2014). A further approach to implementing CE by companies, which has received much research attention, is how CE strategies can be incorporated with the core economic function of companies (Lüdeke-Freund et al., 2019), i.e. as part of the value generating proposition through which the company generates its profits. While the private sector has shown interest, the implementation of sustainable and circular approaches remains relatively low (Cristoni and Tonelli, 2018; OECD, 2019). Hence, it is still necessary to understand the factors that facilitate and hinder a wider adoption of a CE.

The core element of a company is its business model. A business model is a coherent construct that synthesises what a firm does and for whom (value proposition), how it does it (value creation and delivery), and why it does it (value capture) (Osterwalder and Pigneur, 2010; Teece, 2010). Circular business models follow the principles of the CE, incorporating elements that slow, narrow or close the loop of resources, so that the resource input into the company and its value network is decreased and the resulting waste is minimised (Bocken et al., 2016). One of the main strengths of circular business models (CBM) is their potential to reduce dependence on finite resources and fostering innovation (Kennedy and Linnenluecke, 2022). Nevertheless, the initial investments that are often required (Bauwens 2021), the unfamiliarity of existing customers with new business models and the logistical complexity of their implementation often limit their applicability.

Product service systems (PSS) are one specific type of circular business model consisting of value propositions oriented towards satisfying users through the delivery of functions or performance instead of products (Ceschin and Gaziulusoy, 2016). Since manufacturers maintain the ownership of the products and only offer the performance to customers, they have an economic motivation to enhance their resource utilisation. Examples of existing PSS involve the provision of mobility solutions instead of individual vehicles or lighting systems instead of lightbulbs (Ceschin and Gaziulusov, 2016). Consequently, complementing existing products with new services has drastic implications for the processes involved in designing the products in the first place, namely the product development process. In particular, the selection of new materials and design principles involved in the extension of product lifespans necessitates different revenue models and exchanges of information among new actors. As a result, some of the decisions involved in developing products for circularity are of a strong strategic nature, suggesting the need for additional insights into how design processes are reshaped (Baldassarre et al., 2020).

Besides the incorporation of CE elements into core company activities (i.e. value generation), successful implementation also requires additional activities to be developed. Evidence of the environmental and social impacts of such strategies must be proven. The newly proposed SCEIA (Strategic Circular Economy Impact Assessment) framework is designed to guide companies throughout the process of measuring their impacts. We describe the framework's objectives and its validation procedure in Section 4.3.4. A further consideration arising from CE approaches is the need for cooperation beyond the scale of the company (Deutz, 2009), and in particular in territorially defined approaches (e.g. when a public body such as a local authority is attempting to implement a CE within its jurisdiction (see Chapter 6 in this volume), or if a company seeks to incorporate priorities based on its location (i.e. territorial perspectives), then further stakeholders such as governmental bodies become relevant. These considerations

present additional obstacles to the effective implementation of CE approaches, which we consider below.

This chapter synthesises findings from research projects addressing specific aspects of the role of companies in the sustainable and circular transition (encompassing corporate implementation of the CE, CBM, PSS, product development, CE assessment and integration of territorial perspectives) in order to address the following questions: (1) what drivers and barriers do companies face regarding the implementation of CE approaches; (2) which approaches can be used by companies to innovate their business models and their products and services for a CE and to assess the environmental and social impacts of corporate CE activities; and (3) what is the relationship between companies and territory at the regional level?

In the following section methods are presented, as well as the results of six research contributions. A discussion of these results and final conclusions provides implications for theory and practice.

4.2 Methods

This chapter builds on the results of six PhD projects carried out by early stage researchers (ESRs) within the Cresting project, each addressing specific aspects of the role of companies in the sustainable and circular transition. Quantitative and qualitative methods were used and included case study research with companies, interviews, surveys, (focus group) workshops, systematic literature reviews, expert feedback and action design research (see Table 4.1).

TABLE 4.1 Research contributions and methods employed in the study of companies' approaches to the CE

<i>Location</i>	<i>Perspective and focus</i>	<i>Methods</i>
Italy, the Netherlands	Company: barriers to and drivers for the CE	Survey (n = 155) in three different languages with companies from different sectors
Austria and the Netherlands	Company: business model innovation	Multiple case study (n = 10), action design research
Austria	Company: product and service design	Interviews, participant observation, content analysis, morphological analysis
Italy	Company: CE assessment	Expert panel survey, focus group workshops
France, Switzerland, Taiwan	Company and region: territorial business models	Interviews, participatory social network analysis
The United Kingdom, Austria	Company and region: stakeholder and embeddedness	Interviews, discourse analysis, observation, survey

4.3 Cases addressing the business perspectives of a CE

The results of the six research contributions are presented in this section. First drivers for and barriers to corporate CE practices are presented. Based on this general view of corporate CE practices the focus is on innovation at the company level, with first circular business model innovation (CBMI) and second product and service design for a CE. The fourth contribution addresses the assessment of CE performance at the company level. Finally, the fifth and sixth contributions address the embeddedness of companies in larger systems using the example of territorial business models and a regional perspective of companies in a CE.

4.3.1 Corporate CE practices: drivers and barriers

While researching drivers for and barriers to the implementation of a CE an in-depth analysis of CE practices (strategies, solutions or business models) in companies across sectors located in Italy and the Netherlands was carried out in mid-2019. In a survey distributed in three languages 155 respondents from companies engaged with CE practices answered, among others, questions regarding their exact CE practices, the goal of pursuing these, as well as the drivers for and barriers to the implementation of a CE.

Regarding the planned and implemented CE practices, the respondents were presented with a list of 15 CE practices identified by Kalmykova et al. (2018) from which they could select multiple answers. As depicted in Figure 4.1, the most commonly applied CE practice is the *recovery of products, materials or energy from waste*. This is followed by 4Rs to increase energy and material efficiency, which could be attributed to process optimisation. The least applied CE practice in the sample is providing a sharing platform for consumer goods, tailing behind *repairing products, remanufacturing or refurbishing goods* as well as *PSS models*.

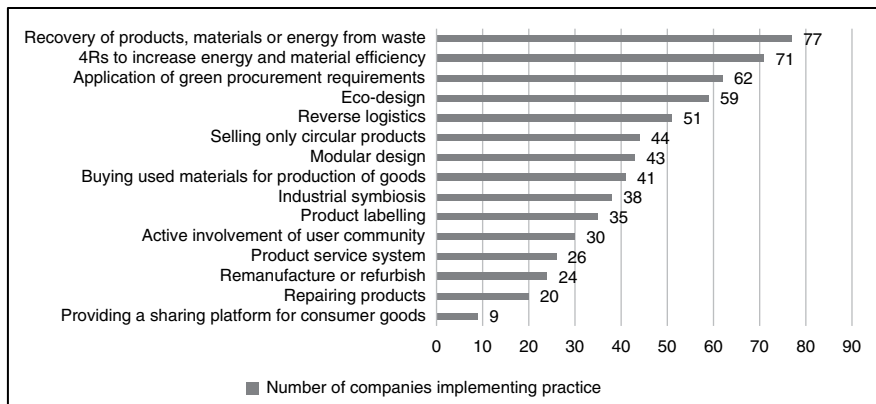


FIGURE 4.1 CE practices implemented or planned by respondents, n = 141

Some 72% of respondents indicated that they have implemented or plan to implement more than one CE practice. Regarding the main business activities of the respondents, the majority have a waste management focus, which is the sector that the CE has traditionally related to (Cecchin et al., 2020). In contrast, concepts such as the PSS or the sharing economy are less prevalent in the observed CE practices. Interestingly, CE practices that entail more manual labour such as repairing, re-manufacturing and refurbishing products are also at the lower end of representation, potentially due to the higher employment costs (discussed in Chapter 7) as well as less predictable demand chains.

4.3.1.1 Goal of implementing CE practices

After identifying the most pertinent CE practices the respondents provided the three main goals they aimed to achieve with these strategies (Figure 4.2). The three goals were ranked from 1 to 3 and were captured in an open text field, meaning that the three ESRs who carried out the survey had to iteratively code the goals and define the categories, first individually and then by comparing their categorisation together. The weighted occurrence takes into account the ranking of the category by importance, attributed by the respondents, while the total occurrence represents how many times a category was mentioned irrespective of its rank. The responses offered can be divided between corporate goals, those directly related to the motivation of companies, and social goals, where respondents mentioned that they wanted to contribute to a broader cause. Corporate goals were sometimes in reality CE practices, as is exemplified by the first category including the value retention options (i.e. better seen as a means to an end such as resource efficiency, rather than an actual goal per se). Waste reduction was mentioned so often that it was placed in

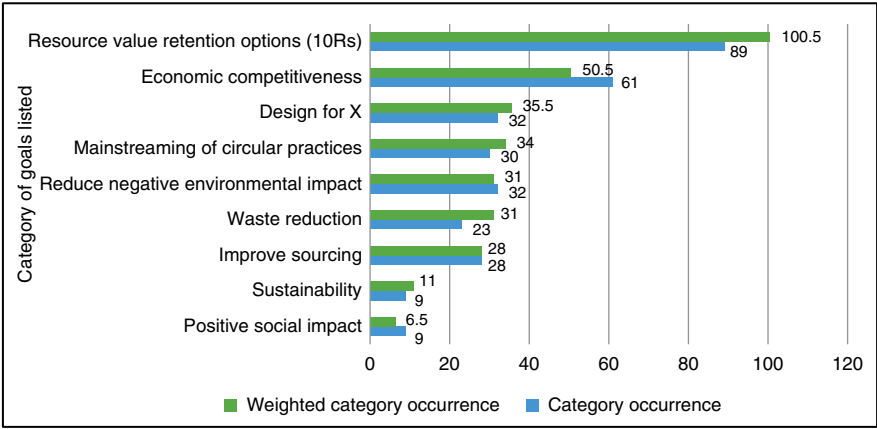


FIGURE 4.2 Company goals to be achieved through CE practices, ranked and weighted, n = 134

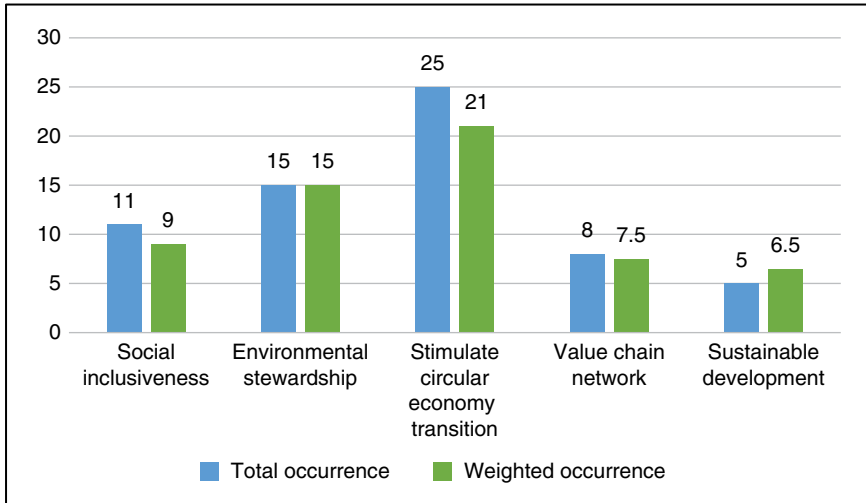


FIGURE 4.3 Society goals to be achieved through CE practices, ranked and weighted, $n = 134$

a separate category, also showing that the connection of the CE and waste was still very strong in the understanding of the respondents. The second goal, economic competitiveness, is noteworthy because, while it was not always mentioned as the first goal, it was often present in the second or third rank. What was also interesting is that the reduction of negative environmental impacts was considerably higher than the more holistic category of sustainability or bringing about positive social impacts through business activities.

The society-related goals (Figure 4.3) were mainly related to helping to create a system change towards a CE transition, followed by environmental stewardship, social inclusiveness, creating fairer value chain networks and contributing to sustainable development.

4.3.1.2 Drivers for and barriers to CE implementation

The final part of the questionnaire was dedicated to uncovering the drivers for and barriers to implementing CE practices for companies that were early adopters and/or strongly engaged with the CE. As they differ considerably by country, the results are displayed comparatively in Figures 4.4 and 4.5. The most dominant CE drivers are the potential to reduce the environmental impact, the use of critical raw materials and the coherence with company sustainability image. In contrast, the main barrier to CE implementation is external, namely legislative constraints. These were especially extensive among the Italian respondents, a topic that was later discussed in interviews with companies. The main issues are related to the rigidity of waste regulations and the definition of waste, forbidding

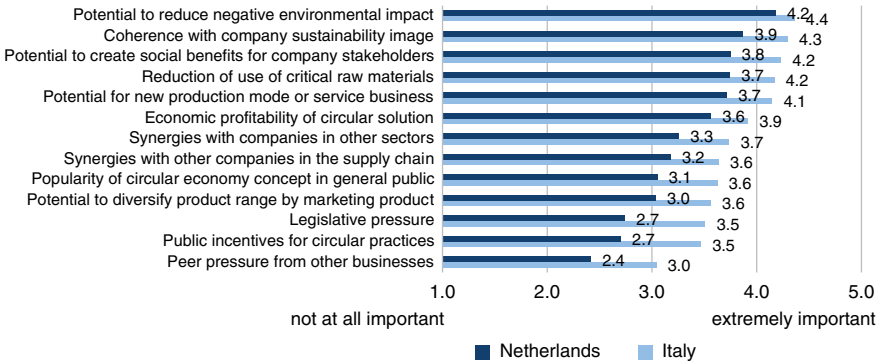


FIGURE 4.4 Respondents’ perceived importance of CE drivers to respondents, on a scale of 1 (not at all important) to 5 (extremely important), ‘I don’t know’ responses were excluded, n = 105

its further use as a material input. Therefore, it is often necessary to go through the process of recategorising waste as a by-product to enable trade with other companies. The next highest ranked barriers, however, are internal, connected to the uncertain and long-term economic gains of implementing CE practices as well as the high investment costs (limited access to finance is ranked in fifth place). It needs to be stressed that the respondents generally accorded less importance to the barriers than to the drivers, indicating that the proposed barriers are not seen as heavily interfering with the implementation of CE practices within the companies under study.

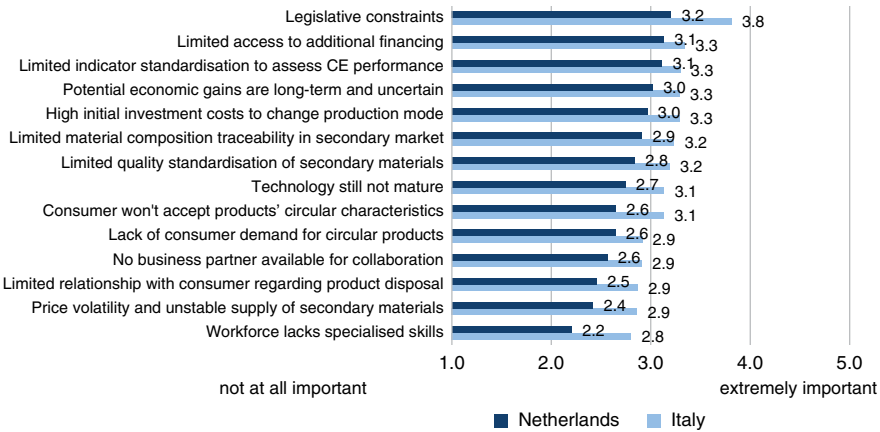


FIGURE 4.5 Respondents’ perceived importance of CE barriers to respondents, on a scale of 1 (not at all important) to 5 (extremely important), ‘I don’t know’ responses were excluded, n = 105

4.3.2 Business model innovation

This research contribution focused on the topic of CBMI, particularly on the capabilities needed by incumbent firms (i.e. those already established in the market) to transform or diversify their business portfolios, and the challenging process of designing these new business models. The development of sustainable and circular business models has been described as a leverage point in the circular transition; however, the process of designing and implementing circular business models remains under-explored in the literature, which calls for further empirical insights and concrete guidelines for firms (Centobelli et al., 2020; Pieroni et al., 2019; Santa-Maria et al., 2021).

In order to explore how incumbent firms transform or diversify their business models for the CE, a multiple case study of ten successful cases of CBMI was conducted within the Cresting project (Santa-Maria et al., 2022a). Building on the explanatory potential of the theory of dynamic capabilities to understand how firms innovate, adapt and transform in changing environments (Teece et al., 1997; Eisenhardt and Martin, 2000;), 26 specific practices relevant for CBMI have been abductively identified, which were grouped into 12 microfoundations of the conventional dynamic capabilities of sensing, seizing and reconfiguring (see Figure 4.6). Through an additional step of cross-case analysis and focusing on those sustainability-oriented innovation practices present in 80% or more of the cases, the six most relevant practices for CBMI were identified. These include (i) adopting a life cycle perspective; (ii) implementing environmental management tools (e.g. life cycle assessment, ISO 14001); (iii) ideating and developing value propositions with environmental and/or social impacts; (iv) developing a sustainability strategy and culture; (v) engaging strategic partners in collaboration and co-creation; and (vi) integrating stakeholders and coordinating partners in the business ecosystem (Santa-Maria et al., 2022a).

Two insights were derived from this cross-case analysis: first, by comparing innovation processes centred on different CE R-value retention options (Reike et al., 2018) four practices were proposed which are particularly relevant for innovations focusing on short and medium loops (R0–R5),¹ i.e. early customer engagement, understanding the needs of key stakeholders, experimenting with validating assumptions and promoting an innovation culture; and four practices particularly relevant for innovations focused on long loops (R6–R9),¹ i.e. engagement with strategic partners, effective coordination of the business ecosystem, being open to external expert support and having fact-based external communication. Second, the analysis also allowed the researchers to propose seven practices particularly relevant for long-term sustainability-oriented business module transformations (in contrast to business module diversifications), i.e. articulation of a clear and ambitious sustainability vision, counting on full support from the CEO, guiding the transformation journey through the use of a sustainability framework, receiving support from external experts, training and empowering workers in sustainability topics, being proficient at organisational change management and having a fact-based consistent external communication.

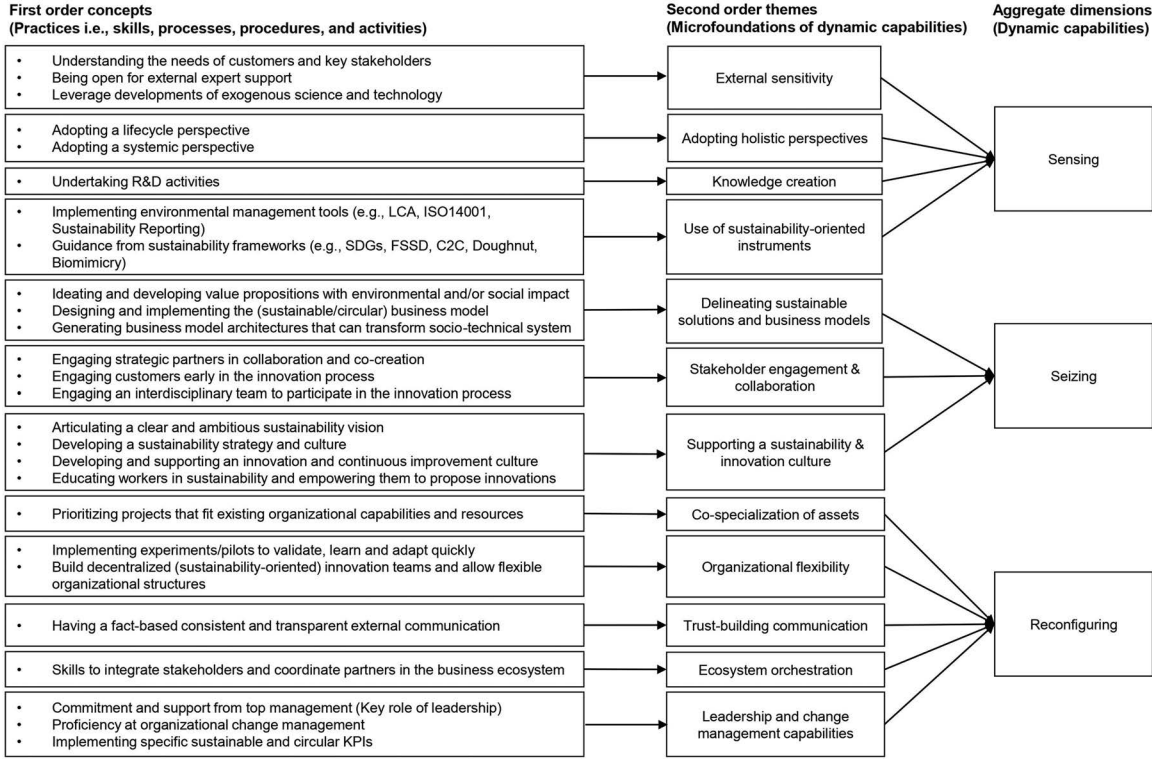


FIGURE 4.6 Data structuration and analysis process, following the Gioia method, which allowed the researchers to group the 26 identified best practices for CBMI into 12 microfoundations of dynamic capability, and the three main dynamic capability categories

Source: Santa-Maria et al. (2022a) used under CC BY license 4.0.

This empirical study facilitates a better understanding of the complexities of business model innovation for the CE, and makes it possible to identify the needed organisational capabilities for its success. However, acknowledging the difficulties of CBMI and the lack of concrete guidelines, a complementary research project was conducted with the aim of developing a design thinking-based framework to guide firms in CBM development. Design thinking has gained popularity in innovation management fields (Kolko, 2015), offering principles and tools capable of addressing complex problem-solving challenges through multidisciplinary collaboration (Brown, 2008; Carlgren et al., 2016).

Following an Action Design Research approach (Sein et al., 2011), a framework entitled the Circular Sprint has been developed (Santa-Maria et al., 2022b). The process iteratively combined four streams of literature, feedback from 16 experts and six workshops that involved a total of 107 participants working in 14 teams. The Circular Sprint aims to facilitate early stage CBM development in a time-efficient and online-based manner and is composed of seven innovation phases and 12 complementary and purposefully adapted activities (see Figure 4.7). The Circular Sprint framework and its activities are described in detail in Santa-Maria et al. (2022b), which includes a step-by-step user guide in its supplementary material.

Beyond the development of the framework and its activities, our research allowed us to reflect on the inclusion of a sustainability perspective within business innovation activities. Conventional wisdom could consider sustainability as an additional constraint within a creative process. However, analogous to Deutz et al. (2010) with respect to design, our study supports the notion that sustainability orientation is an opportunity, one that can open the solution space during divergent thinking phases, and one that can help to filter proposed solutions during convergent thinking phases. Furthermore, we argued that sustainability-oriented business innovation should be guided by the three conventional lenses of desirability, feasibility and viability, complemented by the fourth lens of sustainability (see Figure 4.8).

4.3.3 *Product and service design for a CE*

The adoption of circular approaches drives significant changes in the way companies operate. Therefore, here we provide insights to the impact that value retention strategies have on sustainable product development (SPD) processes. Thus, the starting point was to interview product developers engaged in SPD and eco-design to highlight the main limitations of existing approaches with respect to enabling products' circularity (Diaz et al., 2021).

The findings are outlined as follows. First, product developers mainly discussed sustainability principles once the design of the product was finished. The reason for this is two-fold: on the one hand, development processes are frequently *evolutionary*, which means that companies very often start developing new products from existing designs (see also Deutz et al., 2013, for a survey of product designers in the United Kingdom). On the other hand, the assessment of a sustainability performance

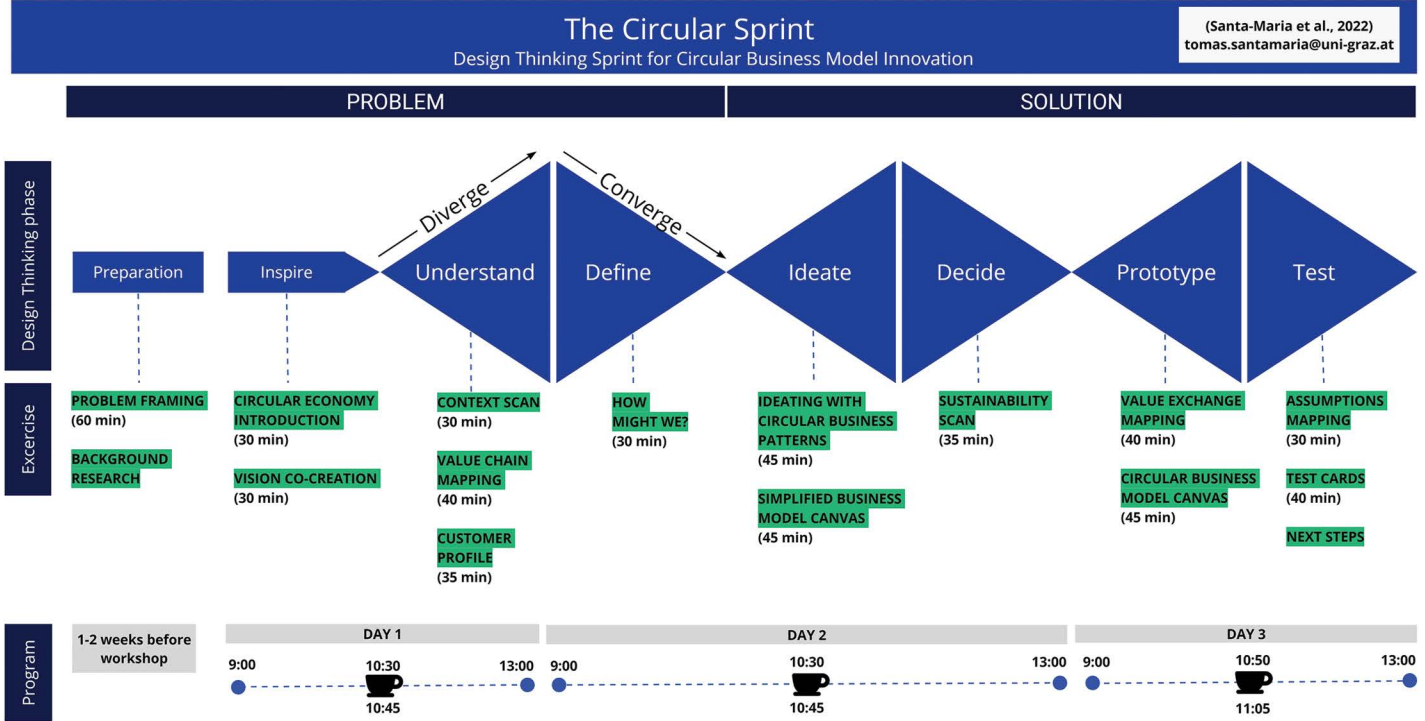


FIGURE 4.7 The Circular Sprint framework. The figure contains the process phases, its 12 activities and a proposed timeframe, which could be adapted according to the use case

Source: Santa-Maria et al. (2022b) used under CC BY license 4.0.

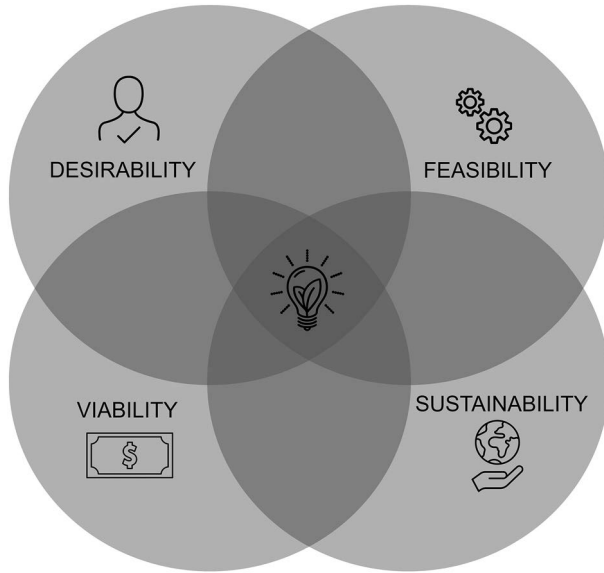


FIGURE 4.8 The four lenses of sustainable innovation

Source: authors' elaboration, inspired by [Brown \(2008\)](#) and [Shapira et al. \(2017\)](#), in Santa-Maria et al. (2022a) and used under CC BY license 4.0.

was only feasible once the product design had been completed, since only then did the product evaluation information become available. This issue has been previously reported and acknowledged as the eco-design paradox ([Lettner et al., 2021](#)). The result of these SPD practices prevents product planners from discussing systemic sustainability concerns or reconsidering value propositions, which could be delivered in some instances through an alternative ownership model arrangement or without the use of a physical product. Starting the conversations later in the design process results in only minor improvements towards sustainability. Second, while the CE literature has developed many indicators, it was found that these were not applied in product evaluation routines. Indicators are important metrics to monitor if the circular economy design traits are effectively engineered into product designs. The lack of indicator integration was partly aggravated by a concomitant lack of industrial standards on CE assessment in the context of manufacturing companies at the time the research was conducted. Thus, at best, practitioner-developed indicators such as the Material Circularity Indicator (MCI) (Ellen Macarthur Foundation, 2015) or the Circular Transition Indicator (CTI) ([World Business Council for Sustainable Development, 2021](#)) were seldomly used in niche design projects. Third, a strong prevalence for cradle-to-gate lifecycle thinking was found when it comes to monitoring the sustainability impact of products. In practice, it was possible to find relatively mature information exchanges with actors belonging upstream in the value chain (such as suppliers or manufacturers of parts) and insufficient or non-existent

exchanges with actors belonging to the use phase or the end-of-life phase. This hinders the sustainability assessment of circular innovations due to the subsequent lack of transparency of assumptions and reliability of data in sustainability assessment efforts (Peña et al., 2020). The fourth and the fifth shortfalls are of an interpersonal nature. Transformative circular design strategies consider more than just material and architecture – they often innovate at the service or ecosystem level. Thus, SPD processes also need to involve inter-organisational actors (suppliers, users, end-of-life managers, outsourced service providers, and so on). Similarly, management actors need to be further engaged as well, due to the need to reconfigure elements pertaining to the corporate strategy such as a product’s revenue model. These new exchanges imply the use of a wide range of communication styles, background expertise to be deployed in new cross-functional dialogues and inter-organisational relationships. Exchanges with other market participants or questions about consumers’ linear expectations necessitate not only changes in the processes or the structure, but also a shift in organisational attitude. Thus, a strong requirement for these exchanges to take place is to align organisational cultures with new processes.

In the second phase of research, it was investigated how companies were implementing a CE. For this, 24 instances of value retention strategy implementations were analysed to examine implementation patterns (Diaz et al., 2022). An overview of an aggregated implementation process can be found in Figure 4.9 (Diaz et al., 2022).

An early observation points to the fact that developing products for a CE starts before product development and design, i.e. during product planning. In this regard, value retention strategies were found to play a two-fold role. During planning processes, they are part of the corporate competitive and sustainability strategies

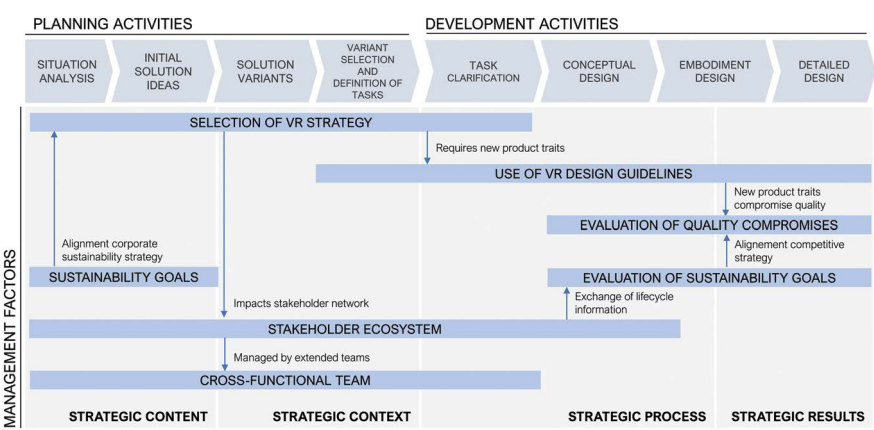


FIGURE 4.9 Overview of management factors influencing circular product design emerging at different stages of product planning and development and main interactions between them

Source: Diaz et al. (2022) used under CC BY license 4.0.

and thus need to deliver on corporate sustainability goals. This is an important step, since the integration of circularity will not always be economically favorable (Bauwens, 2021) and thus a balance between strategic trade-offs needs to be decided upon. A second observation is the fact that value retention strategies determine the stakeholder ecosystem surrounding the product. On the one hand, this includes stakeholders who directly interact with the physical product artifact (e.g. distribution, customers, end-of-life managers, etc.) and whose interventions and decisions largely determine the sustainability implications of circular functionalities embedded in products. The direct involvement of many of these lifecycle actors during product planning and development was observed, e.g. the customers. On the other hand, the involvement of a wider set of stakeholders is needed to secure a certain degree of societal embeddedness of a disruptive circular product innovation (e.g. cultural actors, political actors, regulatory actors and market actors). Managing these wider networks requires the involvement of a varied range of company functions (e.g. marketing, communications, management) and thus a strong element of cross-functional coordination.

The main management factors and conditions needed to implement a CE during SPD processes were systematised in a management framework (Table 4.2). In addition, the framework was applied as a categorisation principle to explore value retention strategy implementation patterns across organisations, again confirming a strong correlation between sustainability strategies and the implementation of value retention strategies.

In sum, value retention strategies need to be managed and integrated into product designs by formulating value retention-based functional requirements. These then need to be translated into design traits and working principles. To verify the effectiveness of a circular design strategy, product evaluation routines need to assess the extent to which the circular product can perform the functions for which it was first ideated (product quality) so that the organisation remains competitive in the market. To verify that corporate sustainability goals are met, sustainability assessments are part of product evaluations as well. It is therefore crucial to conduct thorough product evaluations aligned with circular design principles and sustainability assessments to ensure the product's competitive edge and also to verify the organisation's alignment with long-term sustainability goals.

4.3.4 *Measuring circularity at the corporate level*

Companies are increasingly adopting CE practices to align with international sustainability agendas such as the United Nations Sustainable Development Goals (SDGs) (Opferkuch et al., 2021). However, a common thread is that the relationship between CE strategies and their sustainability impacts is quite ambiguous (Walker et al., 2021). The latest Intergovernmental Panel on Climate Change (IPCC) report has corroborated this point, stating that 'claims on the benefits of the circular economy for sustainability and climate change mitigation have limited evidence' (IPCC, 2021).

TABLE 4.2 Management framework for the integration of value retention options during SPD processes. The top row shows the number of managerial factors enabling the implementation of value retention strategies. The columns display the corresponding range of factor conditions observed.

<i>Sustainability values</i>	<i>Value retention strategy</i>	<i>DfX guideline focus</i>	<i>Quality compromises</i>	<i>System stakeholders</i>	<i>Extended team</i>
Meaning-making	Refuse	Socio-technical system	Performance	Policymakers, media, non-profit, research	Communication
Impartiality	Reduce	Product ecosystem	Features	Market players	Strategic management
Competence	Resell/Reuse	Revenue model	Reliability	Suppliers	Procurement
Influence	Repair	Revenue model	Conformance	Distribution network	Development and production
Health	Refurbish	Service	Durability	Customers	Logistics
Biosphere physical degradation	Remanufacture	Architecture	Serviceability	Local depots, repair services	Marketing and sales
Anthropogenic substance accumulation	Repurpose	Material	Aesthetics	Local waste managers	Aftersales
Earth crust substance depletion	Recycle	Process	Perceived quality		
	Recover energy				
	Re-mine				

Source: [Diaz et al. \(2022\)](#) used under CC BY licence 4.0.

The reality of persisting global environmental and social crises has prompted an increased assessment of the sustainability impacts of CE strategies by companies (Corona et al., 2019). Such assessments will offer additional benefits in terms of both communication and internal impact improvements (Roos Lindgreen et al., 2022). However, CE assessments seem to be applied relatively infrequently (Das et al., 2022; Stumpf et al., 2021). Two reasons for this are a lack of understanding of company needs and capabilities for assessment, and the complexity of the currently available methods (Das et al., 2022). To address these issues, one research aim was to design a new CE assessment framework to assist with the strategic decision-making process of selecting the optimal CE solution. This framework is called the Strategic Circular Economy Impact Assessment (SCEIA). Here we summarise its design, validation and content. The applied research methodology consisted of three phases: (1) setting the objectives of the framework, determining its methodological content and its application routine; (2) validating the framework using an expert panel survey and a series of focus group sessions with practitioners; and (3) applying the framework in practice. See Roos Lindgreen (2022) for a detailed description of each phase.

Following a critical assessment of the available literature on CE assessment, five objectives for the framework were formulated:

- *Enable a holistic (multidimensional) assessment*: the CE is interpreted as a toolbox of resource-efficiency strategies to achieve positive impacts on the three dimensions of sustainable development.
- *Prevent burden shifting to other parts of the supply chain or lifecycle (lifecycle perspective)*: to avoid burden shifting to other parts of the supply chain, a lifecycle view of corporate sustainability is promoted.
- *Provide flexibility in terms of scale and sustainability maturity*: the scale on which the framework can be applied is flexible and depends on the goal of the assessment (Ceschin and Gaziulusoy, 2016). The framework intends to be feasible for companies with different levels of knowledge about assessment by being modular and adjustable to the sustainability maturity of the applying firm.
- *Build on existing assessment tools*: the use of methods such as Material Flow Analysis and Life Cycle Assessment (LCA) to assess the CE, as recommended by several authors, is promoted in the framework.
- *Assist strategic decision-making processes*: strategic decision-making in firms is characterised by high stakes and long-term repercussions (Bushan and Rai, 2004). The strategic level of decision-making is considered here to be particularly relevant due to urgency to move away from business-as-usual patterns of production and consumption.

After defining the objectives and deciding on a preliminary application routine, the resulting preliminary framework was validated. Extensive stakeholder engagement, explained in Chapter 2 in this volume, involved both an expert panel survey (Kravchenko et al., 2021) and qualitative practitioner focus groups (Nyumba et al., 2018).

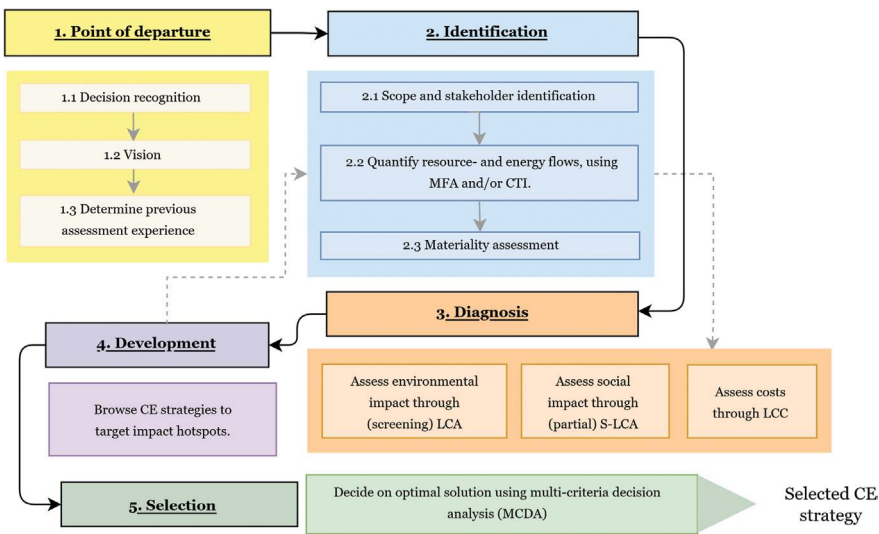


FIGURE 4.10 Overview of the SCEIA framework

Source: developed by the authors based on [Roos Lindgreen \(2022\)](#).

Next, a brief overview of each of the different steps that form the SCEIA framework is presented, together with a visualisation of the framework ([Figure 4.10](#)).

- Step 1: point of departure.* The company decides that a decision on CE must be made, and that assessment will play a role in this. The company formulates its (broad) sustainability goals and determines its starting point, following from its previous experience with assessment.
- Step 2: Identification.* The company sets the scope for the assessment and identifies relevant stakeholders that play a part in collecting data and determining the included dimensions. Next the company collects data on resource and energy flows relevant to the set scope. Optionally, the company identifies impact areas important to its stakeholders through a materiality assessment.
- Step 3: Diagnosis.* In the diagnosis step, the baseline assessment is undertaken. It can include an assessment of the environmental, social or economic impacts of the previously selected system. The diagnosis step will identify impact hotspots within the selected system's value chain. The recommended methods are LCA, Life Cycle Costing and Social Life Cycle Assessment.
- Step 4: Development.* In the development step, a CE strategy will be selected to target the previously identified impact hotspot(s). This can be done using an extensive list of available CE strategies, available as part of the framework. The appropriateness of a certain CE strategy is highly dependent on the company's context.
- Step 5: Selection.* In the optional selection step, a choice is made on which of the previously evaluated CE strategies is most preferred in terms of feasibility and impact.

Finally, the framework was applied in a real-world setting, in collaboration with a company with the ambition to lower its environmental impacts through the implementation of CE strategies. Due to the modular nature of the previously designed and validated framework and feasibility, the primary focus of the application was the use of LCA in assessing the environmental impacts of to-be-introduced CE strategies. These scenarios were based on market conditions and meetings with the company's management team. While the process of assessment is still challenged by the complexity of the available methods, the assessment of the sustainability impacts of the selected scenarios using the SCEIA framework provided the company with insights that supported its decision-making process. In a next phase of this work, the framework was used with a selection of CE companies in different African countries to further optimise its design and application.

4.3.5 *Territorial circular business models*

Companies can design innovations for sustainability at different levels. Recent studies show how the innovations for sustainability have evolved from narrow technical product and process-centric processes towards large-scale system-level changes (Adams et al., 2016; Brezet, 1997; Ceschin and Gaziulusoy, 2016). Currently, sustainability and CE innovations in companies have focused exclusively on a limited range of innovation types (products and technologies), predominantly on environmental challenges (Adams et al., 2016). Therefore, to contribute to sustainability and CE transitions companies need to adopt a higher level of systems innovation, including developing PSS design strategies, sustainable organisation design strategies and sustainable collaboration design strategies (Baldassarre et al., 2020).

PSS are integrated offerings of products and services which can have innovative potential, securing competitiveness while at the same time allowing companies to address environmental concerns (Annarelli et al., 2020). PSS are value propositions oriented towards satisfying users by delivering functions or performance instead of products (Ceschin and Gaziulusoy, 2016), e.g. from selling cars to selling mobility solutions, from selling light bulbs to selling lighting solutions. Since manufacturers retain the ownership of the products and deliver performance to their customers, they are economically incentivised to optimise their resource utilisation through improving resource efficiency, increasing product lifetime, or reducing the total number of products needed to provide that performance (Tukker, 2004, 2015; Vezzoli et al., 2015).

Despite the sustainability potential of PSS, recent studies highlight that these offerings are not always sustainable (Boucher et al., 2016; Doualle et al., 2016; Pigosso and McAloone, 2016) nor contribute to the CE. Companies might adopt the business model for their economic interests without internalising environmental or social concerns. Thus, for PSS to contribute to the transition towards sustainability, they need to be carefully designed, developed and delivered for this purpose (Bertoni, 2019; Boucher et al., 2016; Ceschin, 2013).

While gains in resource productivity are essential in designing a sustainable PSS offering, sustainable PSS design should integrate a systemic approach to attain a range of environmental and social performances (Kristensen and Remmen, 2019; Reim et al., 2015; Vezzoli et al., 2015). Therefore, the performance and potential value of the PSS should be understood from specific contexts, such as the socio-technical systems and the territories and multiple stakeholders perspectives integrating customers, suppliers, employees and society (Costa Fernandes et al., 2020; Pezzotta et al., 2018; Yang and Evans, 2019). However, the current approaches to multi-stakeholder relations in PSS for sustainability and the CE studies do not explore their contextualisation, which poses obstacles to the design and implementation of PSSs as the environmental and social outcomes of these stakeholders' relations are a matter of local interpretation (Cook, 2018, 2014). Moreover, sustainability does not fall evenly across space (Castree, 2005). Thus, successful PSS design and implementation need to consider stakeholder relations situated in space.

For companies to develop PSS for sustainability, they must question whether their operations contribute to territorial resilience (Buclet, 2014). Therefore, it is vital for companies when developing a PSS not to focus solely on developing new PSS but also on understanding the contextual conditions that may favour or hinder the societal embedding of the PSS themselves (Ceschin, 2013; Cook, 2018). Without contextualising PSS solutions as part of the wider economic systems their sustainability potential remains unclear and jeopardised. In this study, territories are not only 'neutral' locations where economic activities are developed; they are also considered PSS co-constructors and resource providers (Allais and Gobert, 2019). The territory is an organisation inscribed in space and is socially constructed (Pecqueur, 2014).

In order to ensure the territorial anchoring of the solution, PSS must provide integrative capabilities to companies moving towards integrated offerings of products and services while understanding users' and society's needs in a given context (Joore and Brezet, 2015). Thus, the research identified three main leverage points for practically supporting the integration of the territorial dimension in PSS designs for sustainability:

- 1 Support the understanding of complex systems for organisations and their particular PSS. PSS designs for territorial sustainability require a multi-level approach, in which companies need to identify and understand the socio-technical and territorial systems their PSS activities belong (Joore and Brezet, 2015; Pereno and Barbero, 2020). Without an understanding of these larger systems, companies might lack a clear understanding of their societal function (socio-technical system), and their interrelations with other systems in the territory, i.e. a bike-sharing offering needs to consider how this offering complements the local mobility (societal function) and wellbeing of citizens in a specific city or region (territorial system). Identifying higher system levels is vital for identifying specific territorial needs and challenges concerning societal function, key territorial actors and local capabilities.
- 2 Support the understanding of how the PSS can create societal and environmental values at the organisational, network and territorial level. The current

narratives of the value of PSS in design are related to resource efficiency (Cook, 2018, 2014). This might reinforce PSS innovation design practices focused on technological fixes and insular innovation (Cook, 2018, 2014). This obstructs the reflection process of companies on how companies can innovate for transformations at higher system levels with their PSS offerings (Joore and Brezet, 2015). Thus, supporting companies in understanding the sustainable value opportunities and outcomes in PSS must be understood from multidimensional (economic, social and environmental) and multi-level (organisational, network and territorial) perspectives (Delgadillo et al., 2021). The use of immaterial capitals and territorial capitals facilitates an understanding of a broader range of value benefits of PSS (Allais and Gobert, 2016; Delgadillo et al., 2021), resulting in compelling narratives of the innovation benefits for stakeholder engagement and concept design discussions and assessment.

- 3 Develop concepts that tackle customer and territorial needs. The coupling of customer/user-focused (zooming in) and the systemic perspective of the territorial approach (zooming out) is an essential practice for enhancing the sustainability of business models (Hofmann and Jaeger-Erben, 2020). This process ensures that the business offerings are desirable, feasible, viable and correspond to the local sustainability challenges.

The design and development of territorial PSS imply companies make efforts to think beyond their products and services as well as redefining their purpose in terms of how they function from an economic and operational standpoint. In addition, companies need to develop collaborations with different territorial actors from the private, public and civil spheres to identify local sustainability challenges and business opportunities. Therefore, the design and implementation processes need top-down policy changes and bottom-up initiatives (companies and citizens of the territories) and more democratic and participatory approaches. The role of governments is critical for developing local, regional and national programmes focused on developing platforms and resources for PSS adoption. Governments can enhance the creation of institutional environments in which local governments, businesses, academia and civil society actors come together to develop a PSS for their territory. Particularly for designers, it means adopting a systemic position that is also more critical. They must be able to engage with socio-political questions and frameworks to create the conditions for forming networks around sustainability issues (Forlano, 2016).

4.3.6 Business and the CE: a spatially defined approach

As discussed in Chapter 6 in this volume, the relationship between companies and the places where they operate is rarely considered in a CE context. Focusing on a specific place, e.g. the territory of a city or region, introduces additional stakeholders, including local government and other public agencies, which requires collaboration between businesses and policymakers to transition to a regional CE. This research examined the perspectives of large companies on a potential regionally

focused CE by making comparisons between Hull, UK, and Graz, Austria² (see [Newsholme, 2023](#); [Newsholme et al., accepted](#)).

The companies under study initially showed an interest in engaging with other companies and organisations in the region where they are located; they often took part in local networking groups on the topic of resource efficiency and environmental issues. These networks are aimed at mutually beneficial discussions, not direct collaborations in CE or more conventional commercial relationships. The companies are linked to global sourcing strategies, as was evident in both Hull and Graz. Even those companies with a strong attachment to the region (through historical and family connections) were driven by cost-focused decisions in terms of supply chain operations, which provided little potential to negotiate more closed loop production systems with regional partners. Through their public reporting and in interviews, the companies expressed the view that CE collaboration is something they would undertake with their value chain partners or internally (namely branches of the company located at the global scale). The idea that value chain partners would be willing to collaborate for the overall success of CE activities seems to be an assumption. Although large companies can exert some influence over smaller customers, building effective relationships for complex CE practices could be challenged by the lack of spatial proximity.

Similarly, downstream disposal mechanisms tend not to be focused on the regional level, but are more tailored towards national or international targets due to the economies of scales needed to manage waste efficiently. Notably, however, some companies were also involved in donating unwanted materials to local social enterprises and are therefore effectively part of a local network of organisations using CE practices to support the community ([Pusz et al., 2023](#); see also [Chapter 6](#) in this volume). These donations are firmly to the benefit of the companies (e.g. to avoid disposal costs), albeit that they are advantageous to the recipients.

This research highlights the global companies' value chain configurations and the lack of current interest in exploring the potential to pursue proximal CE activities, often due to prior long-term strategic commitments to globally distributed suppliers. However, companies are participating in local environment-related networks and in voluntary arrangements with social enterprises. Local public bodies may be able to build on these existing arrangements to help foster social capital for companies and other local stakeholders in order to develop functional and collaborative regional CE activities ([Deutz et al., 2024](#)). However, local public bodies may struggle with the funding of authorities tasked with bringing about such activities without additional support at the national level (see [Chapter 8](#) in this volume).

4.4 Discussion

The contributions presented in this chapter shed light from different perspectives on the topic of business engagement and the CE. The first research contribution addressed drivers for and barriers to corporate engagement for a CE using the

results of a survey of companies conducted in Italy and the Netherlands that are engaged in CE practices. The survey asked respondents about the CE practices they have implemented or plan to implement, the goals they hope to achieve through these practices, and the drivers and barriers they face in implementing a CE. The most implemented CE practices were recovery of products, materials or energy from waste, and increasing energy and material efficiency through reuse, reduction and repurposing. The least implemented CE practices were providing a sharing platform for consumer goods, repairing products, remanufacturing or refurbishing goods, and PSS models. This is in line with results from a survey carried out among manufacturing companies in Austria and confirms that higher value retention strategies are less frequently implemented than recycling-based approaches (Schögl et al., 2023a, 2023b). The most common goals for implementing CE practices were waste reduction, economic competitiveness and reducing the negative environmental impact. The most common drivers for CE implementation were the potential to reduce the environmental impact, the careful use of critical raw materials and the conformity with the company's sustainability image. The most common barriers to CE implementation were legislative constraints, uncertain and long-term economic gains, and high investment costs. These findings suggest that companies should focus on CE practices that have the potential to achieve their specific goals, and that they should be aware of the potential barriers to implementation.

The second research contribution discussed the practices and organisational dynamic capabilities required to innovate a firm's business model(s) for the CE. Based on a multiple case study of ten successful cases of CBMI the most relevant practices for CBMI have been identified. In particular, the six most relevant practices for CBMI are adopting a life cycle perspective, implementing environmental management tools, ideating, and developing value propositions with environmental and/or social impacts, developing a sustainability strategy and culture, engaging strategic partners in collaboration and co-creation, and integrating stakeholders and coordinating partners in the business ecosystem. The cross-case analysis performed in this case study resulted in two sets of complementary insights:

- Four practices are particularly relevant for innovations focusing on short and medium loops (R-strategies R0–R5; see Reike et al., 2018): early customer engagement; understanding the needs of key stakeholders; experimenting to validate assumptions; and promotion of an innovation culture.
- Four practices are important for innovations focused on long loops (R-strategies R6–R9; see Reike et al., 2018): engagement with strategic partners; effective coordination of the business ecosystem; being open to external expert support; and having a fact-based external communication.

The third research contribution focused on SPD and the CE, especially how to integrate value retention strategies and how to enable product sustainability and

circularity. The starting points are the limitations of existing approaches to SPD. The first limitation is that sustainability principles are often discussed only once the design of the product is finished. This is because development processes are often evolutionary, which means that companies often start developing new products from existing designs. The second limitation is that there is a lack of industrial standards on CE assessment in the context of manufacturing companies. This means that there are no agreed-upon metrics to monitor whether the CE design traits are effectively engineered into product designs. The third limitation is that there is a strong prevalence of cradle-to-gate focus when it comes to monitoring the sustainability impact of products. This means that there is insufficient or non-existent exchange with actors belonging to the use phase or the end-of-life phase. The fourth limitation is that transformative circular design strategies often innovate at the service or ecosystem level. This means that SPD processes need to further involve inter-organisational actors (suppliers, users, end-of-life managers, outsourced service providers, and so on). The fifth limitation is that management actors need to be further engaged as well, due to the need to reconfigure elements pertaining to the corporate strategy such as a product's revenue model. To overcome these limitations value retention strategies need to be integrated strategically into the product designs. Thus it was identified that value retention strategies play a two-fold role in product planning. First, they are part of the corporate competitive and sustainability strategies and thus need to deliver on corporate sustainability goals. Second, they determine the stakeholder ecosystem surrounding the product. The starting point is the formulation of value retention-based functional requirements. These then need to be translated into design characteristics and working principles. To verify the effectiveness of a circular design strategy, product evaluation routines need to assess the extent to which the circular product can perform the functions for which it was first ideated (product quality) so that the organisation remains competitive in the market. To verify that corporate sustainability goals are met, sustainability assessments are part of product evaluations as well.

Leaving aside the product focus the next contribution concerned the development of a new CE assessment framework, namely the SCEIA framework, which aims to assist companies in the strategic decision-making process of selecting the optimal CE solution for the company itself. The framework was developed in three phases (setting the objectives of the framework; determining its methodological content and its application routine; validating the framework using an expert panel survey and a series of focus group sessions with practitioners; applying the framework in practice).

The SCEIA framework builds on existing assessment tools, which makes it more accessible to companies that are new to CE assessment. The SCEIA framework provides a modular approach that can be tailored to the specific needs of a company. It can be used to assess the sustainability impacts of both current and future CE strategies. This allows companies to make informed decisions about which CE strategies are most likely to achieve their sustainability goals. Furthermore,

the SCEIA framework can be used to identify and prioritise impact hotspots. This information can be used to focus resources on the areas where CE strategies can have the greatest impact. And the SCEIA framework can be used to communicate the sustainability impacts of CE strategies to stakeholders. This can help to build support for CE initiatives and ensure that they are implemented effectively.

The fifth research contribution discusses the importance of considering the territorial dimension when designing and developing a PSS for sustainability. It is argued that a PSS can contribute to sustainability and a CE by reducing resource consumption and waste, but that their full potential can only be realised if they are embedded in the local context. Three main leverage points for practically supporting the integration of the territorial dimension in PSS design for sustainability have been identified (i.e. understanding of the territorial system; understanding of territorial value generation opportunities; and alignment to customer and territorial needs).

The design and development of a territorial PSS requires a multi-stakeholder approach, involving collaboration between companies, governments, academia and civil society. Usually, these design and implementation processes need to be bottom-up, with companies and citizens working together to identify and address local sustainability challenges.

The regional perspective was employed in the last research contribution. Companies, especially large ones, are often linked to global supply chains and sourcing strategies, which makes it difficult for them to collaborate with local stakeholders on CE initiatives. An additional challenge for regional collaborations of companies can be a lack of trust and social capital between companies in a region. To overcome these challenges and to foster regional collaborations for a CE it is suggested that, first, national policymakers need to provide more support for CE initiatives at the regional level. This could include providing financial incentives, technical assistance and regulatory support. Second, companies need to be more willing to collaborate with local stakeholders on CE initiatives. This could be done by building trust and social capital between companies, and by developing shared goals and objectives. The transition to a CE will require a concerted effort from both companies and policymakers. By working together, it is possible to develop effective CE initiatives that benefit both businesses and the environment.

In sum, these studies highlight how important it is for companies to match their practices with the principles of a CE in order to minimise their negative effects on the environment and improve sustainability. An often overlooked factor is the importance of regional and collaborative efforts to fully harness the potential of the CE in corporate strategies.

4.5 Conclusions

The focus of the research activities presented in this chapter was on companies and their role in a CE. Companies are a special form of social system with the goal to produce economic value by transforming tangible and intangible inputs to

outputs for which customers will pay. Typical management tasks are the definition of a strategy and of business models as basis for the long-term orientation of companies and their market success. Furthermore, companies need competent and motivated employees, and they need products and services they can offer on the market. Companies should use a performance measurement system to understand the economic consequences of their decisions and activities. All these topics are of extreme interest from a sustainability and CE perspective and have thus been covered in this chapter. The first research question is answered with a detailed analysis of the drivers for and the barriers to the implementation of a CE at the corporate level. Regarding the second research question, CBMI and circular product design have been identified as useful approaches. Practices like adopting a life cycle perspective, implementing environmental management tools, developing value propositions which have environmental and social impacts, creating a sustainability strategy and culture, engaging strategic partners, and integrating stakeholders within the business ecosystem are useful. These practices help companies to innovate in a way that aligns with CE principles and allows them to assess the environmental and social impact of their CE activities. The research answering the third research question shows that the full potential of CE practices can only be realised if they are embedded in the local context. To support this integration, understanding the local socio-technical and territorial systems, recognising specific territorial needs and challenges, and designing products and services that align with the local context are vital. Multi-stakeholder collaboration is therefore essential, involving companies, government bodies, academia and civil society, to address local sustainability challenges and develop territorial solutions.

Companies can be both contributors and inhibitors in the transition to a sustainable and circular future. They have the potential to drive change and support sustainability efforts but can also hinder progress or oppose initiatives. This research showed that it is necessary to consider a company's internal issues but in particular to go beyond the corporate boundaries and to consider the entire value chain (from a product life cycle perspective, i.e. including the use phase and the end-of-life phase), the broader stakeholder network and ecosystem, and the region a company is embedded in. The case studies on CBMI and on circular product development revealed the strong role of an organisational culture which is open to sustainability, the CE and innovation. This goes hand-in-hand with a quest for a more strategic cross-departmental collaboration, but also for education and training. This education and training should go beyond corporate boundaries, as CE practices and initiatives, being that CBM, PSS or circular products and services, need to be understood and supported by customers, other stakeholders, and policymakers. This also requires the effective communication of the benefits and challenges of these initiatives.

The transition to a CE will require a change in the way that companies think about their supply chains, the use phase of their products and services, and the respective end-of-life phase. Value retention strategies, ranging from recycling to

the complete redesign of business models, products and services, must become a core objective for companies if they are to make a positive contribution to sustainability and the CE. Furthermore, they should be more open to working with local suppliers and communities. The present volume seeks to simplify this complexity through the provision of frameworks that aim to systematise these processes (i.e. arranging business model innovation practices in a structured manner, describing PSS development processes, and organising managerial factors and conditions in a coherent framework) to ease effectiveness, consistency, and ease of understanding. Nevertheless, the context-specific nature of these tools (e.g. building on specific cultural settings, organisational sizes and structures, the human factor, etc.) is important to keep in mind when it comes to the corporate adoption of circularity. This transition will ultimately vary on a case-by-case basis. Given the exploratory nature of the applied research methods future research is needed to validate and complement our proposals in different contextual settings or in larger quantitative studies.

The research also revealed the potential of more standardised metrics to measure and monitor the sustainability impacts of companies, products and services. This would help companies to make more informed decisions about the design of their products. Support in the form of the new SCEIA framework could offer businesses guidance with the impact measurement process when introducing CE strategies. While the complexity of life cycle measurement methods is still a barrier to their implementation, we expect future research to focus on the core business capabilities necessary to successfully implement measurement approaches. Such research has the potential to produce insights that allow for more effective generation of impact evidence, allowing companies to make decisions that will benefit both the environment and social value chains.

Governments can play a key role in supporting the development and adoption of a CE. This can be done through policies that promote resource efficiency, encourage collaboration between stakeholders, and provide financial support for CE initiatives and projects. This collaboration largely depends on interpersonal factors. Therefore, future research might focus on incorporating approaches from organisational behaviour studies, which could offer valuable insights into enhancing the successful implementation of CE strategies by considering individual and group attitudes towards the adoption of a CE among organisations. In addition, the effect of increasing legal obligations, as seen for instance in the European Union in terms of the ambitions and outcomes of corporate CE engagement, is of interest.

Companies have the potential to play an important role in the transition to a sustainable and circular future, but they must be willing to identify the CE and sustainability as being of strategic importance to their business. In addition, companies should strive to become more active in advocating for sustainability and the uptake of CE initiatives, to take risks, invest in research and development into new innovative solutions, and accept their responsibility in creating a more sustainable future.

Notes

- 1 R0: Refuse, R1: Reduce, R2: Reuse, R3: Repair, R4: Refurbish, R5: Remanufacture, R6: Repurpose, R7: Recycle, R8: Recover, R9: Re-mine.
- 2 See [Chapter 6](#) in this volume for further information on the case study areas.

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ASSESSMENT APPROACHES AND METHODS FOR A CIRCULAR ECONOMY

*Andrea Raggi, Hinrika Droege, Katelin Opferkuch,
Erik Roos Lindgreen, Anna M. Walker, Sandra Caeiro,
Tomás B. Ramos and Roberta Salomone*

5.1 Introduction

Both private and public sector organisations play a key role in the global uptake of the circular economy (CE). Businesses from many sectors are experimenting with CE business models, and one reason for this growing interest is probably connected to the concept's promise of various financial benefits through innovation (Ellen MacArthur Foundation, 2013). Beyond such financial returns, research has framed a wider set of advantages of CE activities for companies based on three domains of sustainable development, or the 'triple bottom line', namely planet, people, profit or prosperity (PPP). These include lowering environmental impacts and realising social improvements and the previously mentioned economic benefits, such as cost savings and the development of new markets (Laubscher and Marinelli, 2014; Korhonen et al., 2018). According to this frame, the potential of CE strategies lies in reducing negative sustainability impacts without jeopardising growth and prosperity (Ferasso et al., 2020).

However, the actual sustainability implications of the CE have mostly been assumed rather than carefully assessed (Blum et al., 2020; Harris et al., 2021). Indeed, it is crucial to assess to what extent CE strategies actually contribute to solving global crises, such as climate change, biodiversity loss and economic inequality, while also taking into account potential effects at the regional and local level, such as acidification, eutrophication, ecosystem toxicity and local employment. Likewise, it is essential to improve the understanding of how to assess the potential impacts of the CE. However, doing so is at present beyond the scope of the current impact measurement and reporting methodologies.

To evidence this promised reduction in sustainability impacts, research points to an increasing need for CE indicators and other assessment methods for business. Such

approaches can help organisations to evaluate their progress in the implementation of CE practices and the actual realisation of the expected environmental, social and economic benefits (Kristensen and Mosgaard, 2020). Getting data on such impacts is quite crucial, since for many CE strategies it is unclear whether, or to what extent, they actually lead to more sustainable outcomes across all the dimensions and aspects of sustainability (Kravchenko et al., 2019). Well-intended CE strategies might actually lead to increased impacts and/or burden shifting (Lonca et al., 2018; Corona et al., 2019; Walzberg et al., 2021). This chapter responds to this important gap in understanding by analysing the needs and challenges for private and public sector organisations seeking to assess the circularity and sustainability of their activities.

A key requirement for companies to engage with assessing their sustainability impacts is the availability of the right methods and tools for the purpose. Indeed, as regards the metrics for CE assessment, there are multiple approaches and indicators to choose from, with a large number of review articles inventorying such CE assessment approaches for businesses (e.g. Corona et al., 2019; Kristensen and Mosgaard, 2020). Many of the existing assessment approaches are inventoried and categorised, mainly focusing on their connection to different sustainability dimensions and specific CE strategies. Research has found frequent inclusion of the environmental and economic domains, with less attention being given to social aspects (Oliveira et al., 2021).

Overall, existing assessment approaches are extremely diverse. This might be caused by the complex nature – and limited understanding – of the relationship between the CE and sustainability (Geissdoerfer et al., 2017; Schroeder et al., 2019). There seems to be a lack of consensus on whether the CE and sustainability assessment are different or the same and whether one forms part of the other (Vinante et al., 2021; Walzberg et al., 2021). Hence, the need to bring order to the vast multitude of approaches and indicators available and to delve deeper into the relationships between circularity and sustainability and the related assessment processes, which were identified as objectives of this research.

Notably, companies and other organisations do not exist in isolation but are part of networks (sometimes formally constituted, others less so). CE practices mostly take place within a network of companies (Batista et al., 2018), thus going beyond single firms. While both private sector and academic literature is emerging on how to assess the circularity of a company (Elia et al., 2017; World Business Council for Sustainable Development, 2018; Vinante et al., 2021) and its impact on sustainability (Kravchenko et al., 2019; Kristensen and Mosgaard, 2020), limited literature has looked at the inter-firm level. Hence, the objective to create an overview of sustainability assessment approaches in circular inter-firm networks and to identify criteria of sound sustainability assessment in a CE context, while exploring their application in academia and practice. Additionally, the research sought to analyse the potential synergies between, as well as complementary features of, the CE and sustainability assessment approaches applicable to geographical contexts.

A further area considered by the research was the need to develop communications for CE practices. CE assessment metrics, in fact, could be used to

transparently and reliably communicate to various stakeholders through sustainability reporting the circularity and sustainability progress in companies (Ditlev-Simonsen and Midttun, 2010; Lock and Seele, 2016; EC, 2021). If, in general, the range of reporting approaches available is quite wide (Thijssens et al., 2016), there is an extensive discussion on their ability to contribute to transparent and quality non-financial disclosures (Melloni et al., 2017; Cortesi and Vena, 2019; de Villiers and Sharma, 2020). More specifically, a lack of clarity and a need for further investigation emerged on how circularity should be communicated in sustainability reports and on what the benefits and challenges related to CE reporting are, also in light of the evolving relevant regulation. Therefore, there is a growing need for guiding principles for the inclusion of CE-related information in sustainability reports. From this arose the objective of examining the frameworks suggested in the literature and the existing approaches in order to guide companies in CE sustainability reporting.

Both private and public sector organisations are considered key actors in the transition towards a CE (Kirchherr et al., 2017; Parchomenko et al., 2019). Public sector organisations are defined by the Organisation for Economic Co-operation and Development (OECD, 2019) as any organisation under government control that develops public goods or services. Their political nature distinguishes them from the market-driven private sector (Domingues et al., 2017). Public sector organisations are often characterised as bureaucracies with non-competitive (impersonal) hierarchies, rule-based management, functional speciality, division of labour and focused missions (Weber, 2008). Authors highlight that the different characteristics between private and public sector organisations need to be acknowledged in the development, implementation and execution of CE assessment approaches (e.g. Kristensen and Mosgaard, 2020).

The public sector contributes significantly to the socio-economic system, for example as a regulator and policymaker, a role model or a significant consumer and purchasing power. Many governments have developed and implemented CE strategies and activities already (Klein et al., 2020). These activities can serve as a role model to other public sector organisations, non-governmental organisations, the private sector, as well as citizens (Domingues et al., 2017). Public sector organisations can impact sustainability, especially in areas such as procurement, internal operations (e.g. material consumption) and their ownership of many buildings, among others (Brammer and Walker, 2011). From an economic viewpoint, in the European Union (EU), for example, public sector expenditure accounts for 51.5% of gross domestic product (Eurostat, 2021).

To further exploit the potential of the CE in the public sector, it is appropriate for public organisations to implement a CE assessment in their processes (Klein et al., 2020). Numerous public sector organisations have declared their support for CE performance evaluation; nevertheless, its implementation does not appear to be widespread (Ghisellini et al., 2016). Therefore, a further objective of this project was to analyse which factors hinder the implementation of CE assessments

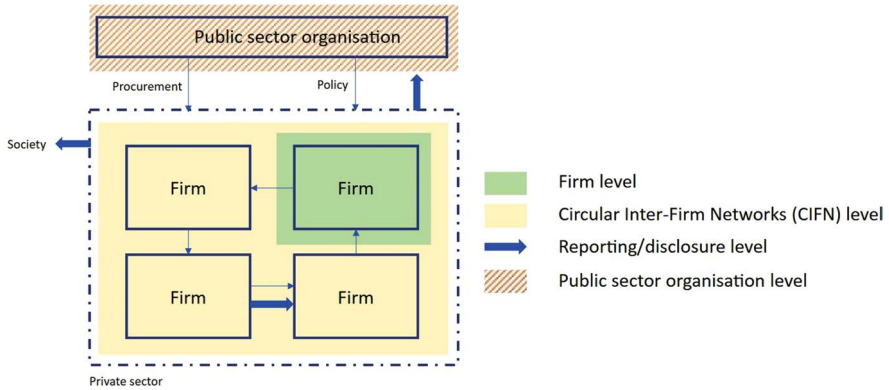


FIGURE 5.1 Different analysis levels of CE assessment applied in this chapter

in public sector organisations and to identify how to overcome these challenges, as well as to provide public organisations with a conceptual framework for assessing and reporting CE performance. Starting from the above-mentioned gaps and objectives, Cresting's research investigated the topic of assessing the sustainability of the CE by understanding the main related methodological issues for both the private and public sectors. The results of the project work packages contain lessons on the tools, methods and indicators useful for measuring both the extent and effects of a CE towards sustainability, at different sectoral contexts and scales. Throughout the research, a dual perspective including theoretical contributions and end-user point of views (i.e. companies, practitioners and public sector organisations) was considered.

The levels of analysis are summarised in [Figure 5.1](#), in order of their appearance in the chapter: the firm level, the circular inter-firm networks (CIFN) level, the reporting and disclosure level and the level of public sector organisations. The dotted line indicates the boundaries of the private sector. The direction of reporting and disclosure takes place from the private sector to society and public sector organisations, while firms also communicate CE metrics between themselves. Measurement-related interactions between public sector organisations are summarised as procurement and policy interactions: this is explained in more detail later in the chapter.

The next section starts by highlighting the main aims for businesses to assess circularity; then, the outcomes of a systematic analysis of key experiences of sustainability assessment for the CE are presented and briefly discussed, identifying the implemented methods and tools for different industry sectors, company dimensions, sustainability perspectives (environmental, economic, social), and key waste streams. In [section 5.3](#) the urgent topic of strengthening inter-firm connections by applying both CE and sustainability assessment is presented. [Section 5.4](#) is centred around the findings related to the use of assessment approaches for facilitating

the inclusion of relevant data within sustainability disclosures and external communication. In [section 5.5](#), while summarising the results of the analysis of CE performance assessment in public organisations and the development of a specific framework, connection to the previous business-centred parts is made. The chapter continues with an overview of key learnings on the use of CE assessment within both the private and public sectors ([section 5.6](#)) as well as listing opportunities for future research ([section 5.7](#)). Finally, the chapter ends with some concluding remarks.

5.2 CE assessment goals and approaches for businesses

CE assessment benefits for businesses can generally be grouped into two categories: (1) internal improvements and insights and (2) external communication and collaboration ([Roos Lindgreen et al., 2022](#)). The first category includes e.g. improving and optimising internal CE strategies, providing insights into broader sustainability performance, enabling a learning process and cultural change among the employees of the company, contributing to the development of a company strategy and vision, and allowing for comparability and identifying market opportunities. In the second category, external benefits are diverse as well, and include the use of the assessment results in marketing and improving the reputation of a company, communication and reporting to stakeholders and clients, providing evidence of CE activities to increase overall transparency, and identifying opportunities for collaboration.

5.2.1 *Navigating the diversity of CE metrics*

To create some structure to the large number of available assessment approaches, four general categories relevant to businesses were identified ([Table 5.1](#)). The first comprises life cycle-based methods. These enable quantifying impacts across all phases of a product's or system's life cycle, from the extraction of raw materials to its disposal ([Finkbeiner et al., 2010](#)). This group also includes material flow analysis (MFA)-based methods, which establish an overview of resource and energy flows across the life cycle of a system, and footprint tools, such as the carbon footprint and the water footprint, which can be considered a sort of simplified Life Cycle Assessment (LCA) ([Brunner and Rechberger, 2016](#); WBCSD and WRI, 2004). The second category comprises several available sustainability reporting frameworks, such as Global Reporting Initiative (GRI) standards. These reporting frameworks aim to create a common language and format for organisations to report on their sustainability impacts ([Global Reporting Initiative, 2018](#)). Next up is the group of single indicators: these are quantitative and qualitative indicators that present circularity as single thematic or sectoral CE key variables which are mainly oriented around metrics such as recycling rates or virgin or secondary resource use ([Kristensen and Mosgaard, 2020](#)). Finally, there is a

TABLE 5.1 Categories of the assessment approaches reviewed

<i>Category</i>	<i>Assessment approach</i>	<i>References</i>
Life cycle-based/ footprint	Carbon footprint	WBCSD and WRI, 2004
	Ecological footprint	Wackernagel and Beyers, 2019
	Product environmental footprint	EC, 2013
	Environmental life cycle assessment	ISO, 2006a, 2006b
	Life cycle costing	Hunkeler et al., 2008
	Material flow analysis	Brunner and Rechberger, 2016
	Social life cycle assessment	UNEP, 2020
	Water footprint	Hoekstra et al., 2011
Reporting framework	Environmental accounting	Bebbington et al., 2021
	GRI standards	GRI, 2016
Single indicators	Material Circularity Indicator (by Ellen MacArthur Foundation)	Ellen MacArthur Foundation and Granta, 2015
	Material durability	Figge et al., 2018
	Recycled content	Kristensen and Mosgaard, 2020
	Recycling rate	Kristensen and Mosgaard, 2020
	Time for disassembly	Vanegas et al., 2018
	Volume of non-renewable resources not extracted	Kristensen and Mosgaard, 2020
	Volume of virgin material production prevented	Kristensen and Mosgaard, 2020
	Volume of waste diverted from landfill	Kristensen and Mosgaard, 2020
Tailor-made indicators	Tailor-made circularity indicators based on a life cycle approach	N/A
	Tailor-made circularity indicators based on direct impact	N/A
	Tailor-made sustainability indicators based on direct impact	N/A
	Tailor-made sustainability indicators based on a life cycle approach	N/A

Source: Based on Roos Lindgreen et al. (2022)

category of tailor-made indicators, which could be based on a life cycle approach or direct (i.e. scope 1) impact, which makes it possible to tailor the CE or sustainability assessment more closely to a company's specific context (Kravchenko et al., 2020).

5.2.2 *Sustainability assessments as guide to circularity for business*

As a result of the large number and diversity of assessment approaches, businesses might struggle to select the one(s) most relevant to their context. In addition, many of the CE assessment approaches found in the (grey) literature are usually solely based on resource use metrics, making them unsuitable to assess the full sustainability performance of circular systems (Corona et al., 2019; Walker et al., 2021). For both reasons, several authors propose to concentrate on using existing sustainability assessment approaches to assess the impact of CE strategies. For instance, Kristensen and Mosgaard (2020) acknowledge that LCA and other methodologies, such as MFA, Life Cycle Costing (LCC), and Corporate Social Responsibility (CSR), are likely to be applicable to CE. Work by Corona et al. (2019) finds LCA to be the most used framework to assess circular strategies and highlights the importance of avoiding burden shifting from reduced material consumption to increased environmental, economic or social impacts. Overall, LCA can be described as a suitable and effective method to measure the environmental impacts of CE strategies for businesses (Roos Lindgreen et al., 2021). It provides decision-makers with a tool to prioritise actions towards developing low-impact strategies. For the other dimensions of sustainable development, related existing methods such as LCC and Social Life Cycle Assessment (S-LCA) could provide an appropriate pointer for assessing CE activities (Niero and Rivera, 2018; Moraga et al., 2019; Kristensen and Mosgaard, 2020). Global standardisation organisations such as ISO and the British Standard Institute (BSI) also promote their use in CE assessment (BSI, 2017; ISO/TC 323, 2020).

A complication of existing life cycle-based methods is that generally they are considered to be challenging to use, due to their time-intensive nature, complexity and cost. There certainly exists tension between the accuracy and completeness of assessment and its feasibility for companies. Does the complex nature of more 'complete' methods warrant the use of relatively simple, resource efficiency-centred CE metrics? Such metrics might be less financially demanding, while also requiring fewer input data. However, the results that follow from such approaches could potentially lead to the implementation of strategies that do not deliver the sustainability impacts promised by CE.

While it is acknowledged that resource efficiency-based metrics could be of use in specific decision-making situations, for CE to be a valuable concept, current ecological and social crises demand that its outcomes should be sustainable (Walker et al., 2021). For this reason, the value of assessing impacts of CE strategies before their introduction becomes evident (Roos Lindgreen et al., 2022). The challenging

nature of the approaches remains, but businesses are rapidly developing knowledge about the use of such tools. In addition, research focuses on the accessibility of life cycle-based methods and tools, not only through their simplification, but primarily through investigating experiences of businesses with such tools by means of a shared learning process between academia and the private sector (Das et al., 2021).

These lessons as summarised above have been integrated in the design of the new Strategic Circular Economy Impact Assessment (SCEIA) framework, which provides guidance for companies to assess the sustainability impacts of their CE strategies. The framework has five objectives: (1) to enable holistic (multidimensional) assessment; (2) to prevent burden shifting to other parts of the supply chain or product life cycle (life cycle perspective); (3) to provide flexibility in terms of scale and sustainability maturity; (4) to build on existing assessment tools; and (5) to assist in strategic decision-making processes. A more detailed description of the framework is provided in Chapter 4 in this volume.

While much literature on the design of CE assessment approaches exists, less is known about the topic of the assessment process and the aforementioned topic of shared learning. This includes conducting research into company needs and capabilities for assessment, which could then provide the blueprint to design assessment approaches that match business realities. Relevant questions are, for example, whether and how CE assessment implies the involvement of a wider set of stakeholders in setting measurement targets through e.g. materiality assessment, how the assessment results could be used for strategic decision-making, or, more generally, how much time and resources it is recommended should be allocated to assessment activities in different sectors. Answers to these questions are expected to be able to increase the level of uptake of CE assessment approaches, providing increased evidence to the CE transition.

After establishing such ‘process level insights’, a next step would be to learn more from businesses that have just begun their ‘assessment journey’: how can they be stimulated to better understand the impact of their operations, without the risk of overcomplication following the large number of indicators and tools available? Businesses are not always sure where to start with CE assessment, and by focusing on assessment as a trajectory, or a process, starting small and slowly expanding, companies could be tempted to assess their impacts, convincing them that not dozens – if not more – environmental, social and economic indicators should be used in the decision-making process at once. A formalised description of such an ‘assessment trajectory’ could provide such companies and organisations more generally with concrete assistance.

5.3 CE practices and inter-firm networks

When dealing with inter-firm networks and the CE, a semantic issue should be first addressed: what actually constitutes the inter-firm or so-called meso level? While some scholars (Ghisellini et al., 2016; Kirchherr et al., 2017; Panchal et al.,

2021) have a more limited perspective at the meso level, claiming that it includes only cases of industrial symbiosis or eco-industrial parks, other scholars (Masi et al., 2017; Chertow, 2000; Oliveira et al., 2021) have a wider understanding of the term. In their view, it also includes supply chains throughout product life cycles, which can be both closed and open looped (Farooque et al., 2019). The latter conceptualisation is the one used throughout this chapter, and, to avoid confusion, the term inter-firm will be used. The different actors collaborating on CE practices can be seen as acting in CIFNs, rather than linear supply chains. Indeed, the supply chain management literature advocates for a network perspective of supply chains, providing a superior understanding of the dynamics within them (Carter et al., 2015). A feature that distinguishes the CIFN from a traditional supply chain network is that the former goes beyond the consumer and includes actors throughout the whole life cycle of a product.

5.3.1 *Assessing sustainability in inter-firm networks*

The question arises how sustainability can be assessed in such CIFNs. Rather than conceptualising new assessment approaches, Walker et al. (2021) show in their literature review that the open and closed loops in supply chains, which CE practices entail, are found in both the fields of industrial ecology and circular supply chain management. After identifying the sustainability assessment approaches that have passed academic rigour, the insights into the actual assessment practices of companies active with CE practices in Italy and the Netherlands were collected through 43 interviews. While the academic assessment approaches were both quantitative and qualitative, most of the approaches applied in practice were qualitative. One exception to this are the life cycle thinking (LCT) methodologies, such as LCA and carbon footprint, which were found to be frequently employed despite their quantitative nature. The companies using them were mostly larger companies and smaller specialised firms, thus explaining the availability of technical know-how (Roos Lindgreen et al., 2022). Additionally, and instead of relying on quantitative assessment approaches, practitioners underscored the importance of relationships when initiating CE practices and assessing them. The relevance of supplier selection criteria and audits to manage performance was stressed, in connection with the frequent exchange of best practices and mutual trust. The latter was seen as an essential starting point both for initiating CE practices and for evaluating them jointly. It was also found that the connection between collaboration and assessment was reciprocal (meaning that more collaboration facilitated the assessment process), as was described by Alghababsheh and Gallear (2020).

To evaluate whether the approaches applied in practice and proposed by academia are suitable for sustainability assessment in CIFNs, it was essential to set some criteria for sound sustainability assessment. Therefore, the four criteria presented by Muñoz-Torres et al. (2018) were adapted by Walker et al. (2022), namely (1) balance of the different sustainability dimensions aligned with the United Nations Sustainable Development Goals (SDGs); (2) consideration of the intergenerational

nature of sustainability; (3) stakeholder involvement; and (4) LCT. Regarding the first criterion, it was found that the LCT methodologies adopted most frequently addressed the environmental dimension, rather than balancing the sustainability dimensions. Regarding the limited inclusion of the social dimension, [Walker et al. \(2021\)](#) underscored in their paper that the social assessment approaches are diverse, inherently context-dependent and mandate stakeholder inclusion ([Kühnen and Hahn, 2018](#)). The most prominent LCT-based social assessment methodology in academia, the S-LCA ([Finkbeiner et al., 2010](#)), is less commonly applied in both the literature and in practice, compared to environmental LCA and LCC, for example. Of the 43 companies that were interviewed, less than half conducted some type of social assessment; the main barriers were a lack of expertise and missing standards. Although the S-LCA, for example, is partially standardised, it was not seen as implementable because of limited data availability and low perceived importance of CE practices' social impacts regarding CSR or risk management strategy, two areas generally informed by social assessment ([Rosenbaum et al., 2015](#); [Kühnen and Hahn, 2019](#)). In contrast, those social assessment approaches applied were mostly qualitative and were evaluated through discussion with partners.

The second criterion of addressing the intergenerational nature of sustainability was the least fulfilled both in the literature and among the interviewed companies. It also emerged that the third criterion, stakeholder engagement, was already a best practice for most of the interviewed companies, while in the literature on LCT methodologies this was documented only sporadically. For companies aiming to conduct more quantitative assessments, it was proposed to work with a set of social indicators based on a normative consensus like the SDGs, which is then complemented with more context-based and strategic indicators legitimised through stakeholder inclusion ([Gasparatos and Scolobig, 2012](#); [Kühnen and Hahn, 2018](#)). At this point it is essential to underline that the balance between having a normative core for the assessment, legitimised through global consensus, and using context-specific indicators, determined with stakeholders, will persist and is essential to yield meaningful results ([Kühnen and Hahn, 2018](#)). While this holds for sustainability assessment in general, it is especially relevant for the social dimension, due to the high context-related variation of values and norms. Indeed, this creates a certain trade-off between standardisation and contextualisation ([Roos Lindgreen et al., 2022](#)), which requires discernment on the part of assessment practitioners, rather than a one-approach-fits-all solution.

Finally, the LCT criterion was also broadly applied in practice by the interviewed companies, although sometimes practitioners did not involve actors throughout the whole life cycle but only in the next tiers of the supply chain.

5.3.2 *Socio-material lens for assessment contextualisation*

While LCT-based methods have evolved to become the most adopted approaches in the context of CIFNs, it is essential to understand that they need to be embedded into companies, inter-firm networks (e.g. through life cycle management; see

Zinck et al., 2018) and their local contexts. One of the options is to use the epistemological lens of Actor Network Theory (ANT) to model end-of-life scenarios of a LCA and to contextualise its results. In this way, the assessment is viewed in its role as a calculative device and can be seen as performative, i.e. a tool to advocate for the implementation of one CE solution over the other, for example (Niero et al., 2021). Conducting more LCT-based assessments supported by sociological analyses is essential in a sustainable development context, because the results can direct companies towards potential levers of action (Baumann and Lindkvist, 2022). Besides the need to embed the LCA into a certain context, it is essential to understand the limitations of this calculative device, given it can only provide a partial (limited set of impact categories) and unidimensional (focusing on environment) picture of a system's sustainability (Gasparatos and Scolobig, 2012; Niero et al., 2021). In addition, LCAs are being used and interpreted by other actors such as the companies commissioning the LCAs for decision-making and external communication (Pryshlakivsky and Searcy, 2021) and should thus not be viewed as a neutral methodology. In a similar vein, it is an assessment approach that mirrors the worldview of LCA practitioners through their modelling choices (Gasparatos, 2010). While a certain degree of subjectivity is unavoidable, and according to Freidberg (2018) even desirable, LCA practitioners should be transparent about these values. This is especially relevant given the status that LCA has acquired as a best practice assessment methodology in the CE context, which is bound to increase its application substantially (ISO, 2020; Roos Lindgreen, 2022).

5.4 CE assessment within sustainability disclosure and external communication

As already mentioned, multiple assessment approaches for the CE have been proposed and reviewed both by academics (e.g. Saidani et al., 2019; Kristensen and Mosgaard, 2020), as well as by private initiatives (e.g. Ellen MacArthur Foundation, 2020; WBCSD, 2022). However, these approaches are generally designed to produce results/data for internal use, offering companies the opportunity to utilise assessment results for internal improvement and CE strategy optimisation. As regards external communication, given the scarcity of indications in the literature on CE data to be disclosed externally, as well as on the connections between CE assessment and corporate sustainability reporting, companies have to decide independently how and what to report in terms of circularity (Opferkuch et al., 2021, 2022). This, as Pauliuk (2018) suggests, could lead to companies reporting indicators for CE which best suit their narrative and thus open themselves up to claims of greenwashing. However, the recently accepted draft European Sustainability Reporting Standards, specifically the standard Resource Use and Circular Economy, will now guide companies to disclosing comparable CE data within their mandatory corporate sustainability reports (EFRAG, 2022). To comply with these reporting requirements, CE assessments will provide companies with sufficient and

relevant CE data to increase the transparency of their business activities and reduce potential claims of greenwashing (Opferkuch et al., 2022). Additionally, the use of CE assessment results can assist companies with the identification of relevant CE-specific risks and opportunities, as is required by their investors and external stakeholders. Overall, CE assessments can gather data relevant for inclusion within corporate disclosures; thus, the assessments themselves can help to facilitate and improve existing corporate sustainability reporting processes.

5.4.1 The need for businesses to report their progress towards circularity

There are numerous reasons why companies should include CE content (including the results of any CE assessments) within their corporate sustainability reports. At a European level, the context of CE disclosure is rapidly moving from voluntary to mandatory disclosure. Following the publication of the EU's Green Deal (EC, 2020), which cemented the CE as a priority approach to address a number of environmental issues, the CE has been included as a key environmental objective within relevant sustainable finance regulations, namely the Corporate Sustainability Reporting Directive (CSRD) (EC, 2021) and the EU Taxonomy Regulation (EC, 2020). What this means is that in the coming years there will be an increasing demand for (1) CE data within corporate sustainability reports and (2) the number of investments made to companies engaging with and reporting CE data. Companies that are already voluntarily conducting CE assessments and communicating this type of data will be at a clear advantage compared to those that will only do so when it becomes mandatory. In addition to this evolving climate of CE disclosure, early evidence suggests that companies are experiencing a number of benefits when externally communicating their CE activities (Opferkuch et al., 2023).

Using semi-structured interviews, a sample of 43 companies engaged with the CE and operating in either Italy or the Netherlands were asked what benefits they experienced when they externally communicated their CE activities. Generally, companies had recorded a number of benefits. First, the CE is a powerful storytelling tool. Companies explained that framing the descriptions of their business activities using a life cycle approach enabled them to develop informative narratives which explain the life cycle of the materials being used and the products they produce. This in turn, helps consumers to understand exactly how the company's products are being made and what the company's values are. Second, companies described the CE as an important tool to promote sustainability education. A major challenge for companies intending to externally communicate CE data was a perceived low market awareness and consumer acceptance of 'circular products' (Opferkuch et al., 2023). These results show the difficulties companies have in selecting what CE content (both qualitative and quantitative) to externally communicate when their audience does not understand the advantages of CE strategies compared with existing linear strategies. Third, by externally communicating CE activities and the results of CE assessments, companies felt that they were

improving their own reputations and enabling eligibility for CE-specific financial incentives. Following on from the publication of the EU Taxonomy (EC, 2020) a number of financial institutions and governmental organisations have developed a variety of financial instruments related to the CE, e.g. private and public equity funds, venture capital, as well as CE-specific adaptations to current bank lending, insurance and project financing procedures (Ellen MacArthur Foundation, 2020). Therefore, companies that are conducting CE assessments and disclosing the results can potentially receive necessary investments in order to continue and advance their CE implementation.

5.4.2 *Disclosing CE assessments in the private sector*

Looking forward, there are several factors that companies should keep in mind when selecting data from their CE assessments to be included within their corporate sustainability reports. Early evidence of a CE within corporate sustainability reports indicates that companies most often qualitatively describe their CE activities with an implicit connection to sustainability aspects and often unquantified indicators (Stewart and Niero, 2018; Opferkuch et al., 2022). Therefore, as proposed in Opferkuch et al. (2023), companies must find a balance between qualitative and quantitative CE data, tangible and intangible CE content, and short- and long-term CE visions. Through a content analysis of the sustainability reports of 94 sustainably ranked European companies, numerous shortcomings of current CE disclosure practices were identified (Opferkuch et al., 2022). Most often, companies were found to be reporting targets for the implementation of a CE that address higher-ranking CE strategies (as presented in Potting et al., 2017) such as targets which aim to eliminate and/or replace non-renewable resources within packaging. However, companies were rarely found to also report appropriate indicators which measure their progress towards achieving these targets. Most frequently, companies are reporting CE indicators which measure references to the linear economy, e.g. indicators showing the volume of waste being sent to landfill. Therefore, it is recommended that companies utilise the 10R-hierarchy, originally proposed by Potting et al. (2017) to develop targets and indicators for individual CE strategies, with the aim of disclosing higher-ranking strategies (where applicable).

Finally, companies should pay close attention to the various ongoing developments in regulations and policies relevant to corporate sustainability reporting and communication, namely the CSRD (EC, 2021), the EU Taxonomy Regulation (EC, 2021, 2020) and the recent Green Claims Directive (GCD) (EC, 2023). In particular, the latter development which aims to reduce instances of greenwashing within both product and organisational level environmental claims, including those concerned with CE attributes. Within the GCD, the EC will require companies to meet a list of predetermined criteria before externally communicating any sustainability claims. These criteria focus on factors such as substantiation, scientific rigour and comparability, to name but a few (EC, 2023). This regulation will undoubtedly influence the

choice of assessment approaches companies can use to collect, measure and verify the data needed for environmental claims in order to comply with this regulation. Although these regulations are imposed at a European level, they will lay the foundations for integrating a CE, and other sustainability issues, within national-level sustainable finance regulations in countries around the world. For example, the integration of a CE as a key material disclosure topic can be seen in countries such as South Africa, through the ‘National Green Finance Taxonomy’ ([National Treasury of the Republic of South Africa, 2021](#)) and the People’s Republic of China, within the ‘Green Bond Endorsed Project Catalogue’ (People’s Bank of China et al., 2021).

5.5 CE assessment in the public sector

To be able to design and prioritise circular policies and solutions that can contribute to sustainable development based on actual evidence, public sector organisations are starting to implement CE assessment initiatives and the topic is gaining attention in the literature ([Corona et al., 2019](#); [Droege et al., 2021a](#)). The public sector assesses CE activities at different levels. At the macro level it assesses the progress and impact of CE policies. At the meso level, assessment initiatives emerge in circular supply chain management and circular public procurement ([Xu et al., 2022](#)). At the micro level, internal CE strategies and practices are assessed ([Droege et al., 2021a](#)). Due to the lack of a shared understanding and a standardised framework, a variety of CE measurement approaches exist in the public sector too, and the literature and practice are only starting to gain a deeper understanding of CE assessment.

5.5.1 *Assessing the impact of CE regulations and policies*

CE regulations and policies intend to address the multifaceted issue of resource availability concerns and sustainable development at the macro level. The complexity of sustainability and circularity issues carries the risk of leading to CE policies that are not effective or even desirable. Measuring the impact of regulations and policies is a first step to make outcomes and potential repercussions transparent and to ensure that strategies and activities follow the intentions of the policymaker/regulator.

There is a significant body of literature on CE policies and policy assessment in China and Europe (e.g. [Geng et al., 2012](#), [McDowall et al., 2017](#)). China was one of the first countries to release an indicator framework to track the progress of its ‘Circular Economy Promotion Law’ ([Geng et al., 2012](#)). The Chinese government introduced a target responsibility system which ties individual performance of civil servants against targets derived for the five-year-plan. In addition, the Chinese government assesses several CE pilot programmes to measure and compare progress of the different pilots ([McDowall et al., 2017](#)). Articles analysing CE assessment implementation in China have been subject to multiple publications (e.g. [Geng et al. 2012, 2013](#)).

In Europe, indicators are used to inform the policy debate and targets are set for the EU member states (McDowall et al., 2017). The first CE Action Plan drawn up in 2015 (EC, 2015) refers to existing indicator sets such as the Resource Efficiency Scoreboard and the Raw Materials Scoreboard (McDowall et al., 2017). Later, the EU released its own assessment frameworks and outputs such as ‘EU Circular Economy Indicators’ or the ‘impact assessment of circular economy policies on the labour markets’ (Eurostat, 2019). These CE assessments in use are facing criticism in the literature because they fail to grasp the complexity of the multifaceted CE concept; some of them lack specific goals and benchmarks and are not transparent in their methodology (e.g. Geng et al., 2012; MacDowell et al., 2017). Researchers have also highlighted that the assessment of environmental and economic topics, particularly those that are the focus of the private sector, is challenging (e.g. Pauliuk, 2018; Roos Lindgreen et al., 2021). However, the assessment of CE policies often excludes the social dimension, which, as already mentioned, is even more complex and often is more subjective than the environmental and economic aspects.

5.5.2 *Assessing circular public procurement*

Public procurement is a fast-growing research field in the context of the CE. Procurement can help organisations and governments to achieve CE-related objectives connected to buying goods and services (Alhola et al., 2019). The United Nations Environment Programme (UNEP) states that

Circular procurement occurs when the buyer purchases products or services that follow the principles of the circular economy, supporting the assessment of designing, making, selling, reusing and recycling products to determine how to get the maximum value from them, both in use and at the end of their life

(UNEP, 2021)

Collaboration and transparency are key principles in public procurement activities as multiple parties are involved in the procurement procedures. Thus, CE assessments can play a central role by providing a standardised language to all parties involved leading to a more successful CE partnership (Ghisellini et al., 2020), while the lack of transparency and information is considered a key barrier to CE implementation (Kirchherr et al., 2018; Droege et al., 2021b). In a systematic review of the public procurement literature, Xu et al. (2022) found that a variety of assessment methodologies are adopted. LCA and eco-labels are widely implemented, and, for example, the EU procurement Directive 2014/24/EU is built upon it (Alhola et al., 2019). There are also procurement guidelines for emissions, packaging, environmental management systems and legal sourcing provided by public sector organisations at the supra-national, national, regional and local level (Kristensen et al., 2021).

5.5.3 *Assessing CE in internal operations*

Existing CE assessments for organisations focus on the private sector and little progress has been made towards CE assessments addressing public sector organisations. Droege et al. (2021c) co-developed a CE assessment framework for public sector organisations. In a participatory case study with Portuguese public sector organisations, they developed a CE assessment framework that covers the following components: (i) a system definition; (ii) a definition of CE assessment elements; (iii) CE assessment targets; and (iv) CE indicators. The system definition included public procurement, resources, processes and operations, as well as employee-related activities as important areas for CE assessment in public sector organisations. These areas were broken down further into 35 CE elements which were then detailed by allocating CE principles, a target as well as an indicator to assess the CE progress of each element.

The authors showed that public sector organisations encounter difficulties when considering non-sector-specific frameworks, as they include indicators that are not relevant for CE assessment of a service-based organisation and/or require very complex assessment methods that are not feasible to be executed by most public sector professionals (Droege et al., 2021c). It also highlights the importance of stakeholder involvement to get sector specific insights, incorporate user-friendliness and the requirement for continuous development of CE assessments (Droege et al., 2021c). Thus, the developed framework gives these organisations specific guidance on how to assess their specific CE progress.

5.6 **Key learnings for CE assessment in both the private and public sectors**

CE assessments need to be tailored to their context. What ‘CE performance’ is and how it should be addressed differs across sectors and organisations. However, cross-sector learning is very important to understand the experiences and innovative ideas which the public and private sectors can exchange with each other (Xu et al., 2022).

First, as circularity is a complex multifaceted issue, it is valuable to include experts and stakeholders in the development and execution of CE assessments. For example, depending on the thematic focus of the public sector organisation, it might lack technical and specialised staff with expert knowledge of the CE. Thus, including experts and stakeholders can bridge this knowledge gap. While this challenge might not apply to big private corporations or more technical organisations, small and medium-sized enterprises might encounter similar difficulties as they potentially also lack trained staff and the financial resources to implement complex assessments (Droege et al., 2023).

In addition, CE assessment in the private and public sectors still faces implementation challenges that need to be overcome. Bridging the findings from

the academic and grey literature with insights from practitioners can help to develop assessment approaches with low barriers for implementation. It can support the reduction of complexity and increase user-centricity, which improves user experience of CE assessments as the intended audience is directly addressed (Droege et al., 2023). Increased attention on shared learning between businesses, the public sector and academia will further improve the general understanding of needs and capabilities for assessment. Through such collaborations, assessment approaches that match business realities can be realised (Roos Lindgreen et al., 2022).

Currently, CE assessment is not yet widespread and research identified multiple challenges that prevent implementation. In the public sector, Droege et al. (2021b) identified challenges across four main factors (cultural, structural, financial and technical) that are interrelated and partly drive each other. The most pressing barriers for CE assessment implementation in the public sector are cultural factors, a lack of public and political pressure and a resistance to change. Cultural challenges drive structural ones such as a lack of leadership commitment, the voluntary nature and lack of governance for CE assessment. Technical and financial challenges, contrary to previous findings of the literature, are not prioritised and are seen as a result of the cultural and structural challenges.

For the private sector, barriers to CE assessment can be divided into internal and external barriers (Roos Lindgreen et al., 2022). The former include factors such as small company size, unclear use of CE assessments and the necessary acquisition of new skills by a business's employees. The latter contains barriers such as a lack of definition of what a CE means, complexity of the supply chain under assessment and a lack of standardisation of CE measurement.

5.7 Future research avenues

In line with these learnings, several suggestions for future research can be proposed. On the one hand, future research should focus on further adapting assessment approaches to a variety of different contexts, while on the other hand it should create knowledge to support companies in CIFNs and public sector organisations to actually implement these approaches.

It is recommended that the academic sector increases its focus on building knowledge that supports organisations on their pathway towards sustainability, acknowledging that assessing circularity in itself does not necessarily lead to insights into an organisation's sustainability impacts. This knowledge creation – and awareness – will strengthen the assessment capabilities of organisations to design assessment approaches that match company capabilities, while limiting the introduction of new methods to reduce so-called assessment fatigue. The design and application of assessment methods should be centred around both core as well as tailor-made indicators, thereby facilitating the comparability of performance and flexibility for context-specific aspects.

Overall, many organisations have already started to assess their circularity and sustainability impacts. Illuminating such best practices and sharing their lessons among organisations can demonstrate the efficacy of CE assessment and reporting practices, while also highlighting common pitfalls. Exchanging such information can facilitate the uptake of assessment methods, promoting the strategic change in organisations necessary to combat current sustainability challenges.

It is strongly recommended to incorporate both the environmental as well as social dimensions of sustainability when assessing CE impacts. At a methodological level, in comparison to environmental LCA, it is expected that S-LCA is inherently more socially embedded due to the integral value discussions that need to take place during the assessment (Kühnen and Hahn, 2018). Yet, given that several CE practices are novel, future research should explore their social implications in the sectors where these circular innovations are most prevalent. Moreover, scholars should aim to also include the ‘use phase’ of the product or service, which is mostly omitted from the social assessment scope (UNEP, 2020). Special attention should be attributed to the fact that organisations must not become more circular at the expense of adverse social impacts, given the relative simplicity of circularity assessments. This key insight is in contrast with the recent GCD, which pertains only to product and organisational claims of environmental performance, excluding any considerations of social sustainability impacts (EC, 2023). This provides an opportunity for academia to collect evidence which can advocate for the development of the necessary social-specific criteria within the GCD, not only to reduce instances of greenwashing within social-related claims but to actually encourage firms to communicate substantiated claims of social sustainability.

As the CE is being increasingly integrated within European and international sustainable finance policies (EC, 2020), studies should investigate the implications of CE implementation on existing risk identification and management processes. In particular, these implications should be connected to streams of research on sustainability trade-offs and due diligence processes. This will help to provide clarity on the assumption that circular practices are always sustainable.

Another potential research strand could focus on the role of strategic partners for implementing assessment methods in CIFNs, including partners within the network and external knowledge partners, to better understand the process of organisational learning.

Finally, the role of LCT-based assessment approaches itself can be more thoroughly analysed from a sociological perspective. Several scholars (e.g. Baitz et al., 2013; Freidberg, 2018; Niero et al., 2021; Pryshlakivsky and Searcy, 2021) have started to view the assessments as more than mere tools, and in fact as calculative devices with the power to convince other actors of the evidence-based superiority of a potential strategy. LCT assessment approaches have rightly been called the best methodologies available to evaluate sustainability aspects in a CE context. Yet to ensure their continued effectiveness and validity, it is crucial to also pay attention to how they are applied and talked about by practitioners.

5.8 Conclusions

The path towards circular processes and systems has recently taken on an increasingly important role, both for private sector companies and public organisations, and is often equated with a path towards sustainability. However, it has been highlighted that circular practices might not translate into improvements in all aspects of the various dimensions of sustainability (economic, social, environmental and institutional/governance). Hence, there is a need for adopting ad hoc assessments of the sustainability of each specific circular system before promoting its diffusion.

Therefore, alongside the approaches for measuring circularity as such, often based on technical indicators of efficiency of use and recovery of materials, it is necessary to adopt sustainability assessment methods that are based on the LCT, such as LCA and related methods. These are recognised as adopting holistic and multi-criteria approaches that allow users to avoid problem shifting from one aspect of sustainability to another, from one type of impact to another, and from one phase of the life cycle of a product or process to another.

These reliable and accurate methods are consolidated and are also well suited to the evaluation of circular systems in the context of inter-firm networks, as also revealed through a survey conducted among a sample of Italian and Dutch companies at the cutting edge of the implementation of circular practices. From this survey, it also emerged that social assessment is less widespread because of a lack of expertise and standards.

The adoption of LCT assessment approaches is also facilitated by the existence of relationships of mutual trust and collaboration between organisations in a supply chain or circular network. Although, on the one hand, these methods generally meet the various criteria identified for sound sustainability assessment, on the other hand they are particularly resource-requiring, and therefore are not always within the reach of any organisation. Precisely to encourage companies to adopt evaluation approaches for their CE strategies, a specific holistic and multidimensional SCEIA framework was developed (see [Chapter 4](#) in this volume).

LCT assessment should be embedded in local contexts by supporting them with sociological analyses, e.g. using the ANT to model end-of-life scenarios. Furthermore, LCT-based methods should be acknowledged as calculation devices in decision-making processes. It is essential to be transparent about their limitations, including the fact that they consider a predefined, albeit relatively broad, range of impact categories and the fact that they present elements of subjectivity linked to the modelling choices of practitioners.

Most of the proposed circularity assessment approaches are oriented towards internal uses in organisations, such as strategic improvement. Regarding the external communication of these results, the connection between CE assessment and corporate sustainability reporting is less studied. Recently there has been an evolving climate of CE disclosure due to increasing regulation in this area, especially at the European level. Furthermore, early evidence suggests that companies are experiencing a number of benefits when externally communicating their CE activities.

However, companies disclosing their CE activities in sustainability reports most often describe them qualitatively and do not make clear connections with sustainability. In other words, CE is often only implicitly linked to sustainability aspects, revealing an opportunity for reporting trends to improve. In addition, there is a need to educate consumers about the advantages and importance of the CE within an organisation's products and operations.

Alongside the private sector, the assessment of CE activities is also becoming increasingly popular in the public sector, where it can take place at the macro, meso and micro level. Specifically, as regards the micro level, unlike what happens in private companies, there are still too few tools to support public organisations. To overcome this gap, a specific and easy-to-implement evaluation framework has been developed by the Cresting project through a participatory approach. That framework, which considers various components, including the definition of the evaluation system and elements, the identification of CE targets and related indicators, can support public administration organisations on their journey towards circularity. However, even in this area, there is still a need to verify the sustainability of the circular solutions adopted, as well as the need to understand the relationship between CE assessment and sustainability assessment. Additionally, involving stakeholders to obtain a sector-specific perspective of CE assessment and addressing their views, knowledge and needs will contribute to a user-friendly and acceptable assessment. This collaborative involvement should be a fundamental pillar of the assessment initiatives.

Whatever the reference sector, circular systems are complex and highly context-dependent systems, which involve different actors and organisations. Furthermore, their relationship to sustainability aspects is not always obvious and clearly defined. We therefore need suitable approaches and methods to capture such complexity while assessing circularity and its impacts on sustainability. Those methods should, on the one hand, guarantee reliability and accuracy; however, on the other hand, they may require technical skills, human and financial resources, as well as an adequate cultural attitude, that are not always present in organisations.

It is therefore desirable to develop synergies, through collaboration among stakeholders, to demonstrate the effectiveness of these assessment and reporting practices, promoting their understanding, as well as for the development of simplified tools, while maintaining an adequate degree of reliability.

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6

SOCIO-SPATIAL DIMENSIONS OF A CIRCULAR ECONOMY

*Pauline Deutz, Andrew E.G. Jonas, Sabrina Brullot,
Martin Calisto Friant, Małgorzata Pusz,
Aodhan Newsholme, Santiago Perez,
Heather A. Rogers and Kaustubh Thapa*

6.1 Introduction

Interest in the transformative potential of a circular economy (CE) has emphasised economic and environmental benefits with relatively little attention paid to how the changes anticipated might be distributed either spatially or socially. Given that economic activity is socially constructed in and across space – in specific places and regions as well as globally – it follows that activities contributing to a CE always operate within, and are shaped by, different socio-spatial contexts. Yet the difference that place and space make to the development of a CE rarely receives explicit attention in the literature. There are calls for ensuring a regionally ‘just’ transition ([Stavis and Felli, 2020](#)), e.g. from the [European Commission \(2019\)](#), with assurances which imply recognition of socio-spatial inequalities. There has also been growing interest in the role of the CE in global development (e.g. [de Souza Campos et al., 2023](#)), but likewise largely without an explicitly geographic focus.

The social dimensions of the CE have started to receive significant theoretical attention ([Mies and Gold, 2021](#); [Valencia et al., 2023](#)), but so far there is a lack of significant empirically based research to support the increasing association of the CE with social ambition in academic definitions ([Kirchherr et al., 2023](#)). Environmental policies can indeed bring social and economic benefits, but with uncertain redistributive impacts – effects on different social groups will vary ([Fullerton, 2011](#)). Furthermore, there are uneven socio-spatial outcomes, with an emerging economic focus (such as CE or bioeconomy) generating a new area of competition between places while reproducing rather than removing the contradictory interests between employers and employees characteristic of the global capitalist economy ([Deutz, 2014](#)). Moreover, while academics may have social aspirations for a CE, this is not necessarily the focus of policymakers (see [Chapter 3](#) in this volume).

Furthermore, the impacts of national-scale policies need to be examined at smaller scales (Bourdin et al., 2022); more attention is needed to understand the effects of and relationships with CE policies at a larger scale (Gregson et al., 2015). The complexity of socio-spatial effects, including cross-scalar influences, relating CE policies and practices has been neglected in CE research, which tends to be routed in specific territories. Here we counteract that shortcoming by drawing on a number of Cresting studies.

This chapter describes and examines examples of CE policies and practices in particular places and their relationship to the wider regional, national and global political economy. We thereby seek to uncover how local or place-specific factors are influencing, or are influenced by, the CE; how in turn those factors may be influenced by processes at work at wider scales; and to assess socio-spatial redistribution across and between scales. The chapter draws on project case studies of plans and proposals for the implementation of a CE in diverse places and regional settings. In so doing, the chapter addresses four spatial scales relating to the different contexts: neighbourhood-scale short-loop CE practices (Hull, United Kingdom, Graz, Austria, and Santiago, Chile); city-scale policies for the CE (comparing Amsterdam, Copenhagen, Glasgow); regional policies for long-loop CE and industrial engagement (the UK, France, Austria); and global-scale impacts of European-scale extended producer responsibility policies (Nigeria and Vietnam).

6.2 Space, place and the circular economy

For geographers, places often have material significance and meaning extending well beyond their immediate territorial boundaries. Place and territory have a complicated relationship with each other insofar as the residents of a place will have material and meaningful attachments reflecting the experience both of living there and their connections with other places (Massey, 1991; Cresswell, 2014). Businesses and organisations, including territorially defined organisations such as local government bodies, likewise have complex interests in, and perspectives on, places. These reflect views of their different branches and of their employees as well as those relating to institutional memory and similar ‘untraded interdependencies’ (Storper, 1995). Perspectives may in turn reflect connections across space and scale (Cox and Mair, 1998; Coe et al., 2008). Even the physical boundaries of a place can vary according to different local and regional functions (Warnaby, 2009). Places are thus simultaneously influenced by societal (and natural) processes both within and extending beyond their immediate territory, including state policies at different scales (Jonas, 2024). When considered together, place, territory and scale are discrete yet overlapping concepts that are often used interchangeably to describe the complexity of societal processes operating within, around and through space (Jessop et al., 2008).

While the specific combination of more or less global societal processes and circumstances seldom maps uniformly onto different specific places, territories and

scales (especially at the global scale), the underlying societal issues, conditions and constraints can be similar – and these in turn can be illuminated by a detailed study of particular places (Cox, 2021). Spatial context influences socio-environmental outcomes notwithstanding their technical similarities (e.g. Deutz et al., 2015). Spatial analyses of CE tend to focus on the territory or scale of the place in question as delimited by jurisdictional boundaries (be these urban, regional or potentially national or supranational in the case of the European Union – EU; see, for example, Colombo et al., 2019; Johansson and Henriksson, 2020; Williams, 2023). This approach, however, underplays the multi-scalar operation of societal processes as addressed in the geographic literature on place, territory and scale (Jonas, 2024), thus contributing to the problem of ‘methodological territorialism’ (Jessop et al., 2008) wherein one scale (e.g. the local) is analytically privileged at the expense of knowledge of the workings of another (e.g. the global). Gregson et al. (2015), for example, consider how EU policy for the CE has implications beyond the Union given international waste flows that the policies seek to end by promoting loop closing within the bloc. Likewise, CE literature (e.g. Stahel, 2013) that idealises the local scale for closing loops tends to underplay the role of wider (e.g. regional) collaborative networks for achieving such a transition. Conversely, focusing on a given scale (especially national or above) can overlook spatial variations at smaller scales. This calls into question the prospects for implementing a more socially *and* spatially encompassing ‘just transition’ to a CE.

Within the field of CE research there is emerging interest in approaches focused on cities and/or regions. Scholars have highlighted the important role that cities and urban planning and governance can play in developing CE initiatives and adapting to climate change (Petit-Boix and Leipold, 2018; Campbell-Johnston et al., 2019). Much of this work examines the potential challenges and barriers that cities (urban administrations) and their stakeholders face when transitioning to a CE. Notably, city CE policies tend to focus on the types of initiatives relating to existing functions of cities (such as waste management, public health and supportive of company-facing economic development) (Petit-Boix and Leipold, 2018; Fratini et al., 2019). Similarly, regionally focused work is also emerging (Tapia et al., 2021; Bourdin et al., 2022) that examines challenges facing policymakers, such as recruiting companies to participate in industrial symbiosis (exchange of pre-consumer residues between different entities (Chertow, 2000; Rincón-Moreno et al., 2022)). The scalar focus of this work reflects the limited scope to directly impact approaches beyond the spatial scale of the territory, but also exhibits limited reflection on unintentional impacts.

City-focused as well as regional CE research tends to concentrate on what can be termed top-down approaches. These consist of institutional change, such as strategy and policy decisions from public bodies focused on projects concerned with developing and facilitating market initiatives (Ghisellini et al., 2016; Lieder and Rashid, 2016). Conversely, bottom-up change describes company collaborations within supply chains and also social movements such as sharing schemes

(Hobson and Lynch, 2016). The shorter-loop resource recovery options such as repair, reuse and sharing options (Stahel, 2013) are commonly overlooked, or under-emphasised, in city-regional approaches to the CE (e.g. Petit-Boix and Leipold, 2018). Nevertheless, these strategies are starting to attract research attention, sometimes under the heading of ‘diverse’ (not financially driven) economic approaches (Gibson-Graham, 2008; see, for example, Hobson and Lynch, 2016; Lekan and Rogers, 2020) rather than in mainstream urban or regional analyses.

This chapter reports on aspects of the Cresting project that have sought to analyse the socio-spatial dimensions of the CE. The intention is that by carrying out spatially situated analyses of the local and regional development of different aspects of the CE we can uncover the structures, mechanisms and contingent conditions that would, or could, be of more general applicability to knowledge of the development of the CE at wider scales including the global.

6.3 Methods

In this chapter we draw on Cresting research conducted under both ‘place’ and ‘policy’ headings that utilise a range of primarily qualitative methods including document analysis, stakeholder interviews, workshops and the Delphi method. Following a critical realist philosophy, we seek to separate the underlying causal mechanisms and contingent conditions (those that are place-specific as well as those that operate across multiple scales; Sayer, 2000). Using this approach we can strive to understand general patterns from the experiences of specific places and regions; itself a well-established approach in geographical research (Cox, 2021). Furthermore, working with multiple scales enables us to gain an understanding of their interrelationships without prejudice to one over another (Ollman, 2003; Jessop et al., 2008).

Some comparisons are made between case studies conducted by the same person, while others draw on case studies conducted as separate research studies. Table 6.1 shows the different aspects of the CE, along with their scales, places and territories of operation, which are included in the studies considered in this chapter. There is no space here to provide details about the methods used so references are provided instead. Given the large number of different places involved, contextual information is provided in section 6.4 alongside a discussion of the findings.

6.4 Findings and discussion

These are presented in terms of the four scales of the CE considered, which broadly correspond to the scales of policymaking and the underlying generative conditions (neighbourhood scale, urban scale, regional policies, and global implications of national/supranational policies) with multiple examples compared at each scale. Although each scale provides a discrete analytical entry point into the CE, the examples also explore inter-scalar connections.

TABLE 6.1 Scales and approaches to the CE presented in this chapter, with methods used and references for further information

<i>CE aspect and scale</i>	<i>Places and territories</i>	<i>Methods</i>	<i>Reference</i>
Community-embedded short-loop approaches (repair, reuse, repurposing)	Hull, UK, Graz, Austria, Santiago, Chile	Interviews	Pusz, 2023 Rogers et al., 2024
Urban-scale CE policies	Amsterdam, Netherlands, Copenhagen, Denmark, Glasgow, UK	Policy analysis Secondary data to characterise the cities	Calisto Friant et al., 2023
Regional-scale collaborations for CE development	North Humberside, UK, Styria, Austria, Strasbourg, France	Document analysis, semi-structured interviews	Newsholme, 2023 ; Perez et al., 2020
Global-scale material flows	Vietnam, Nigeria	Documents, interviews, workshops, observations	Thapa et al., 2023 ; 2024

6.4.1 *Neighbourhood-scale: community-embedded short-loop CE strategies*

This section examines ‘actually existing’ CE initiatives, which, in contrast to the policies discussed below, are not necessarily self-defined as CE initiatives. They tend to emerge from already existing neighbourhood-based projects, organisations and/or social enterprises embedded in their communities. What the organisations in this section have in common is that they are engaging with short-loop CE strategies (repair, reuse, repurpose – and to some extent recycling). Some of these organisations engaging in CE activities are not independent of local government influence, as will be shown, but they are engaging in CE practices because they suit the organisations’ purposes and capacities, rather than responding to a city plan (i.e. they comprise bottom-up initiatives). The cities used for this aspect of the research are Hull, UK, Graz, Austria and Santiago, Chile.

Both Graz and Hull are manufacturing cities surrounded by a rural agricultural economy. Hull (population 267,010 in 2021; [Hull City Council, 2022](#)), is a maritime port city with an industrial heritage linked to water as a means to import, export and dispose of waste. While Graz (estimated population 305,404; World Population Review, 2023a) is the capital of the region of Styria, Hull is a standalone local authority as the UK does not have a regional scale of governance. The third city, Santiago, was selected as a contrast. It is the national capital of Chile with a much

larger population than the other two cities (estimated population 6,903,392; World Population Review, 2023b) and is the dominant urban centre within the Chilean economy. Hull notably includes some of the most deprived neighbourhoods in the UK, with a thriving voluntary and community sector. By contrast, Graz benefits from the greater social protections in Austria (scoring 13.3% compared to the UK's 18.6% poverty rate; World Population Review, 2023c), and is missing the extensive and embedded poverty found in Hull, where there are families with multiple generations of worklessness. The overall level of prosperity in Austria may contribute to the relatively high per capita production of waste for the EU. However, it does not indicate an absence of underprivileged residents, albeit that they may be comparatively hidden and potentially therefore missing out on support to which they may be entitled (Eisfeld and Seebauer, 2022). Although a high-income country since 2012 by World Bank definitions, Chile has a much lower per capita income than the UK or Austria and a higher Gini co-efficient indicating the social shortcomings of apparent economic development in recent years¹ (World Bank, 2023). The city is strongly segregated along class or income lines, with some neighbourhoods exhibiting deep and firmly entrenched poverty re-enforced by institutional arrangements (Dockemdorff et al., 2000). Frustrations with this spatially uneven development resulted in an outbreak of social unrest across Chile known as the 'Estallido Social' (Laing et al., 2019).

6.4.1.1 *Institutional arrangements for community organisations/ social enterprises*

Many, though not all, of the organisations considered in this section broadly fall into the category of social enterprises (SEs). This term encompasses a range of legal arrangements and organisational forms in different countries, which have developed since the early 2000s as a new form of organisation alongside more traditional charities. We adopt the academic definition of a SE as a mission-driven organisation that may have a 'business arm' for the generation of income, but which invests that income in a social and/or environmental cause of benefit to local communities (Longhurst et al., 2016). In exchange for their investment to the common good, organisations may enjoy tax privileges and other simplifications of the barriers to business in comparison to regular companies. In Chile and Austria, there have been deliberate initiatives to encourage environmentally driven SEs; by contrast in the UK there are tax incentives for regular (i.e. profit-driven) companies to invest in organisations delivering social benefits (Pusz, 2023).

Other organisations, notably the small-scale repair companies in Hull, do not necessarily have the motivation of community or environmental benefit, though these may be present (Rogers et al., 2024); nonetheless, they are embedded in neighbourhoods across the city. Organisations studied in Chile are primarily led by entrepreneurs trying to launch businesses drawing on CE strategies, such as

upcycling. These organisations are protected by the status of SE under Chilean terms (i.e. for their environmental benefits). They are not setting out with altruistic motives, albeit that they may have intentions of addressing social issues in the future. Crucially, while there are many examples of more ‘altruistic’ SEs in Chile, the researchers primarily engaged with those Chilean SEs that target financially privileged consumers, with the aim of cross-fertilising ideas across different socio-spatial contexts (e.g. proposing new business ideas/circular activities to be implemented by SEs in Hull; Puszt, 2023).

6.4.1.2 Circular activities

An overview of spaces where circular activities are taking place, circulating materials and (co)producers for each city is shown in [Figure 6.1](#). This demonstrates the wide range of neighbourhood and social contexts involved, ranging from individuals’ homes to institutional settings such as prisons and schools, allotments and community spaces. Some of these are providing public services; others are community driven (albeit that they are sanctioned by local authority policy, as in the case of allotments). Likewise, the individuals participating represent a wide range of social groupings – some are explicitly disadvantaged (prisoners, ex-offenders, the mentally disadvantaged, the homeless), others are defined by characteristics that might imply a level of need depending on their circumstances (the elderly, ethnic minorities, women) and still others who are apparently in certain categories by choice (artisans, students). Finally, a wide range of materials are reused, conserved or recovered by these groups. Sometimes these activities (arts and crafts) are undertaken for their own sake, sometimes for support, or to provide local cost options (such as food).

In Graz, a detailed case study was made of *heidenspass* – a project run by an association established to provide work for unemployed youth. A range of CE activities are undertaken, including the preparation of meals for staff and customers from the unsold surplus of a large retailer, or repurposing/upcycling a range of materials (including vehicle parts, clothes and furniture) into goods with aesthetic and economic value ([Lekan et al., 2021](#)). In addition to the environmental benefits of preventing materials from going to landfill, the SE provides work experience and skills to disadvantaged youth. Notably, the latter comprise a low-cost workforce, which alongside the fact that many of the inputs are donated, help to keep *heidenspass* financially viable. Not all of the resources/customers are local – many of its retrieved/remade/resold goods are products of global production systems. The SE’s relationship to the city of Graz is via social services, i.e. with respect to the workforce. Relationships surrounding material supplies largely occur with companies (other goods being donated). Those companies are also the key customers (in line with the ambitions of Chilean entrepreneurs), paying, on a business-to-business basis, prime prices for the image of environmental and social care conveyed in remanufactured/upcycled goods.

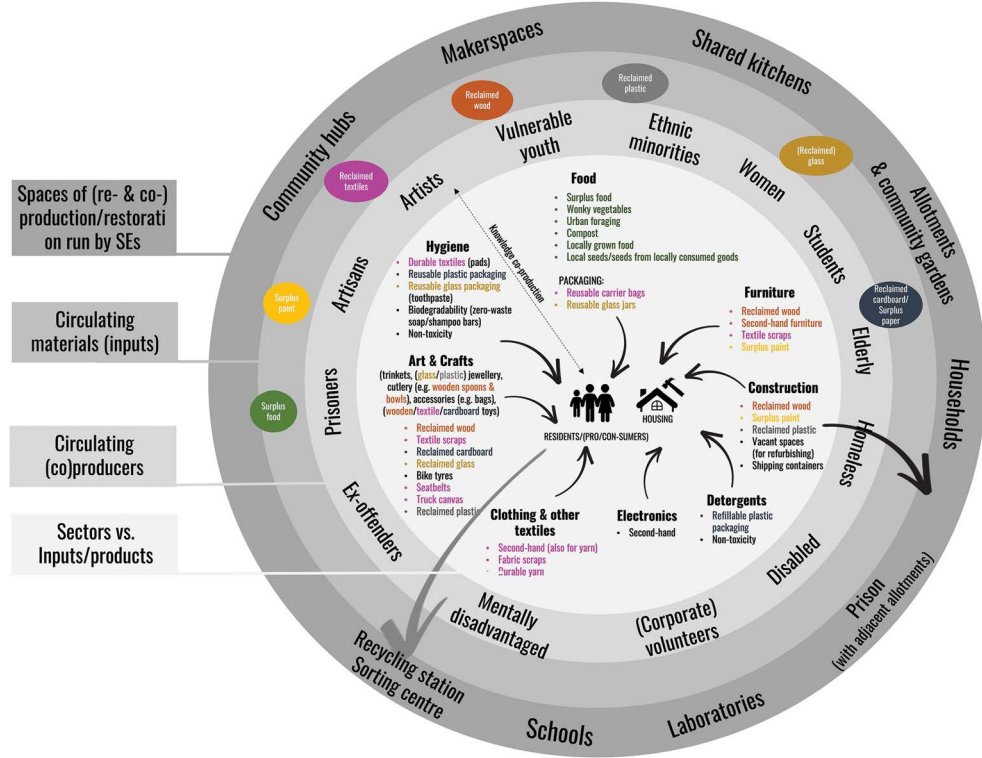


FIGURE 6.1 An overview of circular spaces of (re- and co-)production, circulating materials and (co-)producers, and generated items in the context of case study SEs in Hull (UK), Graz (Austria) and Santiago (Chile)

Source: Designed by co-author (Pusz, 2023, p. 128).

By way of comparison, in Hull 31 participating organisations were studied ranging from locally predominant SEs operating multiple retail outlets (i.e. charity shops in UK terminology) to those that are heavily dependent on a key individual. The SEs typically function in more than one field, but variously focus on food (six); furniture (five); clothing and other textiles (five); arts and crafts (four); hygiene (one); electronics (two); construction/housing (six); mixed (two) sectors (Pusz et al., 2023). Of these, two of the arts and crafts organisations are defined primarily by their target beneficiaries (i.e. the elderly and autistic people). These organisations work with a wide range of social groups, sometimes more than one, namely the elderly, the disabled, the mentally struggling, the homeless, ex-offenders, prisoners, vulnerable youth, refugees and asylum seekers. As with *heidenspass*, there are SEs with close relationships to large corporations. In the case of Hull, this also includes a large commercial waste management company enabling one SE to capture reusable items from a waste recycling centre, and local authorities. While companies act as sources of unwanted products (rather than as customers), local authorities offer SEs contracts to provide a service (although many are filling in gaps in service delivery of their own accord, possibly with financial support). There is a level of competitiveness and distrust between organisations, which are protective of both their geographic space in the town and their remit. The CE is typically a means to an end (e.g. providing affordable food or consumer goods, cheap materials for craft or similar activities, or raising money for social ends by selling to the public). SEs in Hull may also deliver social-circular value across the city through concessionary leases or ‘liability transfers’, whereby local authorities rent their premises (i.e. surplus public sector assets) to mission-driven SEs for a peppercorn rent provided that those properties are not used for profit. Nonetheless, such properties in Hull are often in poor condition, entailing high maintenance and repair costs. Property leasing from companies thus seems to be a more viable alternative for financially constrained SEs, especially in case those companies can cover any repair/refurbishing costs.

A further group of five self-employed repairers were interviewed in Hull (Rogers et al., 2024). Having been working in their respective fields for up to 25 years, these individuals were not motivated by the concept of the CE, but were nonetheless providing a service that is arguably the ideal of a CE (Stahel, 2013), namely extending product life and not just keeping the products in use but with the same owner (minimising both energy and transaction costs) and keeping both the product and the economic opportunity arising from the CE in the same locality. Notably, however, these individuals already had the possibility of taking on more business than they could manage, but nonetheless were operating at the edges of financial viability and were either too busy or too far removed from their skill set to contemplate taking on staff to expand their business. This is in contrast to creative and usually young entrepreneurs from Santiago, albeit that they were engaged in sectors other than repair, who were looking to develop their businesses.

In Santiago 17 SEs participated in the study and were selected on the basis of materials (e.g. food, wood, textiles), online visibility and recommendations. The participants were engaged in a range of activities including recycling and upcycling, making toxin-free products, running recycling centres and providing consultancy services. Similar to the other cities under study, not all of these arrangements embody financial transactions. Some materials and services are donated by private companies or individuals (e.g. tetra pak to insulate houses for the poor, textiles to make yarn and then new high-quality items, or waste management company-derived plastic caps for repurposing into plastic filaments that are used by indigenous artisans), and some SEs offer services that are provided for free (e.g. offering internships) – partly as a relationship building exercise. One company, Prana Sopas, is circular in the sense of selling food in reusable packaging (e.g. glass jars) – albeit that the glass jars are bought from the People’s Republic of China. Such SEs tend to consciously use reusable packaging not so much for economic benefits but as the basis of their marketing strategy and awareness raising. Unlike SEs in Hull or Graz, many of the SEs in Santiago intend to upscale their ventures to sell their goods internationally (although this entails complex and expensive shipping arrangements), or replicate their businesses, i.e. establish circular social franchises (Pusz, 2023, p. 239), not only across the country but also abroad. The case of Plastic LUP also reveals how SEs can empower artisan communities across the country by equipping them with the necessary skills, knowledge and tools to sell their circular products directly to customers (i.e. bypassing profit-driven middlemen).

The SEs under study are providers of short-loop CE services, and these community organisations can be framed as part of the ‘diverse economy’ (Lekan and Rogers, 2020; Lekan et al., 2021). They produce ‘circuits of value’ (Lee et al., 2004) drawing on non-financial values (voluntary labour, donated premises/materials/products). SEs in Hull and Graz were primarily working for a socially ‘good cause’ (e.g. raising money to support disadvantaged groups, or directly providing resources/opportunities for people especially in socially deprived urban neighbourhoods). In Santiago, however, the SEs bore more resemblance to small companies with a business model of cheap/secondary inputs enabling the marketing of environmental products (although exceptions apply e.g. one venture produces reusable sanitary pads using first-hand, high-quality imported materials). However, while that may appear less altruistic, many of these organisations look forward to becoming more socially responsible (e.g. by providing workshops for disabled individuals). They seem to have found a more remunerative approach than their opposite numbers in Hull: targeting people keen to consume (and pay for) circular goods, rather than those who are constrained in their choices. This may offer a more financially sustainable approach (not always helpful to the marginalised), therefore potentially being a secure route for material circulation. Whether similar markets for such goods exist in Hull, or other relatively small cities (compared to large capital city Santiago) is uncertain. Above all, while these SEs are encouraging a different type of consumption, which can serve as a means to generate

socially beneficial new employment opportunities, their activities are probably still not as environmentally beneficial as reducing consumption when it comes to non-essential products.

There is an element of competitiveness among SEs in all contexts (SEs compete for funding awarded locally, regionally and nationally; some SEs such as *heidenspass* tend to compete for specific materials from private companies working with similar SEs in the city). The case of SEs in Hull and Graz also revealed distrust between organisations, which are protective of both their geographic space in the town and their remit. What these SEs also share is a use of materials/goods produced in the profit-driven enterprises derived on a global scale from ‘global circuits of capital’ (Lekan et al., 2021), and therefore do not comprise a separate economic category. A third way of regarding these organisations is that while it is possible to extract additional use value from pre-used/discarded items (i.e. to make something that someone will want to use), there is limited potential in terms of exchange value (what anyone might want to pay) as individuals try to earn a living at the margins constrained by the costs of alternatives or SEs cannot be self-sufficient (so also linked closely with public support) as we discuss elsewhere with respect to Hull (Deutz et al., 2024). This underscores the limitations inherent in a CE strategy founded on SEs, and also the limitations of a corresponding social strategy. SEs are largely treating the symptoms of social problems, rather than resolving them, which should serve to remind us that while CE approaches may offer some cost saving and even fundraising options, these are nonetheless merely a form of first aid from a social perspective. They may also encourage private companies to pursue greenwashing practices. Some SEs do, however, set an example for large private companies on how they could reinvent their business models in a more sustainable fashion (e.g. by offering toxin-free products or refillable packaging), taking responsibility for their end-of-life-products rather than shifting it to third parties (see also Chapter 9 for EPR schemes).

In sum, a wide range of local-based short-loop CE activities take place in the cities under study. The circular activities in Chile and the repair workers in Hull provide models for how individuals can generate a living through a CE (see also Chapter 7 in this volume). The social enterprises in Hull and Graz are, both knowingly and coincidentally, using CE approaches to provide support, social activities and affordable commodities to local people. Importantly, while none of these activities is directly under the control of a public authority, or part of a wider CE strategy, they do reflect the characteristics of the neighbourhoods and communities in the places where they are operating. There are varying forms of support and funding and ways in which organisations are complementing or directly delivering local public social services or responding to national government financial policies. The materials they work with are sourced from the financially motivated economy (on a global scale), despite the fact that some of the exchanges described are enabled or subsidised by non-economic values. In all the above cases, the aims of the SEs include (re)entering products into the mainstream economy, which they then

have to enter into competition, and meet the requirements for other products. Thus, these circular activities are neither a means to opt out of the economy nor a means to find a more secure pathway within it.

6.4.2 *City-wide policies for the CE*

In this section we consider policies for implementing the CE at the city scale. Three European cities, Amsterdam, Glasgow and Copenhagen, were chosen for analysis, all of which developed wide-ranging CE strategies following the enactment of the CE Action Plans launched by the European Union (EU) in 2015 and 2020 (Calisto Friant et al., 2023). These wealthy cities in the Global North may shape the nature and scope of the debate on the topic and influence other cities seeking to implement CE policies within and beyond the EU. Analysis was undertaken of self-defined CE policy documents for each city to uncover their vision of a circular economy based on the scope of issues included, the policy commitment to implementation and in particular the extent to which they are attempting to build in socially distributive elements (or safeguard against retrogressive impacts) (Calisto Friant et al., 2023a).

Each of these cities is the most populous city in their respective country and each is of key economic importance for their regions as port cities and major industrial, trade and cultural centres. Copenhagen and Amsterdam are also capital cities while Glasgow is not (though Amsterdam is not the seat of government for the Netherlands). National population and country size are variable, but all three have populations of one to two million including suburbs (World Population Review, 2024a, 2024b, 2024c). Glasgow has a notably deprived population compared to the rest of the UK (it suffers from deindustrialisation without the benefits of the commercial/financial opportunities of the other cities under consideration). While inequalities are lower in the Netherlands and Denmark compared to the UK (World Population Review, 2023), there are nonetheless pockets of deprivation in Amsterdam (with one in five households meeting a local definition of poverty; City of Amsterdam, n.d.) and poverty is an emerging issue in Denmark (notwithstanding the overall high quality of life in that country) as benefits have shrunk over the last decade (Ejrnæs et al., 2020; Hussain et al., 2021). Of little consolation to individuals affected, the scale of the problem of poverty in Copenhagen and Amsterdam is very dissimilar to that in Glasgow (Glasgow Centre for Population Health, n.d.).

Besides their social characteristics, the cities need to be understood in the context of national circular economy policy. Notably, Amsterdam published its own inaugural circular strategy in 2012, ahead of the Dutch national programme in 2016 (Government of the Netherlands, 2016). The plan was further developed and revised in 2020 (Municipality of Amsterdam, 2020a), with a strengthening of the country's social ambitions. The plan explicitly targets not just reducing the city's ecological impact, but promoting wellbeing and 'a fair chance at a good life' (Municipality of Amsterdam, 2020b, p. 11) while still being reliant on economic growth to bring

this about. Thus, although this is an unusually socially aware approach to the CE, it is nonetheless reformist rather than socially transformative in the sense of [Calisto Friant et al. \(2023\)](#). The first Scottish CE strategy appeared in 2016, similar at the time to that of the Netherlands. Glasgow City Council responded to the national approach with its own policy appearing in 2019. Critical of the socially divisive impact of neoliberal (i.e. relatively unregulated) capitalism on the city ([Glasgow City Council, 2020a](#)), the Council sought better social outcomes from the environmental safeguards envisaged within a CE. This is a strongly reformist approach – a triumph of optimism in expecting a significantly different socio-economic outcome from a (somewhat) different enviro-economic approach. As with Glasgow, the Copenhagen CE policy followed on from the Danish national policy of 2018. Published in 2019, the Copenhagen approach to the CE is likewise firmly embedded in a pro-growth strategy. Similarly to the UK's national approach to the CE, the policy highlights the association of the CE with 'waste and resources' ([Municipality of Copenhagen, 2019](#)). While concerned for the city's and respective countries' disproportionate use of resources, the drive is for increased eco-efficiency in the context of green economic growth, rather than a call for reduced resource use and socio-environmental impacts; it is also not a call for increasing equality of access to resources. In all cases, policies were largely based on industry rather than community consultations. While the Dutch government held some participatory workshops with citizens and civil society organisations to build their CE policies, their role in shaping the outcomes of the CE strategies was consultative and the impact of the workshops is thus rather unclear.

An extensive review of the urban CE literature led to a categorisation of published CE policies at the urban scale into the 12 policy areas presented in [Table 6.2](#) (based on [Calisto Friant et al., 2023](#)). Each city's level of commitment to each policy area is based on the both the number of policies under each heading and the scope and strength of these proposals, i.e. their implementation (i.e. the number and scope of actions proposed to back up a given area of CE activity).

All three cities' CE plans focus on areas critical to their own operations. New monitoring programmes, public procurement and public-private partnerships relating to the CE have been put in place. Education is also a common priority, especially as a means to raise awareness of the CE and wasteful practices. However, the cities promote such issues in ways that bring the responsibility to the consumer rather than challenging the systemic conditions that influence consumption habits. Food waste reduction and recycling is another core policy area with many actions taken to make use of organic waste, which must now be separately collected and recycled according to the new EU directives and regulations on the CE (also a requirement in the UK). Waste management, besides food, is one of the top priority areas for Copenhagen, where there are plans to improve recovery and recycling infrastructures and technologies. It is also an important policy area in Amsterdam, but seemingly less so in Glasgow based on specific CE policies. However, it is likely that this reflects the fact that there is a separate zero waste policy in Glasgow

TABLE 6.2 Commitment of the municipalities of Amsterdam, Glasgow and Copenhagen to different policy areas in their respective CE action plans. Policies are shown in order of collective policy commitment for the three cities.

<i>Policy area</i>	<i>Amsterdam</i>	<i>Glasgow</i>	<i>Copenhagen</i>
Governance and municipal operations	Strong commitment	Strong commitment	Medium commitment
Education and knowledge development	Strong commitment	Strong commitment	Medium commitment
Food and organic waste streams	Strong commitment	Medium commitment	Medium commitment
Economic and industrial policy	Medium commitment	Medium commitment	Medium commitment
Green buildings	Medium commitment	Medium commitment	Medium commitment
Waste management	Medium commitment	Limited commitment	Strong commitment
Social justice and livelihoods	Limited commitment	Limited commitment	Limited commitment
Renewable energy	Limited commitment	Medium commitment	No commitment
Transport and mobility	Limited commitment	Medium commitment	No commitment
Water management	Limited commitment	No commitment	No commitment

Source: based on Figures 3, 5 and 7 in [Calisto Friant et al. \(2023\)](#).

Note: The commitment of each city is measured as follows: no commitment: no policies in that area are developed; limited commitment: some minor policies are proposed for that area; medium commitment: a reasonable number of policies were developed for the area, possibly leading to real changes; strong commitment: a wide range of policies are proposed for that area likely causing substantial changes to the sector.

([Glasgow City Council, 2021](#)). Likewise, the relatively low commitment to transport or mobility, water management or renewable energy tells us that the cities are more narrowly defining the CE than is the academic literature, but does not mean that they are not giving attention to those issues. This emphasises the need to broadly define how CE policies are investigated as they may come under different policy areas in different cities (and indeed may not be identified as circular).

Economic and industrial policies emerge as important aspects of the CE policies of the examined cities, albeit with a medium level of commitment. All three had incentives and support systems for CE innovations, technologies and start-ups, with an overall ambition to make CE an avenue for economic growth, development and competitiveness. Green buildings and constructions standards also stand out as relatively important policies in all three cities, which seek to improve the recovery and recycling of demolition wastes and the use of sustainable building materials. Conversely, little attention was given in CE-specific policy to urban form or

territorial planning. Thus, the focus is more on dealing with, literally, material-related issues, rather than instituting new urban design principles with the associated need for financial resources and long-term planning.

Significantly, policies in the area of social justice and livelihoods are largely absent from all three cases, despite that Glasgow and Amsterdam both positioned their CE strategies in terms of social justice and improved social wellbeing. Copenhagen has significantly lower commitment to CE policies across the range (with a high-level commitment only to waste). Glasgow and Amsterdam are perhaps driven by observations of social deprivation at the urban scale, but ultimately they are constrained by the policy areas within their remit and the budgets at their disposal. Thus, they appear to be relying on the increased economic growth that they associate with a CE to provide social benefits without redistributive intervention. Unlike the other cities, Copenhagen did not claim to have social justice as a goal or an aspiration in its CE strategy. However, this may not reflect a disinterest in social wellbeing in Copenhagen so much as an assumption that such issues are managed at the national scale (for better, or, increasingly, for worse).

We see therefore that these three cities have taken on board ambitions for a CE that reflect their multi-scalar circumstances. The combination of a socially ambitious rhetoric in the absence of a socially ambitious CE policy (as seen at the EU scale) is reflected most closely in Amsterdam. Copenhagen shares the waste/technology focus of the EU in practice, without the social welfare rhetoric. Glasgow, which is of course no longer part of the EU, is nonetheless closer to the EU than the Scottish approach (which is far more waste-oriented and with economic expectations, but social concern addressed by non-CE policy areas). This may reflect contrasting political views in response to the observed levels of deprivation in the city. CE policies without awareness of social implications risk reproducing existing social relations (Calisto Friant et al., 2023a), but more radical or socially transformative options (see Chapter 3 in this volume) are not in the gift of city governments, especially not those with tightly constrained budgets. Little attention is paid to the social or environmental implications of their consumption beyond the territory of the city.

6.4.3 Regional place-based collaborations

This section addresses the efforts of policymakers to engage with industry to bring about CE-focused collaborations within their regional territories. The policy intentions of Hull and the neighbouring authority, East Riding of Yorkshire (collectively North Humberside), were analysed in Newsholme et al. (2022). Both local authorities and companies view circular activities as primarily in the companies' remit, but although the local authorities are nonetheless envisaging social benefits for the region, companies are focusing on internal and supply chain considerations. In this discussion, we draw on interviews with local authorities and

companies not just in North Humberside, but also in Styria, Austria (Newsholme et al., accepted) and the city and neighbouring port of Strasbourg, France (Perez et al., 2020) to consider the respective influences on building the collaborations necessary for a CE.

The selection of a regional scale of analysis for North Humberside was empirically driven, incorporating both political and physical delineations of the 'region' as a semi-coherent scale of territorial organisation. For example, industry in and around Hull has located itself there part to take advantage of the Humber Estuary (historically for water supply and waste disposal purposes). Companies are located along both sides of the estuary, distributed between four different local authorities (the identity of which has varied over the decades), which are in some areas acting together and in others competing with each other (e.g. Deutz, 2014). Companies network with each other, relocate and otherwise are not driven by these jurisdictional boundaries. Likewise, in the French case, the city of Strasbourg collaborates with the Autonomous Port of Strasbourg, i.e. the companies associated with the city are not necessarily located within its jurisdictional boundaries but are functionally connected by port activities and trade. The city of Graz, in Austria, the initial focus of a planned comparison with Hull, is the capital of the region of Styria. In this case, the region is the relevant level of governance for waste and resource issues (contrasting with the lack of a regional scale of governance in the UK) and likewise manufacturing and other companies are predominantly located outside of the city itself. In France there is a strong alignment of CE priorities between the national and regional scale supporting the activities in and around Strasbourg (Perez et al., 2020).

These three regions all have historic connections with CE activities specifically relating to industrial symbiosis. Humberside was home to one of the two original regional franchises of what became the National Industrial Symbiosis Programme (Mirata et al., 2004), which was supported by governmental funding from 2005 to 2012 (Wang et al., 2015). Companies in the region have multiple connections, predominantly transactional supply-disposal chain links (Penn et al., 2014), including the recovery of biowastes (Velenturf, 2016). Styria became known as an example of an industrial symbiosis network that was uncovered, rather than planned, with economically-driven connections between traditional manufacturers including heavy industries (Schwarz and Steininger, 1997). Now the region bases its environmental credentials on the Green Tech Cluster, a network of more than 180 companies internationally recognised for innovation in environmental technologies (Newsholme, 2023). Strasbourg, in eastern France, is a port-city on the River Rhine. The Autonomous Port of Strasbourg, the entity responsible of the management and administration of the port, celebrated its 95th birthday in 2021 and still holds the position as the second most important fluvial port in France. Since the late 1990s the city of Strasbourg and the Autonomous Port of Strasbourg have worked to generate synergies among the industrial firms and their surroundings as part of their sustainability agenda (Beyer and Lacoste, 2017).

A key feature shared by these regions is that the authorities concerned see industrial symbiosis as a tool for decarbonisation. This is particularly striking in the case of North Humberside, with its legacy of oil and gas companies and power generation. It is the prime carbon-emitting region in the UK and a prominent target for the government's decarbonisation agenda. However, the public bodies see the establishment of initiatives between companies as being an industry responsibility. By contrast, in Strasbourg, there is an ongoing local authority-led involvement of companies in environmental projects, with decarbonisation being the latest context (following on from the Millennium and later the Sustainable Development Goals). This territory-based collaboration may be characterised more as an industrial ecology (environmentally driven inter-firm collaboration) than industrial symbiosis in particular. Companies interviewed in both Styria and Humberside held similar views to those of the authorities that inter-firm connections and CE initiatives are the purview of the companies. This alignment may be fortuitous in some sense, but limits the potential for local authorities to influence the nature of those connections or to achieve the sort of economic development benefits that they associate with them (Newsholme et al., 2022). As discussed in Chapter 4 in this volume, the companies interviewed saw their supply chain partners rather than their neighbours as the assumed partners for environmental initiatives beyond the scale of the company. For a number of reasons (such as particular material requirements or longstanding contractual arrangements) those supply chain partners were internationally distributed.

Our research suggests that there is a range of circumstances between the three regions, with Strasbourg having been the most successful in achieving a role for public authorities in industrial collaboration, followed by Styria and finally North Humberside. It is far more difficult to assess whether the actual level of inter-firm collaboration, especially industrial symbiosis, differs between the regions. Previous research has indicated that some companies in Humberside are well connected (Penn et al., 2014), while current research indicates that only a small minority of companies in Strasbourg are participating in industrial symbiosis. Further research is needed for a quantitative comparison. Nonetheless, the perception that the city is valid partner to industry collaboration in France is helped by several factors: one is the consistent approach over the past two decades. In 2015, with the publication of the National CE Roadmap, Industrial Ecology became one of the seven central strategies to develop a national CE strategy. In the UK, national funding for industrial symbiosis was discontinued after only seven years, even when activities were implemented through a company (not a governmental body). The latter could be seen as a third party facilitator for industrial symbiosis, and at the time offered a free service. The public agencies in France appear to be similarly trusted in this context and also have been more consistently supported by national government funds. The alignment of policy across scales of governance is more effective in both France and Austria than in the UK. The French national CE policy offers support for regions, whereas the UK policy remains waste- and company-focused.

Expectations for regional decarbonisation are not necessarily well resourced and the authorities interviewed felt that they lacked the regulatory tools to encourage, let alone require, companies to engage. In Austria, the situation is intermediate, with authorities having the ability to engage companies in public-private partnerships. This affords an economic tool for fostering collaboration which is missing in the UK case.

6.4.4 *Global-scale dimensions*

The fourth scale of entry for analysing the CE concerns the global-scale impact of CE policies enacted in Europe. In the section above we referred to disconnections between national and subnational scales, and a lack of connections between the scale and practices of the CE within cities. Here we consider the unintended consequences of a policy at a geographic scale greater than the relevant territorial jurisdiction. This analysis emphasises the interconnectedness of places as well as influences across scales, indicating how aspects of a CE may be very differently experienced and understood depending on the spatial context.

Research was conducted into material leakages from the European CE using used electronic and electrical equipment (UEEE) shipped to Nigeria and to-be-recycled plastics shipped to Vietnam as case studies (Thapa et al., 2023, 2024). These extra-territorial impacts of the EU's extended producer responsibility are an unintended consequence of seeking to impose controls on material recovery within the EU. Implications for *producers* beyond the EU were very much intended (as imports have to meet the same requirements as products manufactured in the EU). However, the implications for managing waste were not sufficiently considered. Lacking the capacity to manage the increasing amount of plastic waste generation, the EU legally ships some of its collected to-be-recycled plastic to Vietnam legally and similarly to-be-reused plastic to Nigeria, but without putting in place sufficient safeguards. These safeguards ought to apply both at the source and destination. Electronics ostensibly exported for reuse should still be in working order (and not technically outdated); plastics should be clean and sorted to have a realistic prospect of being recycled. Furthermore, the intended destination should be equipped with facilities operating according to the health and safety and environmental standards expected in the source countries. Lack of law enforcement leaves open loopholes for waste crime, a financially lucrative business that attracts illegal and illicit activities (Bisschop and van Wingerde, 2021), despite well-documented social and ecological injustices (Clapp, 2002).

Waste exports to Nigeria and Vietnam burden the existing waste management capacities of those countries (Thapa et al., 2022a). UEEE are shipped to Nigeria to be reused, one-third of which may not be functional, and the rest becomes e-waste, usually with a shorter lifespan. With only two formal e-waste management facilities, the burden of e-waste management falls squarely on the informal sector (Thapa et al., 2022b, 2023). The informal sector is usually associated

with precarious working conditions. In the EU, producers are responsible for their e-waste management, and are therefore no longer responsible for the UEEE and e-waste shipped to Vietnam. On the one hand, e-waste contains valuable material while containing toxic elements – which is why exports of e-waste from Organisation for Economic Co-operation and Development (OECD) countries to non-OECD countries are illegal, according to national and international laws. To-be-recycled plastic provides an economic opportunity for Vietnam, but this waste value chain is not transparent, and our research found that the informal sector's waste management practices cause harm to the waste workers, their homes and the environment (Thapa et al., 2024). Shipping EU waste to Vietnam helps the EU to meet the recycling targets and CE goals applicable in its own territory, effectively by dumping material beyond that jurisdiction. This process lacks accountability and ethics – suggesting that the vaunted 'just transition' itself is only applicable within the EU. While reuse and recycling are part of the CE and its transition in the EU, our research finds a lack of justice and ethical considerations while shipping EU discards and waste to third countries for reuse and recycling. Overlooking the fairness and ethical dimensions results in harms to individuals, society and their environment in Nigeria and Vietnam. This is a case of spatial injustice (Soja, 2010), where economic and environmental goals in the EU hurts the wellbeing of Vietnamese and Nigerians. It calls for just sustainability (Agyeman, 2008) to ensure that environmental sustainability in the EU does not come at the cost of injustice, inequality, racism and classism.

Beyond these considerations of the ethics of shipping waste internationally effectively (if not theoretically) for disposal, one can also question the circumstances by which there are 'low cost' destinations for such materials. Inequalities and inequities with historical roots in European colonialism exist in both countries. Nigeria secured independence from the British empire in the 1960s, and Vietnam gained its independence from France in 1956 after being plundered since the 1880s. Sound waste management depends on the social, economic, technological and political context, and today both Nigeria and Vietnam find managing their domestic waste challenging. Both are lower middle-income countries (according to 2024 World Bank definitions) that depend on foreign investment for economic growth – the manufacturing industry in Vietnam and the oil industry in Nigeria, for instance. Both are vulnerable to the exploitation of structural inequalities, including waste-related harm (whereas China has more effectively managed to ban the import of waste plastics, but with a detrimental impact on neighbouring countries). This trade in waste comprises an unequal exchange (Hickle et al., 2022), analogous to richer and more powerful countries exploiting others for the net appropriation of wealth and resources.

The waste value chain is increasingly complex and global, and sound waste governance must be mindful of social justice and incorporate circular value-adding practices wherever possible without causing harm to others and the environment. An ethical approach to defining the CE for the EU (or other) scale should take

into account the implications (for individuals, society and the environment) beyond the territory of the policy itself. Thus, the implications of the global waste value chain, and not just the supply chain, should be addressed. For example, our research shows a need for a functionality and durability guarantee when shipping UEEE from Europe and ensuring that the original producers are held responsible for sound management of their e-waste in Nigeria. Otherwise, such unequal exchanges of a colonial nature that shift burden and harm unfairly to others increase inequity and inequality, creating even bigger socio-ecological challenges.

6.5 Conclusions

This chapter has analysed case studies of CE policy, practice (variously intended, unaware and unintentional) and the barriers to instigating such practices across a range of places, scales and territories. This has illustrated how the expression of the CE is simultaneously rooted in places, where its local social and material benefits can be observed, and also extends across territories and scales, such that its wider distributional outcomes can be assessed. Furthermore, the opportunities for developing a CE in a place are constrained by the current and historic political and economic relationships pertaining to that location. Thus, for example, Hull, with its legacy of a high-carbon economy and an under-privileged population, has a local authority that is hoping to use decarbonisation as a route to new economic opportunities. That authority, however, is overlooking existing circular activities (largely survival mechanisms) and does not have the policy tools needed to achieve its circular goals through the actions of companies with connections beyond the region. It is also challenging to foster an entrepreneurial spirit (e.g. encourage the development of ‘innovative’ circular ventures) among such a socially deprived population whose necessary preoccupation is to make ends meet. Graz, which has a different social profile, experiences similar challenges for policymakers to engage internationally connected companies in regional activities on the one hand, while community-organised CE activity is closely connected to international economic flows on the other.

The intentions of policymakers and others working with the CE at discrete scales may be seen as either realistic or under-ambitious, or potentially over-ambitious and idealistic, but not well thought out especially in terms of understanding the interdependencies between place, territory and scale. In this respect, analyses of the CE that privilege one territory or scale at the expense of another are guilty of what has been called ‘methodological territorialism’ (Jessop et al., 2008). Similarly, one might generalise that existing CE policy approaches are not paying enough regard to the geographical dimensions of the processes with which they are attempting to engage. Ultimately, however, they have to work with what they have in order to carve out an economic niche (i.e. one that is suited to their spatial niche or place) in what is already arguably a thoroughly globalised CE and inextricably entwined with the global economy. We can see the SEs in the Global North trying to use the

CE (knowingly or otherwise) to help the disadvantaged, with some short-term benefits but no resolution of issues. The entrepreneurs in Santiago are trying to use the CE to carve out an opportunity for themselves, with good intentions for the future, but may struggle to break into the international markets needed to achieve financial security. This is even while countries in the Global North are allowing waste to be offloaded to countries in the Global South – to the economic and environmental detriment of those communities. Although the idea of the CE is to divert attention from waste to more ambitious approaches for resource management (see [Chapter 4](#) in this volume), clearly it is premature to disregard waste in a global economy in which only there are significant variations in practice and economic drivers are difficult to overcome.

Overall, we argue that CE initiatives, whether so named or not, are essentially and inevitably situated in particular places and territories. Some territorially defined activities are recent inceptions and, in part, embody responses to explicit CE policies. Others, however, are locally emergent from economic activities and practices, which have been in operation in specific places and regions well before the CE emerged as a distinctive idea and package of activities. Our analysis suggests that places and regions mould the CE more than the CE per se has transformed these places and regions. Social benefits from CE practices might be real and important to those involved in developing the CE in places and regions; however, the embracing of the CE is an opportunity for existing individuals and organisations (social enterprises, companies, etc.) to address immediate social and economic needs rather than offering a transformational route to local and regional development. Evidence for socio-spatial redistribution is limited but significantly includes the exporting of social and environmental disbenefits. The CE is constantly transformed by those places and spaces, adapting its socio-ecological functions and mechanisms to more or less local and place-specific values, capabilities, motivations and objectives. Thus, while a CE could be part of a transformation towards more sustainable and just places and spaces, this is difficult to imagine without a larger-scale and more profound political drive for such a change than has been seen so far.

Note

- 1 The Gini index is a measure of social inequality where 1 = perfect equality and 100=maximum inequality; Chile 44.9; the UK 32.6; Austria 29.8.

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7

EMERGING INDICATIONS OF EMPLOYMENT IN A CIRCULAR ECONOMY

A synthesis of European case studies

Pauline Deutz, Heather A. Rogers, Anna Diaz, Natacha Klein, Katelin Opferkuch, Aodhan Newsholme, Andrew E.G. Jonas and Tomás B. Ramos

7.1 Introduction

Wedded to the principle that the route to raising standards of living globally is through economic growth, the United Nations (UN) adopted the idea of a green economy in 2012 as a means to provide investment and employment opportunities protective of the environment (UN, 2012). The link between green economic growth and assumed opportunities for employment has been further institutionalised via the UN Sustainable Development Goals (SDGs), with goal 8, for example, being ‘decent work and economic growth’. The targets of that goal are firmly fixed within a growth paradigm (Bianco-Varela et al., 2021). The idea that the relationship to employment might be complex, or that the quality of work also needs some consideration, is relegated to two targets referring to the need for ‘decent’ work, as opposed to more opportunities, greater productivity and the protection of basic human rights (e.g. against modern slavery and human trafficking). While the latter is absolutely critical, one might say that the social benefits arising from the SDGs are secondary to economic benefits. In this sense little progress has been made between the framing of expectations for green employment in 2012 (Deutz, 2014) and the subsequent rolling out of the SDGs. This chapter uses Cresting research to address the relative lack of attention to social sustainability to consider the employment opportunities emerging from the implementation of circular economy (CE) strategies in the European context.

A CE has been defined as a ‘regenerative system in which resource input and waste, emission, and energy leakage are minimised by slowing, closing, and narrowing material and energy loops’ (Geissdoerfer et al., 2017, p. 757). In origins and intention ‘circular economy’ is an umbrella term for a range of pre-existing strategies for promoting resource efficiencies (Blomsma and Brennan, 2017; Rieke

et al., 2018). The European Union (EU) has been at the forefront of CE policy implementation, building on waste and pollution regulations since the 1970s, which at present continue to inform resource policies in the United Kingdom. In addition, the EU has begun to take a more holistic approach, at least in rhetoric, to acknowledge the scale and scope of the transformation required and at least pay lip service for this to be managed in a ‘just’ way (Calisto Friant et al., 2021). A number of authors and policymakers have proposed emerging employment opportunities as a benefit of the CE (Ghisellini et al., 2016; Webster, 2017; European Commission, 2018). As with the global-scale SDGs above, however, the empirical foundations of the social features of a developing CE in Europe are under-examined.

This chapter draws on a number of studies conducted with Cresting. These studies addressed a range of aspects of CE implementation: product design; industrial symbiosis; public sector implementation; repair; company understanding and reporting. Methods have comprised semi-structured interviews, surveys and document analysis in a range of geographic contexts. For most of these studies, employment was not the primary focus of the research, but emerged as a significant consideration. Thus, we are able to approach the issue of CE employment from a unique range of perspectives presented herein as case studies. With the overall aim of better understanding the implications of a CE for employment, we ask how CE-ready are European organisations and what type of changes to employment are underway and/or expected?

In the sections that follow, we offer a review of the literature on CE employment. We summarise the methods used as well as the approach to synthesis. Each case study is then presented, followed by discussion of the emerging themes. Finally, we offer some conclusions on the implications for employment in a CE and for the development of a CE itself.

7.2 Employment perspectives from the CE literature

This section focuses on literature attempting to address the issue of employment associated with a CE, which primarily relates to the quantity of jobs, as well as sectoral distribution, skills and training. Here we focus on the Global North, i.e. in an industrialised and developed country context, in keeping with the European case studies. The potential of CE jobs in the Global South has been estimated as substantial, given that most waste jobs are in the Global South (International Labour Organization 2023). Chapter 6 in this volume touched on ethical issues relating to the impact of a European CE in the Global South.

7.2.1 Delimiting and counting circular jobs

One of the challenges when considering CE employment is to define the scope of what constitutes a CE, and by extension what constitutes a circular job. One issue is the relationship between circular and green jobs, which have already attracted

attention (e.g. [Deutz, 2014](#); [Consoli et al., 2016](#); [Cecere and Mazzanti, 2017](#)). The clarification is important if quantitative estimates of ‘new’ circular jobs are to avoid relabelling ones that are already expected and also to better comprehend specifically circular skill sets which may have been previously overlooked. Green jobs can be defined most straightforwardly as those involving environmental protection or restoration (UNEP, 2008), similarly to the European Commission’s (2013) definition that a green job involves activities that preserve, restore or environmental quality and/or the technology required to do that. More specifically, in their study of skills, [Consoli et al.’s \(2016\)](#) understanding of green jobs drew on the US government’s definition of a green economy ‘related to reducing the use of fossil fuels, decreasing pollution and greenhouse gas emissions, increasing the efficiency of energy usage, recycling materials, and developing and adopting renewable sources of energy’ ([Dierdorff et al., 2009](#), p. 3; [Consoli et al., 2016](#), p. 1048). Although a CE can be very broadly defined, it may not be helpful for the concept to be so broad that it essentially embraces ‘anything green’ or even ‘anything sustainable’. For example, although ideally a CE is based on the use of renewable energy, work on developing renewable energy technology is not circular as such, unless specifically relating to promoting the circularity of those technologies (e.g. recovery of materials at end-of-life; [Jensen et al., 2020](#)). By this consideration, circular jobs would be seen as a subset of green jobs ([Horbach et al., 2015](#)). The relative definition of green and circular jobs has not reached a consensus, though. Some authors propose that green jobs can also be considered circular jobs ([Sulich and Sołoducho-Pelc, 2022](#); [Niang et al., 2023](#)). The scope of definition may be less critical than clarity regarding the types of roles included in a given study. In any case, we can take some principles on skills from [Consoli et al. \(2016\)](#), which we discuss below.

Regardless of the extent to which definitions of green and circular jobs coincide, it has been argued that a CE involves roles and skills that fall outside the scope of work directly engaging with environmental protection or restoration. [Burger et al. \(2019\)](#) distinguish between jobs relating to the core strategies of the CE and those in necessary enabling roles. The ‘core’ CE jobs relate to repair, reuse, refurbishment and the prioritisation of regenerative resources (e.g. promoting the use of renewable, reusable and non-hazardous materials/energy) and the redesign of business models (e.g. to incorporate servitisation, rental, sharing). This understanding corresponds to that of [Wijkman and Skånberg \(2015\)](#), who define CE activities as relating to the decoupling of economic growth from resource and energy use. Such jobs already encompass a wide range of skills from craft-work or mechanics, to materials science and business, but all could be considered ‘green’ if directly seeking environmentally beneficial alternatives to standard approaches. Conversely, the ‘enabling’ roles relate to collaboration (e.g. across sectors, along supply chains); ‘design for the future’ ([Burger et al., 2019](#), p. 250) and the incorporation of digital technology to facilitate circular practices. The latter in particular relates to the broader challenges of what has been termed the fourth Industrial Revolution, i.e. a seemingly accelerating process of change in opportunities and experience of

employment as a result of emerging digital technologies, including artificial intelligence (Pauceanu et al., 2020). A further category of indirect CE jobs was identified in a study of experience in the Netherlands (Circle Economy, 2018). These include positions in the service sector, such as financial or legal services, which already do (or could) benefit from circular activity, but equally could engage with any other type of enterprise.

The idea of the CE as a generator of employment has been taken on board by policymakers including the EU (EC, 2015, 2020) and academic observers (e.g. Ghisellini et al., 2016). The EC estimates that 700,000 new jobs will be created by 2030 through the adoption of CE principles (Cambridge Econometrics, Trinomics and ICF cited in EC, 2020). Focusing on the United Kingdom, Morgan and Mitchell (2015) estimated that a total of 54,000 jobs could be created from CE activities by 2030. There have been limited opportunities to quantify job creation in practice (though isolating and quantifying the economic impacts of environmental policy is notoriously difficult; Jaffe et al., 1995; Fullerton, 2011). Recent studies have attempted to quantify the appearance of CE jobs. In a large-scale statistical study of CE jobs in European companies, Moreno-Mondéjar et al. (2021) surveyed 9,848 companies to examine the link between CE strategies and the creation of what they term ‘green jobs’. CE strategies such as energy reduction, material reuse and product redesign were all found to be related to increasing numbers of jobs compared to companies not adopting such approaches. The authors were unable to assess causal relationships between strategies and jobs, but they concluded that economic and environmental benefits can be accompanied by social benefits in the form of employment opportunities. In a study of CE job creation in France from 2008 to 2015, Niang et al. (2023) found significant regional variations behind the overall growth, which nationally outstripped other types of employment. The regional distribution reflected local circumstances such as the actions of local authorities.

Practices widely recognised as relating to the CE include sharing and reuse that are in keeping with social sustainability visions of a green economy (e.g. Newton and Cantarello, 2014). Although a contested concept, the idea of a green economy is associated with an interest in social equity and shared improvements to quality of life that surpasses the (also contested) understanding of sustainable development (Newton and Cantarello, 2014; Horbach, 2015). Inspired by the social and economic challenges following the 2008–2009 global financial crisis, interest in green economy approaches as a route to economic rebuilding accelerated (Newton and Cantarello 2014). Ironically, the more idealistic social assumptions of a green economy are sometimes played down so that the term risks becoming simply a re-expression for sustainable development (e.g. Benson et al., 2021). Conversely, the early environmental and economically driven definition of the CE adopted by the EU (EC, 2015, and similar to the US government’s definition of a green economy, Consoli et al., 2016) has given way to an approach referencing a ‘just transition’ (EC, 2020). The effectiveness of EU policies in place to promote the social benefits

and safeguard against the potential negative economic (employment) effects of a CE have been questioned (e.g. [Calisto Friant et al., 2021](#)). More in line with the ideals of a green economy, some CE scholars are promoting the concept of a circular society ([Calisto Friant et al., 2020](#); [Jaeger-Erben et al., 2021](#)), where equitable outcomes and improvements to quality of life are considered part of CE implementation.

However, regardless of whether social ambitions are considered definitional for a CE, circular activities around reuse, redistribution and sharing can lend themselves to the ideals of more equitable outcomes such as bike sharing and similar green economy practices (albeit with mixed outcomes, e.g. [Médard de Chardon, 2019](#)). Sometimes organised by charitable organisations and social enterprises drawing on voluntary and state subsidised labour ([Lekan et al., 2021](#)), these practices can simultaneously open opportunities for people who sometimes are systematically excluded from the capitalist labour market, while potentially closing opportunities for employment in mainstream outlets for production and consumption. Likewise, ‘repair’ is a CE-adopted strategy for extending product life, which can be a mechanism for affordability (salvaging used items for people who otherwise could not afford new equivalents; e.g. [Sharp and Luckin, 2006](#); [Gregson et al., 2013](#)). However, labour costs can contribute to putting repair costs above the price of a new item ([Bovea et al., 2017](#)), which calls into question the potential for employment generation on a significant scale (c.f. [Morgan and Mitchell, 2015](#)) at least without the financial incentives ([Stahel, 2013](#)) provided in Sweden, for example ([Rreuse, 2017](#)).

7.2.2 Skills implications of a CE

Some consideration of the skills impact of a CE can be taken from work relating to green jobs. In particular, [Consoli et al. \(2016\)](#) define three broad possibilities regarding changing employment skills. First, existing jobs could be in increasing demand as a result of a shift to green consumption; second, holders of existing jobs may need to re-skill to reflect changing priorities; and third, new kinds of jobs may emerge. The second category tends to comprise jobs involving formal qualifications, as well as experience and on the job training. New green jobs are likely to be in sectors where formal educational qualifications are less significant (putting more emphasis on training within a job) ([Consoli et al., 2016](#)). Likewise, the skills associated with CE jobs have been compared to those of the wider economy in the US context ([Burger et al., 2019](#)). Notably, this comparison is based on US government data relating to skills rather than responses of companies. It suggests that compared to the wider economy, CE core roles require lower education and lower skill than the rest of the economy, while enabling roles are more demanding in both education level and skills. Importantly, though, the CE offers opportunities across the entire range of educational levels – requiring as it does a diverse labour force. Specific training may be a requirement for certain jobs, but there are expected to

be opportunities across a wide range of occupations. Observing the potential for emerging low-skill CE jobs, [Morgan and Mitchell \(2015\)](#) offered the possibility for CE jobs to be widespread geographically (with local processing of recovered products/materials), potentially not only avoiding the risk of jobs being offshored (or clustered nationally), but potentially helping to fill employment gaps left by industries that have already moved (while noting the current labour shortage in the UK and elsewhere, we also note that there are still people out of work). It is noteworthy, though, that competition between companies and places exists so that CE/green jobs will not be immune from other trends in employment such as demands for higher productivity, cheaper labour ([Deutz, 2014](#)), or the implications of IT implementation. Notwithstanding ambitions for local CEs, researchers have noted the challenges of building an effective CE even at the European scale ([Gregson et al., 2015](#)) with regulations aimed at material recovery having perverse effects of incentivising the leaking of waste to countries with relatively lax environmental protection and lower wage costs (see [Thapa et al., 2023](#) and [Chapter 6](#) in this volume). Thus, the scale of circulation of both materials and money and the location of jobs (as well as their nature) are difficult to control.

In sum, while debates around the nature of the CE and the social implications of a developing CE have progressed apace, the employment opportunities arising therefrom are assumed with as yet rather limited empirical scrutiny. Recent research has examined potential skills implications and considered the statistical relationships between companies' self-reported activities and the number of jobs. Much remains to be understood – especially from a qualitative perspective and from the point of view of those undertaking CE roles.

7.3 Methods

This chapter draws on five distinct PhD projects carried out by early stage researchers within the Cresting project. They touched on employment within the CE following two approaches: first, as a specific topic of research taking a qualitative case study approach and second, as an issue emerging from investigation of other factors related to CE implementation. This section will address findings from both approaches. Our approach is steered by critical realism ([Sayer, 2000](#)), which treads a path between constructivist and objectivist research approaches – recognising that understandings of society are coloured by the subjective perspectives of both the researcher and the researched, but that nonetheless some perceptions are closer to an actually existing objective reality than others. Qualitative and quantitative methods equally have their place, to help to meet the goal of uncovering causal mechanisms influencing and constraining the empirical world. This philosophy is served well by the combining of insight from the different windows onto a CE offered by the multiple case studies.

Methods are summarised in [Table 7.1](#). They include semi-structured interviews with representatives of companies and public sector bodies who are directly

TABLE 7.1 Information on the case studies and methods used for research relating to CE employment

<i>Location</i>	<i>Perspective and focus</i>	<i>Methods</i>	<i>Reference</i>
Germany/Austria	Company: design	15 interviewees with three years' experience of sustainable product design; large companies in high-income economies	Diaz et al., 2021
International, Dutch and Italian companies	Company: understandings and reporting	Survey and interviews with Dutch and Italian companies in CE vanguard; analysis of company reports and reporting requirements	Opferkuch et al. 2022 and Walker et al., 2021
Hull, Humberside, UK	Public body view of regional transformation	23 interviewees in the UK at the national to regional level (business and policymakers); including 21 specifically in Hull/East Riding; document analysis	Newsholme 2023 , accepted
Lisbon, Portugal	Public sector – national government	Interviews, survey, documents	Klein et al., 2022a , 2022b
Hull, Humberside, UK	Public opinion and work in repair	Survey (n = 740), five interviews with self-employed repairers	Rogers et al. 2021 , 2024

involved in roles with CE relevance (product design), or management roles (with oversight of CE activity implementation) or directly undertaking CE activity (repair sector). In addition, an online survey with follow-up interviews was undertaken of companies and a document analysis of international sustainability and CE reporting.

7.4 CE employment case studies

In this section we present a summary of each of the five case studies.

7.4.1 Case study 1: A business view of CE employment relating to circular product design

This case study concerns company engagement with circular product design. The findings comprise perspectives relating to the employment implications that emerged from semi-structured interviews with product designers and their

managers (the design aspect as discussed in [Diaz et al. 2021](#); see [Chapter 3](#) in this volume for business perspectives and [Chapter 5](#) for CE assessment).

From these interviews it emerged that current product designers, even those with only a few years' experience, are still not trained to work with CE priorities. Despite having being selected for this study owing to their participation in sustainable product development as design engineers and product sustainability managers, the designers had a limited understanding of the sustainability implications of products designed for circularity during the design process. Notably, sustainability was primarily understood in terms of environmental impacts. Designers were unclear about the goals and principles of the CE, and consequently were not well prepared to translate them into their work practices and routines. For example, one option for implementing material recovery would be to institute a reverse logistics programme – but this seemed unheard of to at least one company, in this case a car manufacturer in Austria:

Interviewer: Do you think it would be viable to develop a take-back system for batteries?

Respondent: I don't know, has a company ever made that in the past?

Interviewer: Yes, some initiatives exist.

Respondent: Sure you know why is it very niche. ... That is probably very expensive and not very profitable.

If such take-back operations were initiated within the company, it is likely that a drastic jump in knowledge and understanding would be achieved. Having take-back operations in place would help designers to gain invaluable insight into the design for disassembly as well as operational information such as the geographic dispersal of their products and their condition during the end-of-life cycle. At present acquiring such information would require external collaboration.

There were two areas where additional competences were considered to be needed. First, digital competencies were identified to manage the infrastructure supporting new streams of information exchanged among parties to proposed new material flows. Second, competences relating to making decisions between available options were highlighted. Designers had familiarity with life cycle assessment (LCA) as a process, but did not carry it out themselves:

This [activity] would go through a partner that can really do an LCA, and really understand it, but we do not do it ourselves. And most of the time, we are too early in the concept phase to actually want to do an LCA.

Circular design engineer, the Netherlands

Additionally, there was a lack of understanding of the potential of a LCA as a predictive model of potential future impacts (as opposed to measured or

estimated current impacts). Although there are inherent uncertainties to predicting future impacts (for example, how and where products might be used), the LCA is actually needed during the early stages of design, because decisions at that point can fix impacts in place by constraining the more detailed decisions at later stages of design.

In addition to the new skill sets for designers, issues emerged that need a different approach at a managerial level, assuming that a company has made the strategic decision at the top level to implement CE approaches. This requires not just additional knowledge and a willingness to implement, but also the ability to redefine strategic goals of the company. These revised goals then need to be communicated and incorporated into the ethos and activities of the company. Addressing this at a higher level might help the designers to overcome hesitation around the risks associated with innovation:

Circular product design is innovation ... and if it is an innovation, you cannot really know what is on the other side ... Otherwise it would not be innovation. So that is what we see, there is a part which is about risk. But there is also a part that is also risky not to redo your product design these days, because it takes time and if you do not start now, you might be outdated soon.

(Circular design engineer, the Netherlands)

Circular and other environmental design considerations are competing with other criteria for the attention of designers, who are seemingly predisposed to familiar solutions to problems in order to meet cost and time constraints (Diaz et al., 2021). Thus, change requires appropriate messaging and support from management. Management were more confident of their abilities to meet the necessities of change than their staff. Nonetheless, the impression is given that sustainability is more a burden, or at least challenge, rather than an opportunity. Companies were fond of detailing their achievements, even if in reality these were quite modest.

One can infer the following design-related roles are needed to implement a CE:

- Sustainability and circularity designer: to embed CE principles into design guidelines and engineer the physical features into the products
- Manager of circular operations: to organise reverse logistics
- Circular economy adviser: strategy implementation tools, but also management of culture change

7.4.2 Case study 2: company implementation and reporting of a CE

This case study is drawing on projects examining how familiar companies are with the CE, where it fits into their understanding of sustainability, and how their

practices are monitored and reported (Walker et al., 2021; Opferkuch et al., 2022). Although a step removed from hands-on CE implementation, without an appreciation of CE embedded at company level, such implementation is unlikely. Furthermore, this study addressed the companies' awareness of the social dimensions of a CE, from which the reflections on employment emerged.

The Dutch and Italian companies responding to the survey see the CE as relating to sustainability – some expressing exasperation about the need to take on something new with connotations that they did not necessarily appreciate (Walker et al., 2021). When asked about the social aspects of the CE, employment tended to be the one thing that came to mind. This may indicate a limited knowledge of the potential ramifications/aspirations of a CE, potentially confined to emerging regulatory requirements. Or alternatively, they may have been aware of more socially focused definitions of a CE, but chose not to take that approach. In a separate pan-European study of company reports, only two out of 94 companies had a target relating to employment (Opferkuch et al., 2022, p. 446), which concerned retraining existing, rather than hiring new staff. Only one out of 94 companies mentioned an indicator relating to employment. Currently, CE reporting is largely confined to environmental aspects (e.g. waste management). It is starting to expand beyond manufacturing, albeit that so far it has not reached the financial sector (Opferkuch et al., 2022).

A specialised and potentially complex form of monitoring circularity is LCA and more specifically social LCA (S-LCA) in order to capture social dimensions. While the companies responding had some familiarity with LCA, the inclusion of social (as opposed to environmental and economic) issues is rare (only 6% of respondents, according to Roos Lindgreen et al., 2022), notwithstanding the fact that companies claimed to see a need to assess social aspects. Further expansion of LCA and especially S-LCA may depend on external pressure, be that regulatory or derived from stakeholder expectations. Achieving such an expansion will create opportunities for people with the relevant expertise. Filling such positions may be difficult, though, as S-LCA is in its infancy even in academia. The implication is that additional data, potentially different types of data, will be required compared to LCA. This will open up new opportunities for graduates or others emerging with the required expertise – but not necessarily as direct employees, possibly more likely within specialised consultancy roles.

In terms of employment, companies saw reporting on CE activity as beneficial for attracting new talent to the company. Respondents assumed that an enhanced environmental reputation would help especially with the generation starting work now, as they are assumed to be more enthusiastic for sustainability than their predecessors. If this assumption is well-founded, then using CE activity to attract new staff should reinforce and strengthen that activity by helping to build a critical mass of engaged staff. Notably, though, the discussion is not around recruiting more staff to implement a CE, but seeking a certain quality of staff who are being recruited anyway.

If incentivising CE activity through emerging reporting requirements is effective, this study suggests that the following types of roles will be necessary:

- Strategic roles to initiate activities to be reported
- Staff to both undertake and report on CE activities
 - Material use
 - Social implications: S-LCA
- CE-specialists to prepare and analyse reports.

7.4.3 Case study 3: regional policy perspectives on CE transformation

The third case study concerns the perspective of local government bodies trying to establish a CE for the benefit of their locality. As with the previous case studies, this project did not set out with employment/skills as an overt object of research, but it emerged as a strong theme.

The idea of a place-based CE follows on from earlier ideas relating to industrial symbiosis, whereby residues from one entity becomes inputs for another (Chertow, 2000). Cities and regions have aspired to circularity as part of both undertaking, and being seen to undertake, a sustainability transition (Prendeville, et al., 2018). The activities and intentions of the City of Hull, together with its neighbouring authority of the East Riding of Yorkshire along with other public bodies and companies in the region were studied to analyse issues facing public-private place-based cooperation for a CE (Newsholme et al., 2022; see also Chapter 6 in this volume). Local authorities and other public bodies see themselves as trying to influence a CE, but view companies as the primary drivers. Interviewees considered the needs of both employers and the local population as potential employees in a CE.

Humberside is one of the most carbon-intensive regions in the UK, and so needs a substantial change in economic focus. It also contains a substantial element of deprivation. There is a need for more employment opportunities with either low skill requirements, or more ideally the opportunity to upskill the population. There is indeed already a scheme in place (Hull City Council, 2023) to help local adults to overcome barriers to engage in training with a view to future employment. The 2019 Humber Clean Growth Local White Paper (Humber Local Enterprise Partnership, 2019, p. 25) refers to ‘strengthening the local skills base to support plans for clean growth and decarbonisation’, referring on the same page to the ‘new and better paid jobs’ it is hoped will emerge from a CE. Hull City Council in its 2018 City Plan for Hull stated that it aims to ‘create and sustain jobs for local people’ through strategies including CE (p. 13). Thus, the expectation is not just additional (or different) employment opportunities from a CE but jobs that are financially more rewarding than (at least some) existing ones.

As regards training for CE roles, it is not yet well understood what that might consist of. A representative of one local authority in Humberside saw a role for their organisation in supporting businesses to predict what might be needed in order to protect the livelihoods of those already in employment:

Employees will be left behind. And so we need to get ahead of the curve in that sense and make sure that businesses understand what the changes are that are coming. How they need to evolve and change. How their staff need to be skilled to do that.

*Interview with a Regional Climate Change Manager,
North Humberside, UK*

Thus, although the CE is viewed by the public bodies as something to be brought about by companies, there is a concern that companies might not have the vision to manage the process in a way that is supportive of their workforce. It is notable that none of the companies interviewed, or company documents reviewed, raised the issue of jobs, employment or skills, which supports the idea that the public bodies may need to drive this aspect of a CE transition. While there is an identified (if non-specific) need for training for the local population to engage with the CE, there was also a reflection on the training and experience of those who are leading the initiative for the public agencies.

The approach taken by a local authority to develop a CE is likely to reflect not only the nature of the place, but also the training and experience of those involved in planning and coordinating CE activity, as noted by the representative of one public authority. For Humberside, the CE agenda was very much about protecting the regional economy through a transition from a high- to low-carbon economy but without any fundamental change from current business or lifestyle practices. This is also indicated by the 2019 White Paper, with the CE referred to in the context of the offshore wind industry that has taken off in the region over the past decade and as an option for the food industry, which is also prominent locally. By contrast, other authorities in the wider region are taking a more explicit CE-oriented approach, e.g. the promotion of circular towns by the York and North Yorkshire Local Enterprise Partnership (n.d.). The Local Enterprise Partnership staff have the training and experience to undertake this approach, but also (whether cause or effect) North Yorkshire has a very different economic profile, with far less heavy industry to accommodate in a vision for the future than Humberside.

The following roles would need to be filled to bring about the vision of the local authorities studied:

- CE-qualified adviser for economic development/sustainability roles
- Training specialists for companies
- Bespoke support programmes reflecting the regional economy, potentially including CE facilitation

7.4.4 Case study 4: organisational change in a national public sector body

This case study concerns public sector bodies trying to transform their own operations to incorporate circular approaches. The role of the public sector can be seen in the other cases as driving change, or constraining choices, through regulation or as trying to be proactive in encouraging companies to go beyond regulatory requirements. Very much less research attention has been paid to public sector operations than private sector, and yet the public sector is a major element of the economy (Klein et al., 2020). The case study is based on interviews with the public sector employees who would be responsible for driving and implementing change in the central public administration in Portugal. Significantly, this affords an employee outlook with a focus on the functional or technical elements of change, not on personal experience (which is considered in the final case study below).

The central public administration in Portugal is seeking to adopt circular practices within its own operations (Portuguese Ministry of Environment and Energy Transition, 2017). The policy at the time of the interviews/survey was in the early stages of implementation. And notably only one out of three organisations surveyed already included the CE in their employee training (Klein et al., 2022b). The data collection captured people working through a CE transition in their place of work and the results indicate that this looks set to involve some changes to the experience of work, e.g. training for skills they might have assumed to be irrelevant, alongside a change in the culture of the workplace to implement those skills. Some activities will be reduced (e.g. the purchasing of new items, disposal of waste) as work is either dematerialised or items are recirculated internally. This might involve some loss of jobs or changing of roles (such as a requirement for a sustainability assessment in public procurement). For other staff there may be more subtle changes to their responsibilities (such as how and where office waste is disposed of, or permissions to purchase items). These additional duties and the exercise of environmental decision-making may be outside of the comfort zone for office workers, whose role is fundamentally to make plans for others to implement and to judge their success in doing so. One example of this would be the suggestion of a digital platform to organise sharing between different departments (within and/or between ministries) – requiring certain skills, as well as changing the culture of the workplace at a very mundane level (such as using reusable cups, reducing the use of printing). The triviality of these tasks can make it difficult to enforce change because they are treated by people as something taken for granted, as opposed to other aspects of their job that are more commonly subject to reflection. Additionally, the need to assess the extent and impact of CE implementation would impose new activities (Droege et al., 2021 and Chapter 5 in this volume), not to mention introduce a likely new area of performance management.

Respondents reported that a barrier to CE implementation was finance, with one symptom of that being a shortage of staff to organise and/or implement changes

(Klein et al., 2022a). Overcoming that barrier may involve increasing CE awareness at a political level, as suggested by this interviewee: ‘the public servants, the politicians, should have CE training and education so it’s another vector that strategically is defined for public administration, to have awareness and skills’ (Marine Litter, Portuguese ministerial expert, Klein et al., 2022a, p. 516). Assuming that the financial barrier could be overcome, interviewees emphasised the usefulness of hiring CE experts who would be able to train and incentivise others. Significantly, the suggestion is to have CE champions at both the management and staff level to drive strategy and day-to-day activities; this route has been recommended in other contexts (Davis and Coan, 2015). A further suggestion is to improve collaboration between ministries to capture any synergies or simply exchange notes on experiences.

The following roles can be identified to support the issues raised by respondents:

- Staff training (procurement, waste)
- Management role: coordination between departments; (potential) redefinition of existing roles
- IT system design and implementation

7.4.5 Case study 5: public perspective and the experience of work in a CE

The final case study relates to a particular CE activity in a specific place – the City of Hull, which is the major urban area within North Humberside (see Chapter 6 in this volume for contextual information). We decided to focus on repair as an example of an activity deeply relevant to CE, yet one that already existed and had another duality as both a thrifty and eco-friendly option, which furthermore might be done by the individual, by friends/family, or as a service. There are two distinct aspects to this case study: one is the public perception of repair based on an online survey and the second the experience of working in repair.

For repair to emerge as an opportunity for paid work there needs to be a market for repair as a service, and/or for re-sold repaired goods. An online survey of Hull residents was conducted in cooperation with Hull City Council. As shown in Rogers et al. (2021), respondents indicated that in Hull there is an acceptance of repaired goods (more than three-quarters of respondents had used a repair service or repaired something themselves) and willingness to purchase used (or second-hand) goods (more than two-thirds of respondents said that they sometimes or often buy second-hand goods). Levels of distrust in repaired items or in repair services were lower than recorded in previous studies (e.g. Bovea et al., 2017), possibly reflecting the disadvantaged nature of the city. However, the second most cited barrier to repair as an activity was lack of skills (given by 59% of respondents). This suggests an identification with repair as something one would do oneself. Those shopping for second-hand goods were significantly more likely than others to self-repair – but not to use a repair service. Having one’s likelihood to engage with repair contingent on the ability to do it oneself reduces the potential of creating paid work as

a corollary of (an eventual) reduction in demand for new goods. Those shopping for second-hand goods had a significant relationship with the urge to effect repairs themselves, but not so much the use of professional repair services. Unlike other studies, age was not a significant factor in the relationship to repair, but gender did emerge as an influential factor.

Respondents were also asked if they would consider working in repair: ironically, those with higher qualifications were more interested at least as a hypothetical proposition – especially in clothing repair (which might reflect a gender bias – female respondents were more likely to repair textiles and also perhaps were more likely to imagine a career in repair). Those less qualified were the least likely to see themselves working in this field in any way. This might reflect an assumption that the opportunity did not apply to them owing to their assumed lack of qualification (but see below). In either case, some careful communication might be needed to target individuals who might otherwise miss out on an opportunity. Men were more likely to work in small/large appliance repair than women; women were more likely to work in clothing repair than men.

Hitherto the CE literature has been rather silent on the experience and perspective of those expected to carry out such work. Here we draw on [Rogers et al. \(2024\)](#) to present the perspectives of individuals working in the repair sector in Hull. Also of interest to this study is that the individuals interviewed were self-employed, working either as sole traders or running micro-scale companies (i.e. fewer than 10 employees – in practice only one to four at most). For these individuals, the concept of a CE was not a driving force in their work. They had been in their present occupations for between four and 27 years. Two women were working as seamstresses/tailors and three men in the repair of various electronic goods (specialising variously in mobile phones, televisions and appliances). The gender division matches that found for likelihood to self-repair, suggesting deeply entrenched gendered roles in society. Attitudes to the work varied between the interviewees, partly according to their time in the trade. While the flexibility afforded by self-employment was widely noted (e.g. the ability to schedule working hours around childcare obligations), establishing a new business is stressful. Respondents referred to working long hours under considerable time pressures as they were nervous to turn away any job. In some cases, the pressure of work interfered with customer interactions, while for others the sense of being helpful to individuals was the chief source of job satisfaction. Respondents were enjoying or seeking a secure livelihood; only one was looking to grow their business, albeit that they were not in a position to do so at that time. Regulations and administration around employment were seen as a disincentive to expand. Notably, though, when recruiting staff the main requirement was experience rather than formal qualification. Another barrier to business development was the lack of access to instructions and spare parts needed for repair of some items – illustrating that even self-employment only brings limited levels of self-control over one's workplace and business.

Based on this discussion, two roles emerge:

- Independent repairer
- Business advice/support tailored for small companies

7.5 Discussion

Collectively, the five case studies shed light on the employment implications of a CE. Several themes emerge which are analysed in this section under the sub-headings of our research questions: what type of changes to employment are underway and/or expected; how CE-ready are European organisations and what are the emerging social implications of those changes?

7.5.1 *Changes to employment*

The case studies illustrate that CE activities are becoming normalised across a range of employment settings. There are people with experience of working with CE activities across a range of contexts, albeit that in all these cases are interwoven in the ‘less than circular’ economy.

Seemingly, very few roles would not be impacted in some way by a flourishing CE. A category of work not considered in the previous classifications ([Consoli et al., 2016](#); [Burger et al., 2019](#)) is the office worker populating public and private sector organisations. With parallels to the experience of domestic resource retention activities (notably recycling, but also energy efficiency and ideally sourcing reuse and shared options for consumption), all work experience is likely to involve an extra level of reflection (what, why, how) as well as some basic knowledge of things such as the suitability of different plastics for different activities, or identifying different types of materials for correct disposal. These are not technically complex issues necessarily, but may be well outside of the traditional skill set expected of people in office roles. The need for some form of monitoring of outcomes may also be new, i.e. performance targets (potentially collective) that do not relate to one’s primary role.

Repair is an example of a job that pre-dates the CE, but demand for it should increase (see [Consoli et al., 2016](#) regarding the first category of ‘green’ employment). The self-employed repair workers interviewed in this study have the relevant skills, but lack the ambition or experience needed to develop a structure to make their services available on a wider scale. This structure may emerge with ‘right to repair’ requirements (e.g. [British Ecodesign for Energy-Related Products and Energy Information Regulations, 2021](#)), which should provide some economic support to these micro-businesses by broadening the range of products they can service. However, such requirements might also incentivise changing business models for companies in a way that might out-compete independent operators.

Some existing roles (such as public sector purchasing, product design, or waste management in almost any context) will need additional skills and expertise to engage with circular practices. These relate to [Consoli et al.'s \(2016\)](#) second category (existing jobs requiring employees to reskill). As discussed in the second case study, the product designers were aware of their limitations, which is an important change threshold to cross, but had limited knowledge about what areas they might need to reskill into. This chimes with earlier research ([Deutz et al., 2013](#)) that product designers typically were not following a well-developed design process, let alone applying a design process with sustainability criteria in mind. These are highly skilled technical roles that would benefit from changes to formal qualifications, but while that is necessary to achieve change, it is not sufficient in itself. Other structural and organisational barriers to implementing circular design would remain ([Diaz et al., 2021](#)).

As in previous studies, CE development requires roles and corresponding skills aside from the directly hands-on ([Burger et al., 2019](#)). These include CE coordination roles such as sharing information within and between departments (or teams) in large organisations, or along a supply chain. Networking and communication skills are likely to be essential here, but IT skills can be important too (as mentioned in the fourth case study). As was the case in the Portuguese central administration, existing staff may need to acquire such skills or to apply existing skills to different fields (such as managing internal performance alongside, or alternatively to, managing external service delivery). Greater knowledge of the CE, its options and ramifications, is needed to determine exactly what needs to be done. At a higher level of management, strategic and leadership skills may be needed to drive change ([Mumford et al., 2007](#)). The challenge here is also to envisage the change, and communicate this to people able to attract and organise the financing needed. In the public sector, there is a need for people with both a knowledge of the CE and an ability to communicate to private sector bodies, even if the latter are then in the best position to consider their own specific needs. And, indeed, company needs may be best served by CE strategies that do not best serve the location ([Newsholme et al., accepted](#)).

One of the most innovative areas of activity around CE research and development may be the measurement of circularity and, more importantly, sustainability ([Roos Lindgren et al., 2022](#)). This is a necessary safeguard to avoid unintended consequences of product changes as well as to measure organisational progress. However, although a comprehensive S-LCA might reduce unintended consequences, LCA appears to be used more often to benchmark existing products rather than as a tool for comparing options for products in the design. So wider changes in practice, as well as new skills, are required. Furthermore, for social dimensions of an LCA, the skills required are uncertain. This is a much more novel procedure and requires research, e.g. what are the relevant data and how can they be sourced, as well as translated into an operational form not requiring research-level time

and skill? How to judge acceptable outcomes is also to be determined. Similar considerations apply in terms of company reporting, i.e. staff involved in reporting will need to adjust to different issues, learn to collect and present different forms of data. But, again, companies need first to decide that they are going to engage (assuming that reporting is voluntary) and how (if it is not). Some additional roles are likely in this area for large corporations, potentially also within organisations who attempt to interpret such reports (such as investors), and in bodies setting the requirements (such as the European Commission).

7.5.2 *Readiness for change*

One can infer from the above discussion that although there are few entirely new circular roles, an important emerging area of CE-related employment will be to offer training for existing employees, for those that might seek to go into CE employment, and also training in business development. The ability of companies to support their employees through a circular transition is called into question by the third case study (local to regional public bodies seeking to build a place-based CE). The concern of the local authorities is to create/retain jobs for the local workforce. They therefore have a concern for skills upgrading that might not be precisely shared by companies. Companies may greatly value experienced and capable staff in whom they may have invested significantly, but nonetheless their loyalty to their host location is contingent upon economic benefits (Newsholme, 2023). Additionally, the local authorities are concerned with upskilling the local population to access future jobs (against a backdrop of the likely disappearance of carbon-intensive jobs). This is complicated by the challenge of trying to predict quite what skills may be needed, compounded by the uncertainty of actually attracting organisations requiring those skills. The fourth case study is based in the same location (in north-east England). It illustrates on a small scale that individuals have managed to forge CE-related positions for themselves, which lends support to the idea that formal qualifications are not necessarily required for some CE jobs. However, the survey respondents interested in related CE work tended not to be from the low-education end of the spectrum.

In each case study a tension emerges comprising the (relatively straightforward) need for people with relevant skills, but also a need for people with the skills and expertise to both identify those skills and to put in place the changes required to actually generate the need for them. This can be seen most explicitly in the examples provided of the Portuguese national government, the product designers and local governmental bodies trying to implement a CE. A further element to the picture is the need for structured decision-making processes, i.e. to model the likely impacts of CE-related changes (via LCA, S-LCA or other sustainability appraisals for either internal or external procedures); here, too, although there may be an awareness of the need for such steps related to products and organisational change (this was not explicitly addressed in all the case studies), there is a lack of in-house ability to

implement such mechanisms. So people are needed to establish operations that we do not know exactly what they consist of, which will involve people with skills we are not specifically certain of, but we think the performance of the people and/or the organisation as a whole will need measuring against standards that we are also do not know what they are, or (unsurprisingly) how to measure them – or who will know how to interpret the results.

Seemingly, the interest in change appears to exceed the preparedness in these case studies. Notably, organisations were selected for study based on having expressed some interest/involvement with the CE. By implication, other (public or private sector) organisations are likely to be less well placed – still in a situation of contemplating ‘unknown unknowns’, if they have even got as far as contemplating a shift to a CE.

7.5.3 *Social implications*

The social dimension of the CE is seemingly an afterthought in both public and private sector contexts. When asked for a social aspect, companies offer employment as an example. Clearly jobs will evolve, or will need to, to take on more circular aspects – a level of on-the-job and pre-job training will be needed. But more attention needs to be paid to the quality of that employment. As seen from the fifth case study, having a socially beneficial job that brings help and satisfaction to individual customers does not preclude the stresses and concern of earning a living. Along with some of the responses around S-LCA, we can see that new, or newly significant, CE roles may not be in a company context. The level of uncertainty around what is needed may breed opportunities in consultancy, which can be lucrative, but carries uncertainties of continuously looking for the next role, with consequent pressures for planning one’s life. There are gender dimensions which are touched on, but need more consideration.

The types of jobs emerging, and disappearing, will vary according to the context of the place, with no guarantee of a good geographic match. Or that those who have not done well out of previous economic changes, will do any better this time (see also [Chapter 6](#) in this volume).

7.6 Conclusions

This chapter has examined the employment implications emerging from five case studies of different aspects of a CE. We note that although there may not be many entirely new roles (just as a CE itself is a concept drawing on many pre-existing ideas and activities), very few roles will be entirely untouched by a CE transition. There are roles to be had which involve ‘doing’ CE activities (from repairing old products to designing new ones), also measuring/assessing, communicating, championing CE activities, or training others to do any of those things, or indeed in human resources to recruiting others for CE roles.

However, although on a generic level one can identify areas of activity, the precise knowledge and skills involved are more difficult to specify. They are also likely to be variable according to the economic and geographic context, and furthermore they are contingent on decisions made about how to implement CE initiatives. A further complication is the lack of knowledge and indeed the lack of control among those trying to, or contemplating trying to, implement a CE. A major point to emerge from this research is the interdependence of different roles. The situation is not so much that a CE will generate new jobs, but that people who know about a CE are needed to be in position to bring about the changes that might create those roles. What emerges will depend on the decisions of those at the top level in organisations; what we see as CE will be influenced by actions of those people as well as those hired to undertake the implementation thereof. A critical role is likely to be the coordination of CE and non-CE activities. Transformation will be intimately connected with employees – those doing the work of the CE at different levels. This will produce and reproduce the CE. It is not that CE leads to opportunities, there will be no well-developed CE ahead of these positions being in place. Furthermore, some critical roles may emerge outside of organisations in a consulting capacity. It might well be that if you want a job in the CE, you need to be in a position to create a role for yourself.

There is much further research to be done in this field, for example addressing different industrial sectors, and different locations to those included here, notably outside the Global North. The experience of work and gender dimensions in particular need further examination. More generally, there is the question of where future CE employment fits within wider and constantly evolving social (and spatial) divisions of labour.

Note

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8

POLICY CONSIDERATIONS FOR A CIRCULAR ECONOMY

*Walter J.V. Vermeulen, Martin Calisto Friant,
Kieran Campbell-Johnston, Pauline Deutz,
Aodhan Newsholme, Małgorzata Pusz, Natacha Klein,
Tomás B. Ramos, Anna Diaz Tena and Kaustubh Thapa*

8.1 Introduction

A successful transition to a circular economy (CE) requires a fundamental transformation of current practices of production and consumption, making them operate in an ecologically and socially sustainable manner. In [Chapter 1](#) we introduced the aim of the Cresting project, namely to provide a critical analysis of the sustainability implications and the spatial dimensions of the current approaches to the implementation of a CE. This has been pursued with sub-questions and projects regarding the implementation of a CE in policies and practices in various European countries, with a focus on the wider sustainability implications at various scales, its measurability and with a critical approach to the diverse conceptualisations of the aspirational agenda of the CE. The Cresting project has been inspired by principles of critical realism and transdisciplinary research, acknowledging the need for science with impact, while providing an understanding of the underlying factors producing the patterns observed. In doing this, various studies in the project have observed the impacts of existing and emerging policy approaches in different national and scalar contexts. With its ambition for an impactful role for science, the project has been engaged in various forms of policy outreach: we organised workshops, produced policy features, policy briefs, white papers, technical briefings, and so on. This chapter will guide the reader through the main outputs of various Cresting projects. Before we embark on this tour, we start with a few preliminary considerations.

First, Cresting was not designed as a formal policy or impact evaluation, taking neither an *ex ante* (predicting future impacts) nor an *ex post* (empirically assessing impacts after implementation) policy evaluation approach ([Hanberger, 2001](#); [Froeyman, 2012](#); [Gertler et al., 2011](#); [Smismans, 2015](#)). Where such evaluations

generally take intended or established policy goals as a starting point, in our research we have taken various open perspectives regarding the formal goals and the conceptualisations of the CE by the actors engaged in these policies and practices. Thus, a wide variety of policies and practices of various crucial stakeholders have been analysed and evaluated, in some cases from an *ex ante* perspective (as in [Chapter 3](#) in this volume), and in others with an *ex post* perspective (in [Chapter 6](#)), but also in various cases with a system-design approach (see [Chapter 4](#)). Understanding what is actually happening in these practices for the CE and why they have been successful (or not) has been the primary concern. In our view this provides valuable insights which are useful for policymakers at different levels and in different places.

Second, the concept of ‘policy’ (and thus also ‘policy advice’) is not reserved for government actors only, but is equally applicable to managers in private and social organisations. Lessons learnt in the Cresting project therefore can be translated to their implications for private actors as well as governments at various levels. The fundamental transformation to a CE requires a solid identification of the key stakeholders and their possible roles and need for collaboration. [Table 8.1](#) provides a basic overview of the key actors required for this transformation. The fruits of the Cresting project address many of these actors and their relations, but not all. [Table 8.1](#) shows what has been covered and what has been beyond of scope of the project. Crucial in the transformation will be the actual change in behaviours and practices of the value chain actors: this is where value retention in its various forms, namely the 10 Rs (Refuse, Reduce, Reuse/Resell, Repair, Refurbish, Remanufacture, Repurpose, Recycle, Recover, Re-mine), with a particular focus on R1–R3 (see [Chapter 3.1](#)) needs to be realised. These actors must do this jointly and may act voluntarily or only under regulatory or market pressures. Both governments and societal organisations can support this and put pressure on the value chain actors. Here we see the governance triangle, with governments and civil society engaging market actors with their diverse and hopefully mutually reinforcing interventions ([Lemos and Agrawal, 2006](#); [Driessen et al., 2012](#)). Opportunities for such interventions differ between levels of government. Supranational governments apply both general frameworks (that still need to be transposed to national laws) and regulations directly affecting business conduct. National, regional and local governments have different powers and policy opportunities, while this distribution of power differs strongly between nations. At the same time, specific topics in creating a more circular society are often addressed simultaneously at various levels of government, which requires proper policy integration, coordination and fine tuning. Although the Cresting project has covered various European countries, such challenges of policy coherence has only been addressed in an ‘impressionist’ approach, looking at a variety of aspects that we as researchers saw as important. We will discuss examples at various government levels and for stakeholder groups addressed.

Third, the concept of governance levels does not equate to the concept of geographical scales. Although the different levels of governance (local, regional,

TABLE 8.1 Coverage of key stakeholder groups and levels in [Chapter 8](#)

		Value chain actors				
		Sourcing (mining, agriculture)	Production steps	Wholesale/ retail	Consumers/users (incl. public services)	Recycling/ value retention
Governance levels	Local	← ← § 8.2.4 / 8.2.5 → → → § 8.2.1 § 8.2.1 § 8.2.2 § 8.2.3				
	Regional	§ 8.2.1 § 8.2.4 § 8.2.3 § 8.2.2 § 8.2.4				
	National	← ← ← § 8.3.3 → → → § 8.3.1 § 8.3.2 § 8.3.4 § 8.3.2				
	Supranational (e.g. European Union)	← ← ← § 8.4.1 → → → § 8.4.2 § 8.4.3 § 8.4.2				
	Global (e.g. United Nations)	§ 8.5 § 8.5				
Societal actors		↑	↑	↑	↑	↑
(Non-governmental organisations/knowledge providers)			§ 8.3.4		§ 8.3.4	§ 8.2.2 § 8.3.4

national, supranational) have a scalar expression, policies apply to fixed territorial jurisdictions, whereas geographical studies of scale address the fluidity of boundaries and inter-scalar flows and influences. As considered in [Chapter 6](#), value chains and their actors cross borders and consequently experience both similar and differing policy and political cultures and socio-economic cultures. Resource flows and with them (after the stage of consumption), the waste and to-be-recycled material flows increasingly have a global nature, which is often ignored in the discourse on the CE. We will show some implications of this knowledge and policy gap in [section 8.5](#).

Fourth, taking stock of the research and acknowledging such differences in levels and scales, we also need to acknowledge differences in ambition, experience and conditions between industry sectors and product categories, and within stakeholder groups between frontrunners, start-ups, incumbent firms and resisters. In the course of our research, data have sometimes been collected explicitly from frontrunners to collect first-hand experiences of piloting actors, while in other cases research has been designed to paint the full picture. When translating this research into policy implications, the implications of the varying perspectives included has been considered. Differences in ambition, experience and conditions can also be the result of temporal disparities: some countries adopted recycling and industrial ecology approaches some time before others, which affects their strategies. By the 2020s CE policies had been developed in many countries and at all government levels (from supranational to local). They address key actors (economic actors in the value chain; consumers and users of products and services; and government agencies active in waste management and recycling) in diverse ways. Some of the policies have a longer history, initiated as waste management or recycling policies, but are now part of the wider CE agenda, while others were implemented recently (e.g. EC, 2015, 2020; see also [Chapter 3](#) in this volume). Various authors have described at least three periods with specific interpretations thereof since the 1980s ([Blomsma and Brennan, 2017](#); [Calisto Friant et al., 2020](#); [Reike et al., 2018](#); [Schöggel et al., 2020](#)). The current framings of the CE build on various interrelated aspects of waste management and product policy over the past four decades. However, this phasing has hardly considered the policy transfer and policy diffusion between nations with different speeds ([Dolowitz and Marsh, 2000](#); [Marsh and Sharman, 2009](#)).

Showing the main outputs of various Cresting projects in this chapter entailed making a choice in how to display the resulting advice and recommendations. One could present them in a global-to-local sequence. However, that would assume that there is a logical hierarchy of globally designed policies to be implemented at lower levels, which is not the case. For environmental policies one can argue that the centre point of policy development is at the national level, whereas for the European Union (EU) the policy interaction between the EU level and the national policies are dominant: the policies in reality are the result of a member state's inputs in the EU's regulatory process, while EU frameworks need to be transposed into the national policies, leaving room for national adaptations. That would suggest starting at the national level and then show the connection to both the higher

and lower government levels. However, for reasons of clarity, we chose to present the policy recommendations going from the local and regional (section 8.2) to the national (section 8.3) and the EU level (section 8.4) and finally the global level (section 8.5). One reason to start at the local level is that local authorities are the most closely connected to the specific value chain and societal actors in their territory, even though the local level policies need to fit into the (country-specific) power distributions between the national, regional and local authorities. Many circularity initiatives have been established independently or to compensate for the shortcomings of policies of higher-level authorities.

The various researchers in the Cresting project have taken different theoretical, disciplinary and geographical perspectives for their studies. These affect the scope and orientation of their policy advice. This chapter takes stock of this by discussing the main lessons and implications for future policies. The final section will present general observations and conclusions.

8.2 CE policies at the local and regional scale

Many circularity initiatives have been established at the local or regional level. Local authorities historically have played a crucial role in waste collection and in organising recycling. Also, non-governmental organisations (NGOs) have been active in promoting recycling and in setting up second-hand shops and sharing initiatives. Local authorities have a long history of supporting these bottom-up initiatives. But CE policies also link to local policy fields other than waste management, such as housing, industry and social security. Local-level authorities need to fit their activities into the power distribution between national, regional and local authorities, which greatly differ between countries. In this section we will discuss some of the research outcomes, first discussing examples of the local support of repairing and sharing networks (section 8.2.1), followed by the support of social enterprises (8.2.2) and an example of local multi-stakeholder collaboration (8.2.3). Next, various policy reviews of local and regional CE approaches will be discussed (sections 8.2.4 and 8.2.5).

8.2.1 *Local and regional policies supporting repair and product service systems (Graz, Austria)*

An example of local policy support for promoting the short-loop Rs in the R-hierarchy (R3, Repair, extension of the life span) is the success story of the case of GRAZ-repariert, a local repair network managed by the city of Graz in Austria, operating under a local financial incentive scheme (Lechner et al., 2021). Following a steady decline in repair activities over the past few decades, it is common for EU countries to deploy national policy instruments to support such incentives (i.e. value-added tax reductions for repair services and sales of second-hand goods, tax reductions to incentivise repair, and tax reductions to encourage the donation of used goods to social enterprises, etc.). In addition to national repair incentives,

the citizens of Graz are entitled to apply for the direct reimbursement of 50% of repair costs (totalling a maximum of €100 per household per year). This policy instrument is meant to stimulate demand for repair services within the city boundaries. At the same time, the supply has also been regulated through the creation of a network of repair service providers. The network is managed centrally, and the cross-member collaboration results in a greater service quality because service provider companies are able to exchange tools and know-how. The combination of the local funding scheme and the management of the network yields positive results. In 2019, network members reported a 33% increase in the demand for repair services within the city boundaries, while demand outside the city decreased by 7%. Cultural connotations around repair activities have also been improved from both sides, since new customer profiles engage in repair and the unifying effect of creating a well-regarded brand also increases a feeling of identity among network members. This is an example of the benefits obtained from assuring policy consistency between different levels and the effects of increasing the territorial embeddedness of value retention.

Another local example is the policy support for product service systems. Sustainable product service systems (PSS) have been one of the key units of analysis within Cresting (see [Chapter 4](#) in this volume), as they exemplify the dematerialisation of a CE through the principle of ‘access over ownership’. PSS approach value delivery through the combination of material artefacts and service add-ons aimed at stimulating collaborative production and consumption networks yielding sustainability benefits. It helps consumers, or users, to refrain from excessive individual use and early disposal. Others have shown that local- and regional-level policies are a key enabler of PSS in a circular economy ([Delgadillo et al., 2021a](#)) as they drive ‘political embeddedness’, the distribution of power among all actors included in the PSS networks, and the influence of policies and NGOs over corporate activities ([Zukin and DiMaggio, 1990](#)).

This is further depicted through the case of sustainable packaging in the EU, where the number of consumers demanding reusable options has been growing, as well as the EU-level policy pressures to reduce the production of single-use packaging ([Foschi and Bonoli, 2019](#)). The lack of a territorial policy approach confronts these trends with a very constrained reverse logistic infrastructure at the ground level, missing the opportunity to implement reusable packaging systems and harness its values locally. Thus, we conclude that there is a need to strengthen the coherence between national- and local-level policy agendas to effectuate a circular economy ([Delgadillo et al., 2021b](#)).

8.2.2 *Local support for social enterprises and social-circular public procurement*

Another role local authorities can take is supporting social enterprises. In line with the call for a more inclusive and Transformational Circular Society (TCS; see

Chapter 3 in this volume), social enterprises can stimulate local development of a socially inclusive approach in particular places by engaging vulnerable individuals in activities such as reuse, upcycling, refurbishing or repair at the local, community, city and neighbourhood level (Lekan et al., 2021; Lekan and Rogers, 2020; Pusz et al., 2023). Social enterprises reinvest funding and profits from a trading arm to fulfil their social and environmental mission rather than merely distributing them among shareholders (Longhurst et al., 2016). Such activities tend to involve symptomatic support to aid the poor and satisfy basic social needs and systemic support to address individual and social/environmental challenges (e.g. they may run social and work integration schemes, and improve human health by promoting environmental stewardship) (Certo and Miller, 2008; Kay et al., 2016). As such, the social outcomes of social enterprise-driven CE are of short-term benefit, but are decidedly not transformational because the underlying causes of deprivation are not tackled, as discussed by Deutz et al. (2024) in a synthesis of the Hull-based Cresting case studies.

Nonetheless, research findings from Małgorzata Pusz (née Lekan) reveal that social enterprises should be recognised as important reuse operators, which have an untapped potential to assist private companies in helping them to take responsibility for their products at the end of their life. This could further be supported through extended producer responsibility (EPR) schemes (Lekan et al., 2021; Lekan and Rogers, 2020; Pusz et al., 2023). The example of the multi-collaborator arrangement between public bodies in Hull, a well-established and prominent local social enterprise (Dove House Hospice) and private companies indicates the kind of mutually beneficial arrangements that can be made. Pusz (2023) terms this social-circular public procurement. Social procurement differs from conventional procurement in that the buyer ensures that procured goods and services create benefits for people, stakeholders, and society as a whole (see the United Kingdom's Public Services (Social Value) Act 2012; [Legislation.gov.uk, 2012](https://legislation.gov.uk/ukpga/2012/12)). The arrangement between Dove House Hospice, Hull City Council, East Riding of Yorkshire Council and FFC Environment (a large international private waste management company) is illustrated in Figure 8.1. The partnership exemplifies how the third sector can capture potentially reusable items from the local authority owned household waste recycling centre (HWRC), ultimately diverting waste from landfill and reducing municipal waste disposal costs. Although the local authority provides Dove House with a free disposal access to HWRC, the charity must meet any transportation costs incurred to return unusable items from its reuse shops. Moreover, the local authority resists procuring items for its own use in public offices (e.g. upcycled furniture) through these routes, ironically citing the need to minimise costs by procuring from commercial enterprises. Consistent with Morgan (2008), local authorities find it less risky to enter into large-scale contracts with regional or national companies rather than local providers. It is also challenging to assess social returns of particular social enterprise (SE)-led services and reconciling social value with financial returns. Local authorities likewise have no power over private

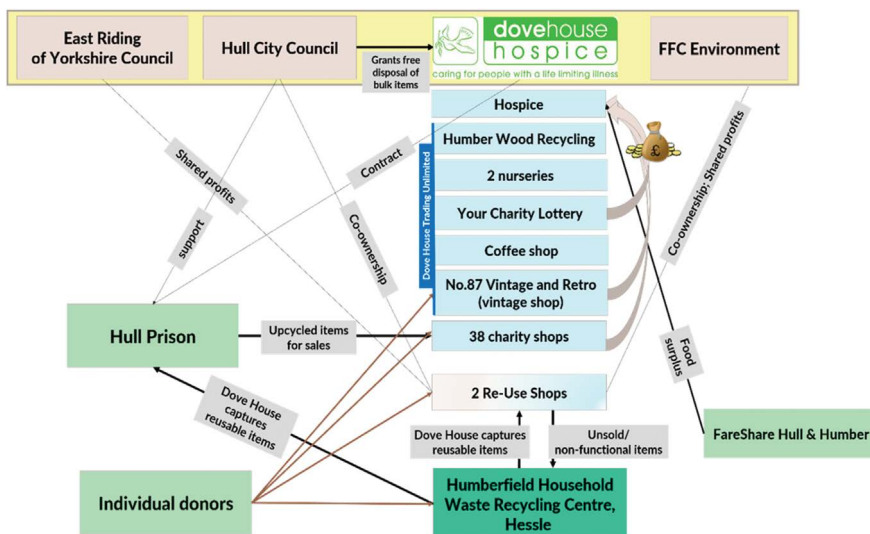


FIGURE 8.1 Partnership between Dove House, Hull City Council, FFC Environment and East Riding of Yorkshire Council and key actors associated with the CE in Dove House

Source: compiled by the authors based on Pusz (2023).

companies when it comes to encouraging them to procure goods and services from local SEs. This can occur so long as they can maintain a strong social ethic and work in partnership with those companies. While there is the potential for local authorities to implement social-circular procurement strategies, this subsection has thus highlighted significant challenges requiring responses at multiple scales.

Collaborative EPR schemes including third sector organisations should shift their focus from recycling to reuse. However, some of the interviewees from the UK expect private companies to resist the implementation of mandatory EPR schemes for fear of incurring additional costs. It is hence important to ensure that SEs play a major role in discussions/negotiations on new or to-be-adjusted EPR schemes, which could boost private companies' corporate social responsibility and lower their waste management fees. In this regard, national support infrastructure organisations offering advocacy and/or lobbying in favour of implementing sustainable EPR schemes, e.g. Charity Retail Association (UK), WRAP (UK) or Triciclos (Chile), are going to play an important role.

8.2.3 Regional CE policies: the case of North Humberside (UK)

Local authorities do not always play an active role as they do in the above cases. Local and regional authorities' direct involvement in CE activities in North Humberside (Hull and East Riding of Yorkshire) has been relatively limited to date

in practice, with a current strong reliance on traditional heavy industries. There is some evidence of a shift towards more sustainable practices, for example, the formation of the industry-led Humber Waste Alliance group in Hull. However, there is little evidence in terms of collaborative regional CE connections coming to fruition from these networks (see [Chapter 6](#) in this volume and Newsholme, 2023). In North Humberside, the region is rarely considered by companies as a key driver for the implementation of CE activities. Instead, historically CE discussions have remained an internal company matter and are discussed with company value chain partners ([Chapter 4](#)). This is likely to raise concerns for regional-level authorities and their ability to capture potential CE benefits in economic and environmental terms locally. Additionally, in Hull policy that is solely focused on the CE acts as a 'business as usual' approach to environmental concerns, while still aiming for economic growth (Newsholme et al., 2022).

Local authorities often envision the CE as a way to promote their region as a place to conduct business in order to attract new firms to the area and build an economy based on circular-based production systems. However, in Hull there is a lack of awareness of the skills needed for a CE to flourish (Rogers et al., 2021), this was also evident amongst business and policymakers (see [Chapter 7](#) in this volume). Our research suggests that increased devolution over developing regionally sensitive and tailored CE strategies based on local needs in their region would be beneficial in the UK, where the policy system in practice is highly centralised (Farrelly, 2010). Currently there is a lack of ability to make regional changes to CE strategies locally, as regional agencies must follow the regulations set by national and international policymakers (Farrelly, 2010). Nationally in the UK, there is some recognition of the potential for business and public bodies to work together to foster regional CE activities, but a concomitant lack of comprehension of the diverging interests that would need to be overcome. The business world has overlooked the role that policy can play in acting as a facilitator for CE activities locally, while policymakers called on business to act. However, businesses were evidently connected to and dependent on global value chain partners, which were the focus of their CE aspirations ([Chapter 4](#)). This points to a fundamental conflict of interest between spatially defined public bodies and companies with a CE based in the territory, which has not previously been acknowledged in CE research (Newsholme et al., 2022). Policies will need to counteract the tendency of companies to focus on company-oriented collaborations at a potentially global scale.

Local authorities in Hull also faced logistical challenges in terms of waste management and were reliant on economies of scales when attempting to manage waste in a cost-effective manner. This results in waste being collected by local authorities before being segregated, distributed and managed at the international/national level due to commercial viability concerns. These findings also build on the work of Llanquileo-Melgarejo and Molinos-Senante (2021) in the Chilean municipal context, who found that local authorities struggle to manage waste at the regional level due to cost concerns with small quantities of waste, in turn raising important

questions for the practical potential to keep resources in circulation at the regional level (Newsholme et al., 2022).

8.2.4 City-level CE policies: Amsterdam, Copenhagen and Glasgow

In the section above we discussed various examples of specific CE activities at the local and regional level. City-based local authorities are increasingly engaged in defining an integrated local CE policy, connecting the various relevant policy areas in one policy plan. One of the Cresting researchers designed a framework for *ex ante* evaluation of such integrated CE policies. It builds on the conceptual framework presented in Chapter 3 in this volume. The challenge of this project was to see if the disconnect between words and actions with policy narratives, found at other levels and sectors (as shown in Chapter 3), would also be found at the local level. This analysis was applied to examples of cities often portrayed as ‘pioneers’ at the forefront of the CE transition: Amsterdam, Netherlands, Glasgow, UK, and Copenhagen, Denmark (Calisto Friant et al., 2023a). All three cities have developed or updated their CE actions plans recently (between 2019 and 2020). Their approaches to the CE are rather different. Amsterdam uses Kate Raworth’s doughnut economics as the foundation for its CE policy (Raworth, 2017). Consequently, it has a quite inclusive discourse that seeks to achieve societal wellbeing within the ecological boundaries of the Earth (Municipality of Amsterdam, 2020). Glasgow has a similar discourse, inspired by the cradle-to-cradle approach to circularity, referring to its inclusion of environmental, social and economic sustainability criteria in their certification (Glasgow City Council, 2020). Copenhagen, on the other hand, takes an ecomodernist approach to the CE, but also includes social justice considerations and focuses on business innovations, economic competitiveness and green technologies as avenues for environmental sustainability (Municipality of Copenhagen, 2019). However, one point in common throughout all case studies is a growth optimist approach to the CE. That is, all the case studies seek to decouple economic growth from environmental degradation by using new circular technologies and innovations that increase the city’s eco-efficiency and competitiveness. Current policies focus much more heavily on generating new circular businesses and innovative circular practices, without affecting or shrinking current unsustainable industries nor disrupting unsustainable overconsumption trends in these powerful cities of the Global North. The possible environmental benefits from increased eco-efficiency and new circular business models thus risk being overshadowed by the continuation of unsustainable consumption and production practices and overall economic growth (Calisto Friant et al., 2023b).

This analysis also reveals that all the case studies have surprisingly given very little attention to some key policy areas relevant to circular cities (see also Chapter 6 in this volume). Policies in the areas of renewable energy, transportation, water management, ecosystems and urban form and territorial planning are weakly or not explicitly connected to the CE policies in these cities. This is a key omission

from their strategies as research on urban planning and sustainability has evidence that action in those areas can have substantial sustainability and circularity benefits (see, for more details, [Calisto Friant et al., 2023a](#)).

Furthermore, our analysis finds that social justice policies are hardly integrated explicitly, even in Amsterdam and Glasgow, which have taken a socially progressive approach to the CE (see also [Chapter 6](#) in this volume). Despite the inclusive and holistic CE discourse of these two cities, their social CE policies mostly focus on small pilot projects such as the promotion of sharing economies and urban agriculture. These do not substantially redistribute large inequalities in wealth and resource use from those that overshoot their fair share of planetary boundaries to those that undershoot their fair share. Nor do they address the many forms of urban and spatial injustice in access to housing, green areas, social services and education within their cities. If the TCS vision is pursued, these policy areas would need to be connected more explicitly. Finally, the CE policies in our three case studies lacked substantial and meaningful citizen engagement in their development. While Amsterdam was the only city to hold participatory workshops to create its CE strategy, these mostly has a consultative role as the final decision regarding the shape of the CE strategy remained in the hands of the municipal government ([Municipality of Amsterdam, 2020](#)).

There is thus a lack of more inclusive co-creation of these policies and this limits both their content and their transformative potential. For this study an extensive review of possible policy elements was made, enabling policy advice to municipalities based on what CE scholars have been suggesting so far in academic literature. One needs to note here that this policy research approach is highly led by what explicitly has been mentioned in policy documents on the CE. Policy documents in other local policies may very well have addressed issues discussed. Some additional pathways have been proposed by various authors. Described in more detail elsewhere ([Calisto Friant et al., 2023a](#)), these can be summarised as:

- 1 Cities can more explicitly foster a socio-cultural transformation away from hyper-consumerism and hyper-competitiveness and towards slower, healthier and more convivial ways of life through community-owned media sources, restrictions on street advertisements, environmental education and promotion of non-materialist values and care ethics.
- 2 Cities can explore how circularity may involve more than only material resource cycles ([Calisto Friant et al., 2023b](#)), by enabling the circulation of wealth, knowledge and power throughout the local economy in a redistributive manner. They can support local cooperatives, promote and finance ecologically sustainable initiatives such as repair cafés, tool libraries, community swap centres, community-owned renewable energy generation, and community-supported organic agriculture.
- 3 Cities can establish and facilitate participatory mechanisms for the development, governance and implementation of CE policies (such as participatory budgeting processes, citizen assemblies and deliberative councils).

- 4 Finally, cities can implement post-growth urban planning approaches by creating compact multi-functional neighbourhoods (with access to urban infrastructure and services for everyone), linking housing and bio-diversity policies to the CE policy more explicitly.

Notably these practices would be difficult to instigate at the urban scale as cities do not necessarily have the authority or resources to carry out radical policies. They are confined within multiscale policy frameworks and the stringencies of the global capitalist economic system (Deutz et al., 2024). Lekan et al. (2021) provide a heuristic device for tracing the ‘circuits of value’ in a local CE, that is transactions that are not based solely on financial considerations. As discussed above, though, the transformative potential is limited (Pusz et al., 2023).

8.3 CE policies at the national scale

We will now look at national-level policies. When reflecting on CE policies, we need to take note of the historical development of these policies and the different rates of take-up in various countries across the world. The current framings of the CE build on various interrelated aspects of national waste management and sustainable product policies over the previous four decades. These earlier policies (described as CE 1.0 and 2.0 (see Reike et al., 2022)) also addressed the (re-)design of products and the implementation of recycling infrastructures. In contrast, current approaches in science and policy regarding the circular economy strongly focus on business opportunities in which the value retention hierarchy of the 10 Rs is applied to new product design or alternative service provision (see Chapter 4 in this volume). During the earlier phases of the CE 1.0 and 2.0, more simplified waste hierarchies (of 3 Rs or 4 Rs) have been guiding waste management and recycling policies. ‘Recycling’ and ‘useful application’ have been described in general terms as requirements. However, the concept of the CE has evolved, creating a more inclusive perspective, and this has resulted in more attention for the middle-long and short loops as discussed in section 3.1. Waste management and recycling policies have also been closely linked to more general corporate sustainability policies, stimulating the business world to implement environmental and sustainability management systems and create transparency to society by demanding reporting on social responsibilities to society and business stakeholders, like financial institutions and customers (by means of standards like GRI, ISO 14001 and ISO 26000).

A number of Cresting research projects have analysed the experiences in earlier and current CE-related national policies and their impacts on business performance. This section on national policies first discusses these policies’ results in influencing business behaviour. Then it moves to lessons learnt about EPR, which has been one of the major policy instruments in the 1990s during the phase of CE 2.0. Finally, it presents CE initiatives in national-level public organisations showing

the government's role as an example of good practice, as a role model for other stakeholders (businesses and consumers/users) in the CE transition.

8.3.1 *Producer-oriented CE policies at the EU scale*

As discussed in [section 3.1](#), the CE refers to the production of goods that need to be based as much as possible on the use of recovered materials and focus on making long-lasting repairable, modular and recyclable goods. This defines key roles for actors in the value chain. Designers and producers of consumer goods and commodities need to take this as a starting point. The micro-level CE transformation for businesses and public organisations is addressed in [Chapters 4 and 5](#) in this volume. Consumers or users of products also have a key role by avoiding waste generating practices, over-consumption and early disposal, as well as participating and cooperating in a myriad of sharing and regenerative practices such as tool libraries, repair cafés, bike sharing, and community composting. This section looks at the wider policy scale and how it is incentivising producers in their transition to socio-ecologically sustainable CE practices. This is key as political-institutional environments will strongly determine the choices made by industrial and societal actors.

There is evidence of the impact of current CE policies on organisations aiming at achieving a CE. Case studies examined by [Santa-Maria et al. \(2022\)](#) have found that the development of legal frameworks that promote, and government initiatives that apply, sustainability-oriented tools (e.g. Life Cycle Assessment and ISO14001) and sustainability frameworks (such as EPR, ecolabel standards and carbon taxing) can spur sustainable innovations in firms. The use of sustainability key performance indicators, the establishment of clear and strict sustainability accounting standards, financial support for sustainable R&D and business experimentation, and improved knowledge sharing among society players can all be influenced in the private sector through public policy instruments.

When examining the organisational routines of companies, linked to the implementation of a CE, public policy activities are found to influence the prioritisation of corporate sustainability objectives and strategic decision-making ([Diaz et al., 2021](#)). Organisations are not only reactive to policy developments, but also routinely engage in stakeholder management activities targeted at influencing policies to support their own interests by connecting with market, political and regulatory actors ([Diaz et al., 2022](#)).

8.3.2 *Reviewing extended producer responsibility implementation in the Netherlands*

For this reflection on EPR we take a look at one of the EPR schemes that has been successful in achieving almost full collection after the use of the product (passenger car tyres), and one that has been far less successful in this, collecting only

half of it (plastic packaging) (Vermeulen et al., 2021, p. 21). Similarly to other EU member states, the Netherlands structured its treatment of plastic packaging and end-of-life passenger car tyre management through an EPR system. This mechanism gives a lot of leeway to companies in terms of how these products should be recovered. The government maintains mostly an oversight role, setting specific recovery rates for the industry to accomplish, and allowing these private actors to reach those objectives in whatever way they see fit. This has resulted in relatively high recovery rates for these materials with very low rates of landfill and mismanaged waste. The plastic recycling rate is thus at 57% in the Netherlands, with the rest of plastic waste going to incineration (Calisto Friant et al., 2022). The tyre recycling and reuse rates are at around 90%, with the rest being incinerated (Campbell-Johnston et al., 2020b).

However, these figures do not show the full picture. Indeed, a large proportion of this waste is exported outside the Netherlands, as the country lacks sufficient recycling capacity (Gradus, 2020). Yet there is very little transparency and information regarding what happens to this waste once it leaves the Netherlands. Recent research has found that a large proportion of waste which is counted as ‘reused’ or ‘recycled’ in official statistics, is lost in the oceans or other ecosystems instead of being properly treated (Bishop et al., 2020). It is very difficult to track and discover the final destination of this waste, but it is known that it is often sent to countries in the Global South which lack sufficient infrastructure to handle it in a socially and environmentally safe manner (Barnes, 2019; Thapa et al., 2023). Another major problem with the abovementioned Dutch, but also other European EPR systems, that we have observed in our research, is that there is currently create no incentive to reduce countries’ overall consumption of materials or to change the design of products so they can be more easily remanufactured, repaired, recycled or reused (Calisto Friant et al., 2022; Campbell-Johnston et al., 2020a).

The following policy recommendations can address the above-mentioned problems with the EPR systems in the Netherlands:

- 1 Introduce taxes on the use of virgin materials and reduce the taxes on recycled or recovered materials, reused goods and repair services. This is key because virgin materials are often still significantly cheaper than sustainable secondary materials (Cramer, 2018; Forrest et al., 2019).
- 2 Eco-modulation of EPR fees so that the EPR fees paid by consumers when they purchase a product are calculated based on the socio-ecological impact, reusability, recyclability, repairability and lifespan of the product. This can incentivise eco-design innovations and reduce the consumption of unsustainable products (Campbell-Johnston et al., 2021; Kunz et al., 2018).
- 3 Include civil society organisations and local and national government representatives in a participatory and inclusive manner so that decisions regarding waste processing and reuse are more transparent and inclusive. While EPR costs are borne by producers that pay EPR fees, which are ultimately included in the

product price, people currently have no say on how EPRs are managed. More importantly, actors that can provide solutions to increase waste recovery and circularity (repair shops, high-tech recyclers, second-hand shops, etc.) are not included in the organisations executing the ERP obligations. A more democratic and inclusive EPR system is thus needed by placing these actors on the boards of EPR organisations. This will increase transparency and accountability regarding what happens to collected waste and foster key improvements in the social and environmental performance of the EPR systems (Campbell-Johnston, Pruijsen et al., 2022; Vermeulen et al., 2021).

- 4 In the case of electronics, more rare and critical raw materials (CRMs) are lost due to practices that promote cost-efficient mass material recycling. Existing EPR schemes do not account for those materials embedded in products that are most critical, important for the energy transition, or likely to be exhausted the first in the future. Transforming waste policy to stimulate the recovery of critical materials is recommended (Campbell-Johnston et al., 2023; Campbell-Johnston et al., 2022a). Incentives need to be given to support the recovery of CRMs, where it is currently not economically feasible. Policymakers should adjust EPR targets and/or conditions, including treatment standards, to promote the monitoring and recovery of CRMs where economically and environmentally feasible (connected to long-term ambitions). Policymakers should adjust eco-design requirements to promote greater accessibility of CRMs in products. Where recovery of CRMs is currently not feasible at the waste stage given present technologies, CRMs substitutions should be promoted, or accessibility enhanced at the product design stage.
- 5 Current EPR schemes, as a form of delegated public-private governance tend to rest on limited monitoring and reporting requirements of governments. In particular the routes of to-be-recycled products and materials are not properly documented. We observed this in various studies on tyres, e-waste, and plastic (Campbell-Johnston et al., 2020; Thapa et al., 2023). Also for CRMs producers need to provide information on the presence and quantities of CRMs in their products. This would help to improve treatment standards to promote CRM recovery (Campbell-Johnston et al., 2022).

Most of the above recommendations for national CE policies serve to upgrade the current national CE policies, helping them to promote the shortening and slowing of material loops. As such these can fit within the Reformist Circular Society (RCS) view of the CE. In the vision of a TCS, it is argued that more systemic and cultural changes are needed. While EPR policies have a key role to play in the transition to a circular society, they are not seen as sufficient enough to create a sustainable future by themselves. Proponents of the TCS argue that a major challenge is changing the materialist capitalist system focused on economic growth, which is at the core of current unsustainable overconsumption and overproduction practices. Plastics, synthetic rubber tyres and other problematic materials are not

seen as the core problem. Rather, the problem resides in the materialist habits of mass consumption and production that use these valuable products in a throwaway and unsustainable manner. It has been extensively shown that the economy cannot grow forever in a finite planet and decoupling economic growth from environmental degradation is not likely to happen on a sufficient scale to prevent a widespread socio-ecological breakdown, societal transformation does not take place (Jackson, 2016; Haberl et al., 2017; Hickel and Kallis, 2019; Parrique et al., 2019; Wiedenhofer et al., 2020). The question is thus how to create a society that can operate beyond economic growth, and thereby how to create a post-materialist society where social wellbeing and economic stability does not depend on endless material consumption.

8.3.3 *National CE policies: the case of the England*

In EU member states, European policies have set the directions, boundaries and frameworks for the CE policy, which have resulted in a diversity of national implementation approaches. During the post-Brexit period in the UK new more independent approaches have been taken. The UK government refers to using the EU CE policies as a benchmark for developing CE activities post-Brexit, yet it also has its own specific policy approach. It should be noted that topics in relation to the CE are a devolved matter in the UK, so each national government is only responsible for developing waste-related policies for its own administrative jurisdiction (i.e., England, Scotland, Wales, Northern Ireland). As noted above, local policymakers have limited power in the UK compared to their European counterparts at the municipality level, who appear to have more regional empowerment when managing local issues (John, 2014).

In the UK, there are clear tensions between regional policymakers and national-level authorities, while regional-level authorities are calling for more empowerment locally to make nuanced decisions in relation to economic and environmental matters for their regional communities (Farrelly, 2010; Bulkeley et al., 2012; Jonas et al., 2017). There is a national expectation of regional-level CE engagement, but with local government identifying a shortfall in policy support from national government in the British context (Newsholme et al., 2022). Related to this, the region needs to ensure a specific benefit, whereas the policymakers operating at higher levels can be content with the expectation that overall there will be economic benefits assumed from a CE, without requiring those benefits to be evenly distributed. At the regional level in Hull the CE is not only discussed as a broad environmental and economic initiative but is envisioned as a mechanism to enable the region successfully transition from energy-intensive to cleaner forms of production, in turn gaining local environmental benefits and addressing climate targets. There is an assumption that the region should be one of the economic beneficiaries of a transition to a CE, despite the ambiguity of the spatial distribution of the impacts of that transition (Newsholme et al., 2022).

At the national level in the UK, policymakers see the CE as a tool to help to secure vital resources, in turn creating a competitive advantage for their administrative territory, although the role for particular regions is unclear. A CE is envisioned as a resource security mechanism for retaining rare and valuable material supply in the UK, which was not evident among regional policymaker concerns in Hull (Newsholme et al., 2022). This policy vision of securing post-consumer waste containing potentially valuable components is driven by economic motivations (e.g. retaining rare earth metals in their own jurisdiction) as opposed to environmental concerns, which raises questions for the overall policy agenda of a CE.

Thus, in the UK there is a need for national support for local authorities to act as CE enablers, given they are well placed to develop local links between business in their region. National government could also play an important role in setting a regulatory context for companies, which encourages more transformative approaches to the CE, including incentivising the development of local connections. Policymakers have yet to move away from the end-of-life approach to resource management that has evolved in England over the past number of decades.

8.3.3.1 *EPR in the UK*

In 2023 the UK's Department for Environment, Food and Rural Affairs (Defra) has proposed introducing an EPR scheme for beverage packaging. On a related note, Defra has also been considering the implementation of a Deposit Return Scheme (DRS), which is being explored by Hull City Council. Such a scheme would involve the imposition of a deposit, of between 15 and 20 pence, on a single-use drinks container, which would reduce the number of drink containers entering residual waste bins and would ideally enable packaging producers to take greater responsibility for their products, ultimately removing some financial pressure from public authorities, if producers pay the full net costs (i.e. ensuring that DRSs do not divert material and income away from councils). Deposits could be donated to charitable social enterprises and community organisations, which could operate return points to reclaim deposits that might otherwise remain unredeemed (Defra, 2021).

Pusz (2023)'s research findings also reveal that EPR schemes could ideally oblige producers to pay financially constrained councils to (1) subsidise those social enterprises that are engaged in commercial clearances and cannot dispose remaining commercial waste in municipal recycling centres, and (2) capture some of their commercial waste (see also section 3.4). EPR schemes could thus remove some financial pressure not only from local authorities but also social enterprises that incur fees for disposing of non-reusable or unsaleable items from commercial companies. This would be in line with the practice in the Netherlands, where EPR schemes cover the cost of municipal collection of beverage packaging's (Vermeulen et al., 2021). EPR schemes could also possibly help councils to invest (using fees paid by private companies to Producer Responsibility Organisations) in a more diversified recycling infrastructure, which could in turn enable social enterprises

to capture particular waste streams. Linked to this, social enterprises should be encouraged to negotiate contracts with large commercial waste management companies to enable social enterprises capture reusable items from waste recycling centres. [Pusz \(2023\)](#) further found that Community RePaint – a SE collecting leftover paint – currently receives corporate sponsorship from Dulux – a large company producing architectural paint. Community RePaint shops can, however, additionally obtain funds from private companies by charging them for collecting and receiving their paint. In doing so, they offer lower disposal rates than the commercial ones while reducing municipal waste management fees. Nonetheless, many of them do not have enough capacity to handle large volumes of paint as they struggle to boost demand for it. Another issue with paint concerns its packaging as 70% of cans are made of polypropylene plastic and only 30% of cans are made of various types of metal. In result, in the UK many plastic cans go to landfill, yet some producers of paint are increasingly keen to move away from polypropylene back to recyclable metal tins, some of which could be potentially recaptured and upcycled by social enterprises on ad hoc basis (although most likely on a small scale).

Finally, levies paid by producers on new products that are within EPR schemes could be also used to create a national fund that could further support costs associated with social enterprise-led reuse and recycling/upcycling activities, including (1) the collection of bulky items (e.g. textiles and bulky furniture are strong candidates for EPR schemes); (2) the introduction of new collection points and take-back schemes; (3) consumer campaigns to promote sustainable consumption; (4) incentives for producers to support circular SEs; and (4) the design of products that are more suited for reuse and contain quality label (cf. [Pusz, 2023](#); [Charity Retail Association, 2020](#)).

8.3.4 *CE practices in national public organisations in Portugal*

In addition to striving to create favourable conditions for companies and organisations to implement circularity, another role of government is to pave the way in the transition towards a CE. Considering the economic and regulatory importance of governments, it is essential to ensure that public sector organisations (PSOs) are implementing CE policies and practices in their own strategic plans, operations and resource management ([Klein et al., 2020](#)). The public sector from an organisational perspective at the national level has been the focus of one of the Cresting projects. The Portuguese Central Public Administration (PCPA) was chosen as a case study. The PCPA corresponds to the direct and indirect state administration of the country which brings together all the ministries and their central services, public institutes, general directorates, and agencies ([DGAEP, 2021](#)).

The PCPA adopted a National Action Plan for Circular Economy (PAEC) between 2017 and 2020 to implement a CE in Portugal with an emphasis on inter-ministerial collaboration in the development of CE actions in Portugal. As an example of CE implementation in the public sector, the Portuguese Council of Ministers approved a resolution in 2018 with measures aiming at promoting the

sustainable use of resources and the adoption of circular solutions in public administration, specifically promoting the reduction of paper consumption, other printing consumables and plastic products (PCM, 2018). The measures cover actions related to the dematerialisation of processes and procedures, more sustainable choices in the purchasing and use of products and services, and even the prohibition of single-use plastic items and packaging (Klein et al. 2021b). These actions are promoting intra- and inter-organisational collaboration within the public sector in their pursuit of exemplarity but there is a need for more collaborative initiatives at larger scale, between the public sector and the other actors of the CE (Klein et al., 2021a).

As one of the key priorities of Portugal's PAEC, Circular Public Procurement (CPP) is an important instrument for the public sector to stimulate the development of innovative solutions and appropriate markets for a CE. For instance, prioritising the servitisation of products and equipment is referred to in the resolution. Favouring the purchase or lease of a service rather than the purchase of a product, such as for computer equipment or telecommunications equipment, requires a closer and continuous partnership with the suppliers of the services purchased by the PSOs. The ownership of the products stays with the supplier that can then repair and reuse products and extend their lifespan. Most of the CPP criteria brought up in interviews with public employees mainly mentioned the procurement of printers which seems to be the most prominent example so far in our case study (Klein et al., 2021b). In an online survey distributed in 2020 to all organisations of the PCPA, several comments pointed to the constrained reality of procurers being able to choose only from environmental or sustainability criteria predefined by central purchasing organisations (Klein et al., 2022). This shows that the specific context that PSOs have to navigate in and that promote CPP is impacted by top-down dynamics and needs leadership support to advance further CE initiatives.

There are indeed several barriers needing to be overcome that so far are hindering efforts towards more increased levels of circularity in the public sector and towards more collaboration and closer partnerships for the implementation of a CE (Klein et al., 2021a, 2021b, 2022). They include organisational cultures and governance structures that tend to be bureaucratic and hierarchical where tasks and procedures are compartmentalised and handled in silos, thus making it difficult to collaborate freely and in new, innovative ways. Finally, in the online survey, different barriers were listed, and the responding organisations were asked to evaluate the importance of each. The least valued barriers being the *lack of stakeholders input* and *interaction with suppliers* revealed that collaboration and stakeholder engagement are not considered as essential as other barriers such as access to sufficient financial resources and absence of leadership commitment (Klein et al., 2022).

8.4 EU- and supranational-level CE policies

In the introduction to this chapter we stated that in Europe supranational-level policymaking is essential. Supranational governments apply both indirect general frameworks and regulations directly affecting business conduct. EU framework

regulations need to be transposed into the national policies, leaving room for national adaptations. At the same time, these policies are the result of member states' inputs in the EU's regulatory process, making the policy interaction between the EU level and the national policies crucial for what happens both at the EU level and within the member states. The Cresting projects did not produce a systematic review of EU policies, but various projects delivered valuable insights. We first discuss the implications of our review of the EU strategies and then closely examine two of the longstanding CE-related policies, on EPR and on product design.

8.4.1 *European CE policies*

The local, regional and national policies discussed above are in practice linked to the discourses and policies at the supranational level, with a strong role for the EU. The EU has also taken a proactive role in pursuing CE policies, outlined in a 2015 Action Plan and updated in 2020. This includes updating and developing existing policies, and also pursuing new ones. Since the enactment of the first CE action plan in 2015 by the Junker Commission, the EU has been considered a global frontrunner on the CE transition (McDowall et al., 2017).

In one of the Cresting projects EU policies have been analysed with a particular focus on those that deal with the circularity and sustainability in the lifecycle of products. These policies addressed the design and production phase of the life cycle, as the end-of-life disposition phase. For policies that affect the design and production of products, the EU has implemented policies already in the phase of CE 2.0, including rules on eco-design (2009/125/CE), restrictions on the use of hazardous substances and chemical reporting requirements. For the end-of-life disposition phase, the EU has outlined a number of frameworks for the general management of waste and for specific waste categories, e.g. packaging, plastics, electronics, cars and batteries. The implementation of waste policy is organised at the level of member states.

In this review of the EU strategy for CE, an analysis of the ten communications, seven regulations and eight directives on CE enacted by the Junker Commission. This study, applying the typology of circularity concepts presented in Chapter 3 (see Table 3.1), reveals that the EU has taken a rather holistic discourse on the CE with some social justice and political participation elements, but that its concrete policy actions remain focused on end-of-pipe technological solutions such as low-cost recycling and incineration (Calisto Friant et al., 2021). There is thus a certain lack of coherence between a discourse of inclusive and just CE transition, and actions that focus on resource efficiency alone. Moreover, the EU has a strong green growth narrative, using the CE as a tool to increase the competitiveness of European businesses. This growth-optimist approach to CE has many limitations as technological solutions can create rebound effects that increase overall environmental impacts in the long term (Schröder et al., 2019; Zink and Geyer, 2017). The EU's focus on decoupling economic growth from environmental degradation is misguided from a scientific point of view as there is no evidence that absolute decoupling is happening

or is likely to happen in the future. Based on these critical reflections we have recommended a long list of 32 additional policies which aim to address the limitations of the current EU policies on the CE and create a more TCS-oriented version of the policy. Among the policy recommendations we may highlight the following actions policy (for more details we refer to [Calisto Friant et al., 2021](#)):

- strengthen eco-design regulations to improve the durability, upgradeability, repairability, recyclability and modularity of fast-moving consumer electronics such as mobile phones, tablets and computers
- promoting open-source innovation (e.g. by mandating that all hardware and software from discontinued products becomes open source)
- banning the destruction of unsold stock
- establishing mandatory circular public procurement targets
- increasing mandatory guarantee periods

Nonetheless, the EU has taken some of the strongest measures on the CE anywhere in the world with high recycling targets for many waste streams, bans on some problematic single-use plastics, and resource efficiency criteria for the eco-design of large electronic appliances that will make them easier to repair and recycle. It is regrettable that no measures to foster a fairer distribution of the many costs and benefits of a CE transition have been enacted thus far. The new EU Action Plan on a CE enacted by the Von der Leyen Commission in 2020 could lead to some much-needed social justice policies as it has a much stronger social focus. However, very few new directives and regulations have thus far been implemented in the scope of the new 2020 Action Plan.

8.4.2 Harmonising diverse EPR implementation across the EU

Other Cresting projects looked at more specific CE-related policies. In [sections 8.3.2 and 8.3.3](#) we discuss national examples of applying EPR. The use of the EPR instrument is basically regulated in European law, and although member states transpose them according to their specific context, our recommendations address national and European policymakers. A higher level of coordination between the EU member states is essential, as markets of the regulated products are not national and the current confusing and burdensome diversity of national solutions is not helpful for producing the impacts needed. In [section 8.3.2](#) we observed that the current EPR systems do not create sufficient financial incentives for product redesign. This is found in other EU countries as well. Also, the current design of EPR regulation results in promoting general recycling over specific quality and material outcomes. Many of the suggestions discussed in this section relate to applying a fully inclusive sustainability assessment of circularity options, which is the core of the principle of cascading. [Campbell-Johnston et al. \(2020\)](#) revived this concept. Circular economy policies need to account not only for the physical processes, e.g. repair and recycling and stimulating higher R-strategies,

but, importantly, the social contexts in which these processes materialise. In the context of recycling policy, this necessitates the integration of equitable labour practices for those working in recycling operations, applying the full sustainability assessment, also respecting the 17 United Nations (UN) Sustainable Development Goals (SDGs) (Campbell-Johnston, Vermeulen *et al.*, 2020). Such more inclusive assessment will be needed to enable development based on the TCS vision.

At the same time, it is clear that the implementation of EPR within EU member states is highly diverse. In a comparison of EPR implementation between France, Italy and the Netherlands we observed that none of these countries met the recent collection targets for waste electrical and electronic equipment recycling (WEEE), while very different governance models (including recycling fee visibility and modularity) were applied, which hampered its intended impact of promoting eco-design. The policy brief resulting from this analysis gives suggestion for introducing fee modulation at the European level, broaden the engagement of relevant actors in the EPR governance, increase the focus on high-value recycling and better address the impact of export of to-be-recycled materials between EU countries (and beyond) (see Campbell-Johnston, Pruijsen *et al.*, 2022). An example of the lack of high-value recycling is the absence of attention for distracting critical raw materials from WEEE. Suggestions for addressing this have been given in a policy brief addressing this (see Campbell-Johnston *et al.*, 2022a).

8.4.3 *EU regulations on eco-design*

An example of EU policies more directly impacting manufacturing industries relates to the product development processes. For example, the Directive 2000/53/EC on the End-of-Life of Vehicles has been found to directly impact the design of complete vehicles and vehicle components, emerging in the form of quantitative material and energy requirements, integrated into the set of design requirements for products. Similarly, the Directive 2009/125/EC establishing eco-design requirements for energy-related products was also found to determine criteria for evaluation design parameters. Although companies reported such policies had driven cultural changes in market players concerning sustainability-related issues, the wide range of compliance-related requirements represents a heavy burden for designers and engineers (Diaz *et al.*, 2022). But for a large share of companies these influences will go as far as the policies prescribe. Only few corporate frontrunners tend to do more than required by public policies. Therefore, a critical assessment of the nature of current CE policies is essential.

8.5 Global contexts

In the previous sections we have discussed our findings for the CE at the local, regional and European level. This suggests that material and product cycles remain within these scopes. But this is far from the reality. We observed that the

rationale behind recycling, as in the design of EPR, implicitly limits the life cycle of a product to a single cycle, to be connected to of life cycles as recycled secondary resources. It ignores the practice of (re-)selling as second-hand multiple times, or as to-be-recycled products to next processors, while crossing borders within and outside the EU. One of the Cresting projects explored the fate of waste streams and to-be-recycled products from the EU to Africa and Asia in the context of the EU's ambitions for closing cycles. Such transboundary movement of all waste, not just hazardous waste, remains a societal challenge globally, frequently surfacing as an ethical question on the one hand and a story of resource management/trade on the other. This phenomenon has been studied across disciplines resulting in diverse, scattered and often contested understandings. Despite previous and ongoing efforts, waste production, management and transboundary movements are increasing and are predicted to grow significantly with global social, environmental and economic implications (Thapa et al., 2023). Despite the introduction of EPR for e-waste and for plastic packaging in all EU countries, substantial amounts of e-waste are still exported to Central Africa (Thapa et al., 2023a) and plastics to South-east Asia (Thapa, 2024 and Chapter 6 in this volume).

Based on these observations, also for addressing policies for waste and recycling exports from EU members states to low- and middle-income countries, various recommendations have been formulated on the same topics as above:

- **Financing:** EPR schemes are designed at the national level, ignoring the trickling down of multiple uses in Africa or Asia. In these contexts, the low- and middle-income countries do not have the financial resources to properly organise the CE. Acknowledging the existing regulations in the EU member states on EPR, proposals have been developed for creating a financial mechanism for the proper recycling of exported products in African countries (Thapa et al., 2023a; Thapa et al., 2022).
- **Actor inclusion:** in countries such as Nigeria and Vietnam, where the informal sector plays a crucial role in waste management, they should be included in the system. Existing EPR does not account for the reality of multiple use cycles which can be within a country or internationally. Thus, the producers who are responsible for waste management under the 'polluter pays' principle avoid the responsibility, when waste is shipped to other jurisdictions, while the interests of actors affected by this export are not represented (Thapa et al., 2023a; Thapa et al., 2022).
- **Technology transfers:** financial assistance and technology transfers from the Global North to the Global South to foster circularity, sustainability and recycling strategies. This is key as waste management technology is so expensive that it can be the single highest budget item for municipal governments in the Global South (Bishop et al., 2020). These funds can also help to finance clean-up activities in heavily polluted ecosystems such as oceans and beaches. Directly related to current EPR systems the concept of Ultimate Producer Responsibility

- has been introduced. It proposes including a mechanism in existing EPR scheme to generate funds to organise recycling in low-income countries to the highest social and environmental standards (Thapa et al., 2022; Vermeulen et al., 2022).
- Waste shipments: instead of valorising waste and maintaining product use as long as possible within Europe, the shipment of waste and second-hand goods follows a very linear trajectory. The functionality and durability of second-hand goods remain questionable; thus such practices are only good for delaying the waste stage until they are outside of the EU, instead of promoting the aspirations of the circular economy. Implementing the EU's circularity ambitions leaves only two options: either fully ban the exports and organise value retention fully within the EU, or allow shipment for recycling, but under very strict requirements ensuring recycling at the level of European quality requirements and organising proper financial mechanisms for establishing such infrastructures in the targeted low- and middle-income countries (Thapa et al., 2022; Thapa et al., 2023a; Thapa et al., 2024).
 - Transparency, monitoring and reporting: waste and used products should be traceable, not only in terms of quantity but also in terms of quality attributes and the fate of what happens to them. Transparency would make better sense of the phenomenon and come up with better interventions to transform the system. For transparency, monitoring and reporting is crucial (Thapa et al., 2023a).
 - Just transition: linear practices, like shipping waste to destinations which might not have the capacity for the sound management of waste management might benefit a few actors at the cost of greater long-term social and ecological harm. Such harm is an example of 'unequal exchange' which exacerbates global inequality. Thus, the existing waste management practices do not take equity into consideration (Thapa et al., 2023a).

8.6 Conclusions

In this chapter we have presented an overview of policy recommendations for various levels of CE policymaking and their relatedness. The Cresting project has produced useful insights at all levels of policymaking as well as for producers. The researchers engaged have applied diverse perspectives, with respect to their disciplinary angle, the levels of analysis and the views on the concept of the CE itself. As a result, the nature of our observations and their implications range from more specific case studies (like the analysis of PSS in Graz, the EPR case studies in the Netherlands and the UK, and the multi-stakeholder collaboration in Hull), based on critical analysis of current practices, to ex ante evaluations, using the CE typology as a reference point for evaluation, resulting in suggestions for enabling a wider societal transformation (like the review of the EU policy and the three local policy case studies). This chapter presents these in a concise and 'impressionist' form. Readers are stimulated to continue reading in the articles, policy briefs and white papers that in elaborate in close detail the analysis and implications. During

the projects these outreach products have been discussed with policymakers at the national and regional level, ensuring take-up of the lessons learned.

Collectively, the Cresting studies produce useful insights into possible routes for further enhancement of the CE. Some specific cases can be seen as successful, such as the Graz case of local support for repair shops. Other case studies reveal some level of success when the original policy aims are taken as reference, but turn out to have major shortcomings, when assessed from the perspective of the current more far-reaching CE aspirations, as in the case of the tyre and plastic packaging EPR in the Netherlands. The presented diversity in results illustrates that both forms of policy evaluation are fruitful and highly needed. They complement each other. The critical evaluation based on the CE discourse typology may serve to inspire policymakers to broaden their perspectives on the CE. This type of research mostly applied discourse analysis, based on currently accepted policy documents. The recommendations in this type of work are based on what other scholars claim to be best pathways for more successful promotion of the CE or even the circular society. The case studies presented that analyse the CE in practice indicate the challenges of implementation and importance of context (for example, around the role of SEs in Hull). The literature-based recommendations require further empirical testing of their effectiveness in different contexts.

Comparing the case studies (for example on EPR) also shows that the practices differ strongly between European countries. Research and policy would benefit from further systematic comparison between countries and regions, which has only been possible in the Cresting project to a limited extent. Comparing different countries, the regional approach of Graz ([section 8.2.1](#)) is more oriented to engage citizens in one specific R strategy (Repair), while the local approaches of Hull ([sections 8.2.2](#) and [8.2.3](#)) are oriented to redevelop and regenerate local industrial networks. Wider research comparing such cases might serve to boost scientific knowledge and inspire authorities across countries to follow successful examples.

Assuring alignment between different policy levels (e.g. national and regional schemes) is a pre-condition for effective local approaches to value retention. This is not always the case in practice (as shown in the Hull case studies). In the British context, there is an assumption that Hull and the surrounding region should be one of the economic beneficiaries of a transition to a CE, despite the ambiguity of the spatial distribution of the impacts of a CE transition on regional stakeholders. Hence, in the UK further devolution may support local authorities to foster regionally inclusive CE strategies, which are tailored towards local stakeholders in a particular region.

The research shown here supports the awareness that CE-related policies effectively shape many elements of the structural contexts of private sector organisations, especially around operational tasks that involve the reporting of environmental and social impacts, as well as the opportunities and behaviour of societal organisations and consumers. The CE can be seen as an evolutionary concept, growing in time for the more limited perspectives of CE 1.0 and 2.0 towards more extended and inclusive perspectives of CE 3.0. The typology of the CE discourses suggests

an evolution from the Technocentric Circular Economy view, via the RCS view towards the TCS view (see [section 8.4.1](#)). Whether this is supported by all relevant stakeholder groups in society remains to be seen, but it does connect to the growing attention to embedding and aligning the CE ambitions in the wider quest for sustainable development, as promoted by the SDGs. With the diversity of analysis of both potential future and actual developments the Cresting researchers have done their best to contribute to this highly needed development.

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9

CONCLUSIONS

Emerging understandings of circular economy realities

*Pauline Deutz, Walter J.V. Vermeulen,
Rupert J. Baumgartner, Tomás B. Ramos
and Andrea Raggi*

9.1 Reflections on our research questions

In this concluding chapter we pull together the key ideas emerging from the themes presented in the book to address our research questions as well as reflecting on the limitations of the research and recommend areas for further research.

9.1.1 To what extent and in what form are CE practices occurring in public, private and third sector policy and practice?

Circular economy (CE) practices, defined as the ten Rs (Refuse, Rethink, Reduce, Reuse, Repair, Refurbish, Remanufacture, Repurpose, Recycle, Recover; [Reike et al., 2018](#)), are well known and have been widely adopted across the private, public and third sectors.

Public sector organisations can have a dual role. Like any (often large) organisation they need to consider their own practices, but they are also responsible for setting rules (primarily at the national scale) and more directly trying to facilitate or encourage CE activity (at the subnational scale). While variations reflect spatial priorities (e.g. reflecting the current industrial base), there is a consistent pattern of taking a ‘reformist technocentric’ approach ([Calisto Friant et al., 2020](#)) with the CE firmly entrenched in an agenda of economic growth (from the European Union (EU) scale down to the cities under study, and firmly including the United Kingdom). A CE can be seen specifically as part of a strategy to generate local to regional growth, reflecting the spatial competition for investment ([Deutz, 2014](#)). A policy-driven CE builds on well-established practices (e.g. extended producer responsibility – EPR – or recycling). Expansion to EPR is a significant element of CE policy in the EU and the UK but a close examination reveals shortcomings in

practice (Campbell-Johnston et al., 2020), focusing on the lowest cost options, for example. Governmental bodies do not aspire to more transformative or ‘diverse’ approaches associated with the shorter R loops (sharing, reuse, resale – including some not explicitly in the hierarchy). Such practices may be referred to at the city scale, but without strong policies to implement. Indeed, a significant shift away from a growth-oriented outlook is beyond the authority and resource capability of local government bodies.

Public sector organisations also face organisational issues in improving their own implementation of a CE. The focus for the case study organisation (the Portuguese national government) was on waste/recycling practices (Klein et al., 2022), notwithstanding the Portuguese government’s front-runner position in CE implementation. Challenges of implementation arise around unfamiliar practices (purchasing, disposing, sharing between departments, requisite IT, among others). There are challenges to overcome including organisation and organisational culture, not unlike those to be addressed by companies, notwithstanding the particular hierarchical issues of public sector bodies having strict chains of command and the predominance of desk-work skills over technical training (Klein et al., 2022). The Portuguese government has made a marked effort to promote the CE in its own activities. Comparisons are needed to see how far the findings of this research apply elsewhere.

Companies surveyed for the Cresting project across several different countries typically viewed the CE as primarily an initiative relating to waste (reflecting and responding to regulations) and a largely internal matter or otherwise relating to their supply chain partners. Some questioned the value of what is seen as a new term for sustainability, others view the CE more specifically as a route to decarbonisation or to improving environmental efficiencies (reflecting national/regional as well as company priorities). Examples can certainly be found of companies interested in taking more ambitious approaches to the CE than improvements to managing end of product life. Researchers worked with companies to devise approaches to business models, product development (see Chapter 4 in this volume), sustainability assessments (Chapter 5 and below). The research indicates that (in the case of existing firms) the most relevant practices that can determine the success of a process of business model innovation for the CE are adopting a life cycle perspective, employing sustainability-oriented instruments, conceiving sustainable value propositions, developing a sustainability strategy and culture, and engaging and coordinating with stakeholders in the business ecosystem (Santa-Maria et al., 2022). Even these forward-thinking companies face numerous obstacles to implementation relating to the economic context (persuading shareholders, uncertainty of markets, legal barriers and internal competences) and furthermore sometimes lack the technical know-how to incorporate CE principles in design, for example (Diaz et al., 2022). Similar to public sector bodies, companies need organisational cultures open to vertical (cross-level), horizontal (cross-functional) and external

(cross-stakeholder) communication exchanges to become effective; and a strong digital infrastructure (enabling fast, traceable, standardised exchanges of information) to support circular innovations. Further research should examine a wider range of examples, including investigations of companies that are struggling to develop circular projects.

In addition to the public and private sectors, the third sector and more specifically social enterprises (SEs) ('mission-driven' organisations) emerge as deeply involved in CE-related activity (see [Chapters 6 and 8](#)). These organisations, based in Hull, UK, Graz, Austria, and Santiago, Chile, engage in practices such as (re)distribution (e.g. food donated by retailers), reuse (e.g. via charity shops), recycling, repair services, upcycling and repurposing. They rely on donations from the public and/or companies as well as support in the form of local and/or national government grants (or tax benefits). Typically, these organisations are using the CE as a means to raise funds to support services for people in deprived circumstances or to provide economic access to goods. The practices undertaken by third sector organisations include for example, reuse and sharing, short-loop activities that are less well represented in city-scale policy or implementation for the CE. CE-practising organisations may be contracted to cities as part of service provision, while typically beyond the scope of CE planning.

Significantly, the research indicates the importance of the relationship between sectors. The public sector constitutes a market for private sector goods and services, as well as (directly or indirectly) collecting and sometimes recycling the residues; both sectors have connections to SEs. The goods traded by SEs have their origins in the mainstream economy (in both the European and South American case studies), and in some cases are offered for sale back into it. SE activity is not necessarily acknowledged in formal plans for a CE by authorities, despite that they engage with the same SEs as part of their social service provision. More attention should be given to these organisations in the context of CE, which could include involving them in formal EPR arrangements and the adoption of social circular procurement practices ([Chapter 8](#)).

Thus, although the CE has become a dominant 'sustainability economy', in reality adoption thereof remains at an incipient level, focusing on technocentric resource recovery approaches and incremental rather than transformative practices. The more holistic, systematic approaches that should come with the conceptualisation of a CE (e.g. design for repair and alignment of public infrastructure) are not widely in evidence. While imaginative ideas are necessary to drive innovation, they are not sufficient to overcome the structural constraints on (potential) CE stakeholders, i.e. the causal mechanisms favouring the prioritisation of economic motivation. Or to put this differently, the CE is firmly embedded in the (global capitalist) economy and it is not just subject to the market pressures ([Siderius and Zink, 2022](#)) but market priorities are influencing how stakeholders understand a CE and therefore constrains their vision.

9.1.2 *What are the sustainability (environmental, social and economic) implications of developing a CE?*

As the policy instruments and the exponentially expanding body of academic literature increase the momentum towards at least the widespread discussion of the idea of a CE, a major aspect of this project has been to consider whether the CE may be seen as necessarily sustainable (i.e. favourably balancing social and environmental considerations alongside economic ones). We have taken a qualitative approach to this (assessing implications, constraints, possibilities, including assessment methodologies) rather than directly quantifying impacts.

A common area of interest around social aspects of a CE relates to employment (Chapter 7 in this volume). Companies asked about their social CE activities suggested employment (if anything) (Walker et al., 2021). This plays to a wider sentiment that having employment is both the minimum and pinnacle of an individual's expectations of sustainability (perhaps to be challenged by recent interest in quality of life; Valencia et al., 2023) but generally viewed from the employer or governmental perspective rather than that of employees. Importantly, while the CE may offer multiple routes for individuals to earn (part of a broader shift towards net zero that needs to be happening), these opportunities might not involve long-term employment. A CE job could entail self-employment (either as a sole trader or setting up a company with ambitions for growth), voluntary or paid work in the third sector. These roles can be simultaneously satisfying on a personal level, but associated with long hours, low income and high levels of insecurity (Rogers et al., 2024). People within employment, or aspiring to existing roles (e.g. as a product designer) will need additional training and not just for specifically circular technicalities (e.g. methods of disassembly) but also for wider skills of communication, collaboration, finance and negotiation (according to the management level of the role). A further route to CE-related employment would be with a consultancy company, i.e. providing skills that organisations do not have in-house (this could be Life Cycle Assessment (LCA) associated with design, for example, or assessment more broadly, or advice to public authorities around economic development options). Work in consultancy could be vulnerable to short-term employment.

In the European context, the EU emerges as a major driving force for the implementation of a certain (economically driven, growth-oriented) vision of a CE. There is an explicit assumption that economic and environmental benefits are favourable for the European economy as a whole. This does not equate to an even distribution of benefits at a smaller scale, where countries and regions are competing for investments (e.g. if being a 'circular' city becomes a necessity, its potential as a geographic competitive advantage is reduced). Moreover, while governmental and industry organisations may all be seeking economic benefits from CE activity, their interests are not necessarily well aligned. Although there is tentative evidence that there is better multi-scalar policy alignment in France than in the UK or Austria (Perez et al., 2020), we note a divergence of interest between public

bodies seeking to favour their territory and that of companies located therein whose scalar focus comprises their supply chain and customer base (Newsholme et al., [accepted](#)). Close stakeholder collaboration, focusing on local resources and demand, may offer CE business opportunities related to product service systems (Delgadillo et al., 2021), but geographic upscaling of such activities implies entering into competition with others.

A significant cross-scalar impact of CE implementation is the export of ‘used’ (but effectively ‘waste’) electronic and electrical goods from the EU and other Global North countries for reuse (but effectively disposal) in the Global South (Thapa et al., 2023). These flows of secondary materials and goods are as much part of the global economy as flows of raw materials and new products. Environmental policies in the EU and other wealthy nations have brought about pollution reduction and an infrastructure for the collection of end-of-life products and materials from both pre- and post-consumer sources. These residues have to be managed within stringent regulations. However, the poor enforcement of aspects of those regulations compounds the effect of the EPR framework that incentivises low-cost options. Thus, there are market-driven disposal routes (of marginal legality at best) through which material is leaking out of the Global North for disposal in the Global South. Lack of adequate environmental and safety standards cause these materials (including electronics, textiles and plastics) to pose a significant threat to human and environmental health in the destination countries. These global-scale variations in environmental standards are well known; lack of adequate enforcement of export rules around used electronics indicates the limitations of ethics in CE, as other, policies. Reducing global-scale inequalities in social economic as well as environmental conditions would be a better solution.

To safeguard against unintended consequences of circular practices, or to aid the identification of the appropriate practice, sustainability assessment of some form is essential. Our research indicated the suitability of life cycle-based methods – possibly adapted – such as the more established Life Cycle Assessment (LCA), relating to environmental issues, or the more unusual Social LCA (S-LCA), which considers social aspects (Finkbeiner et al., 2010). Frameworks for CE assessment implementation were devised for companies (Roos Lindgreen, 2022; Roos Lindgreen et al., 2022) and public sector bodies (Droege et al., 2021). Whether, how and by whom this (S-)LCA information is used remains an important area for policy and research. At present, there is limited engagement with the CE in international reporting requirements (Opferkuch et al., 2021). Further work is needed to consider additional contexts, such as social enterprises and other non-profits; to further incorporate social and other qualitative circular indicators (including non-financial values such as voluntary labour, donated goods and widening access; Lekan et al., 2021). However, there are also questions as to whether and how organisations might be compelled to audit their activities; transparency, i.e. access to product or company S-LCAs to aid consumer decision-making; how

these data could or should be included in formal company reporting and what use might be made of that information; and how and with what authority public bodies might undertake appraisals of activity in their territory. Importantly, sustainability impacts cross scales and impacts beyond the territorial extent of policies should not be ignored. However, useful as all this information could be, there is a bigger question of what impacts are acceptable and who takes responsibility for reducing them, or choosing between trade-offs (which may be geographic as well as environmental and social).

Our research confirms the prioritisation of economic benefits in decision-making relating to the CE. Companies unsurprisingly need this (the whole concept of a circular business model is how to run an economically viable enterprise with improved environmental performance); public sector bodies have financial restrictions and even third sector bodies need financial viability. The efficiency savings of the CE will require investment to achieve and as in other ‘wicked’ problems (Brown et al., 2010), the costs and benefits of that may not be aligned to the satisfaction of stakeholders. One could conclude that it is not so much the problems that are wicked as the circumstances (re)producing them. Social outcomes of a CE are not distinct from these (political economic) circumstances (both local and larger-scale influences and inequalities). The identification of benefits depends on the scale of analysis.

9.1.3 How can a CE be expanded and intensified?

While we note the contingent social (and economic) benefits of a CE, the environmental benefits it can offer are urgently needed as part of a drive to net zero carbon emissions. For all the rhetoric, in reality a CE ‘transformation’ does not appear imminent. A hesitant transition is in progress, comprising multiple interrelated but uncoordinated efforts. Our research provides multiple examples of good practice and frameworks for devising and implementing good practice, in certain contexts. Achieving a step-change in the implementation of a CE, however, involves an unprecedented level of coordination and commitment.

Policy drivers are important to the implementation of the CE, strongly influencing the attitudes and concerns of both public and private bodies. The level of ambition of these policies needs to be raised, to take a more holistic approach to the CE than the incremental steps on the progress of resource efficiencies over recent decades. We note, however, that policymakers have constraints on their options, reflecting economic priorities and multi-scalar dimensions. The CE is part of the global economy – all with the complexities of logistics, competition inequalities and variations in practices and challenges for enforcement.

A CE fully encompassing the resource efficiencies implied by concept would have transformative implications for society. Extensive uptake of options such as repair, reuse or resale have to imply a decrease in the purchase of new goods if any environmental benefits are to be realised. Decreased demand would presumably

impact on manufacturing, distribution, retail and indeed the waste industry. The question of how far we want to take CE practices is therefore a highly political one. It is not a matter of objectively responding to environmental signals, or the more constrained political issues of regulating resource efficiencies. Rather, there is a question of what sort of political economic structures are desired? Academics (and individuals according to our global survey) are more aspirational for the social benefits of a CE than policymakers and practitioners appear to be. It scarcely needs saying that greater level of social ambition for a CE resides with those without the authority for implementation, but this possibly points to a route for change.

9.2 Further research

Notwithstanding the breadth and depth of the research reported here, there are of course limitations and further work needs to be done. We have shown the insights to be gained by combining different perspectives. The lessons around relationships across and between scales and sectors can be expanded and strengthened by adding further perspectives (e.g. defined spatially or by company, organisation or practice).

The spatial focus of Cresting was on Europe; future research needs to incorporate a different and/or wider geographic scope both to assess the different experiences of a CE and to better understand international dimensions of implementation (e.g. from different business and geographic points on the supply chain). Our comparative research was limited by COVID-19 travel restrictions. Formal comparative case studies would be instructive to improve the understanding of causal mechanisms and their implications in different contexts.

In terms of organisations, Cresting predominantly engaged with companies and public sector bodies that were already on a CE journey. This was necessary to gain a picture of CE implementation and the issues around it, but leaves a question over what is happening, why or why not in other organisations, and how can they be better informed and motivated.

Social aspects of the CE remain an elusive element. One issue maybe the challenge to define social aspects as against economic – moving perhaps from the comfort zone of those so far likely to be engaged in CE (or related) research on to issues such as individual experience (as distinct from studies of behaviour or attitudes), cultural, gender, age and class. Rather than be seen as demographic categories, these aspects need to be formulated into case studies to provide new windows on to the impacts of a CE. Furthermore, research needs to specifically consider ‘the public’, that is citizens, activists and voters – as well as consumers.

9.3 Digital recordings from end of project workshops

On day two of our conference we held a series of workshops coordinated by early stage researchers to follow up on issues raised in by our research. One of these



FIGURE 9.1 Assessment: how and what to measure for a sustainable circular economy?

Digital recorder: Bianca Gainus, beevvisual.biz, 16 December 2021.

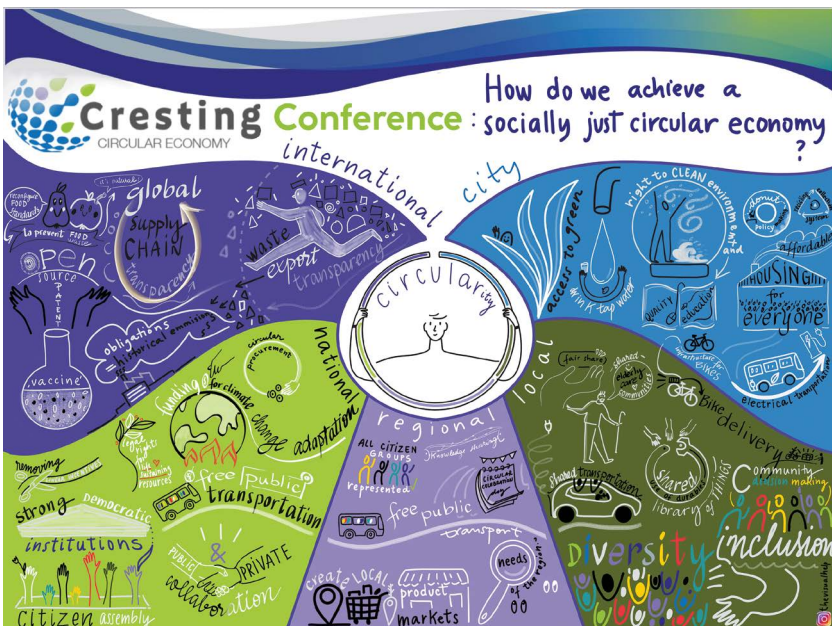
(relating to stakeholder perspectives on a CE) provides the image on the book cover. We present the other three here.

One workshop explored how adopting a circular business model impacts a company's sustainability assessment practices (Figure 9.1). In particular, we looked at what value the results of different sustainability and circularity assessments provide companies, especially when taking their decisions on corporate sustainability issues.

In another session we discussed international, national and local policies and actions addressing consumer electronics, automotive and food (Figure 9.2). The goal was to come up with a timeline of actions allocated to most relevant stakeholder groups. We reflected on how factors like geographical scale, industrial sector and the complexity of our systems affect the implementation of CE policies.

With the help of participatory exercises, we also discussed what a socially just CE looks like at different societal scales (from companies and communities to international organisations) (Figure 9.3). We also considered key actions and policies needed to create a socially just and sustainable circular future.

Digital recorder: Bianca Gainus, beevisual.biz, 16 December 2021.



Digital recorder: Bianca Gainus, beevisual.biz, 16 December 2021.

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