1

INTRODUCTION

Exploring the sustainability implications of a circular economy

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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.

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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, ecodesign, 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 multidisciplinary 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 Comission 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 or 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 appropriates 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.

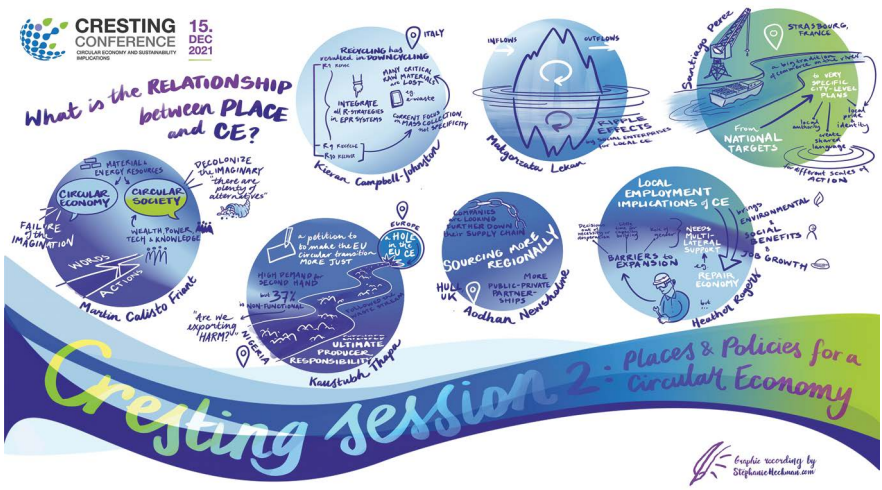

FIGURE 1.2 Place and policy in a circular economy

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

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