An economic geography approach to the implementation of circular economy – comparing three examples of industry-specific networks in West Sweden

Received 12 April 2023
Revised 5 July 2023
15 November 2023
Accepted 17 November 2023

Patrik Ström
European Institute of Japanese Studies, Stockholm School of Economics, Stockholm, Sweden, and
Brita Hermelin
Linköping University, Linköping, Sweden

Abstract

Purpose – The circular economy (CE) has been endorsed as representing a model that is able to achieve environmental protection through decreased use of raw materials, together with changing economic values and social inclusion thanks to its demand for a wide variety of skill profiles. This has motivated many policy initiatives to support the implementation of the CE. The purpose of this study is to follow such policy initiatives in three geographically anchored industry-specific networks.

Design/methodology/approach – The study contributes to the research debate on the CE through a spatial approach with a focus on how the implementation of the CE is conditioned by spatial and regional contexts. The authors investigate three different networks in Sweden for CE with different locations and industrial profiles.

Findings – The findings reveal the difficulty that exist in relation to the implementation of the CE. The network and support functions in combination with private industry are vital. The risk of sustaining an uneven regional economic development is evident.

Originality/value – Although research on the development of the CE has proliferated, geographical approaches to this development are comparably rare to date. The authors seek to contextualise the strategy development and policy implementation of a CE policy.

Keywords Circular economy, Regional development, Governance, Networks, Innovation, Business models

Paper type Research paper

1. Introduction

The model of a circular economy (CE) has developed into a wide debate across policy, business and academia (Gregson *et al.*, 2015). A foundational idea for CE is to extend the life

Disclosure statement: The authors report there are no competing interests to declare.

Journal of Science and Technology Policy Management
Vol. 16 No. 10, 2025
pp. 1-23
Emerald Publishing Limited
2053-4620
DOI 10.1108/JSTPM-04-2023-0058

of products and materials (Gregson *et al.*, 2015; Llorente-González and Vence, 2019; cf. Milios, 2018; Savini and Giezen, 2020), for which closed material and energy loops are the main means (Schulz *et al.*, 2019; Van den Berghe and Vos, 2019). The model for CE centres on the so-called "3Rs", which are reduce, reuse and recycle (Schulz *et al.*, 2019; Ghisellini *et al.*, 2016; Hobson, 2016; Merli *et al.*, 2018), or the "4R approach", which adds recover as a fourth keyword (Murray *et al.*, 2017; Larsson, 2018). The concept of upcycling has also been introduced into the family of keywords for a CE (Bhatt *et al.*, 2019; Henninger *et al.*, 2017; Sung *et al.*, 2019). Upcycling is described as "an umbrella concept incorporating 'creative' forms of repair, reuse, repurpose, refurbishment, upgrade, remanufacture and recycling" (Sung *et al.*, 2019, p. 2).

Through powerful organisations across social sectors, CE has been endorsed as representing a model that is able to achieve environmental protection through decreased use of raw materials, together with changing economic values and social inclusion via its demand for a wide variety of skill profiles. In this way, CE is said to leverage combined positive impacts on the environment and economic growth (EMF, 2015; EU COM, 2020). Using the CE model has important original bases from environmental management for waste (Savini and Giezen, 2020) and from industries being resource-based (Vanhamaki *et al.*, 2019).

However, and importantly for this paper, the model for CE has more recently been diffused to be integrated across a multitude of different industrial specialisations. In general, the model is continuously transforming in interplay with how this ideal has been adopted through different organisations, target areas and industrial specialisation. This involves various aspects of innovations for which cross-sectoral collaboration in networks has been found to be supportive. Such networks serve to be a communication platform, to facilitate knowledge sharing and governance (Köhler *et al.*, 2022). To contribute to this debate on collaboration in networks as a means to facilitate transforming industries towards CE, this paper explores the work through three networks operating within three different industrial specialisation and in the same regional environment in Sweden. These networks exemplify the diffusion of the CE ideal across various production specialisations within a particular regional context. The design of the study serves to develop knowledge on how the model for CE plays out for various industrial profiles (Giunta *et al.*, 2016).

The investigated networks connect actors, stakeholders and various organisations involved within the engineering-based industry, the furniture industry and the fashion industry, representing the industrial specialisations. These are located within the political-administrative territory of a region in Sweden. EU policy is important for the wider context of this regional policy for CE with impacts on initiatives carried out via the networks. EU policy for CE involves a strong focus on innovation as a primary tool (Gregson *et al.*, 2015; Hobson and Lynch, 2016; Völker *et al.*, 2020), which is evident through the EU Green Deal (EU COM, 2019) and the CE action plan (EU COM, 2020). Hence, EU policy for CE can be interpreted as being interconnected with the EU's innovation policy, for which regions are targeted as political bodies to implement innovation programmes (Morgan and Marques, 2019). Overall, the ideal of CE has become an important aspect for both multi-level and cross-sector governance (Obersteg *et al.*, 2019). As a conceptual model, CE has thus been a way of operationalising the aspects of the wider debate on the green economy, that has been put forward in the broader policy and business context of the economy and society (Ghisellini *et al.*, 2016; Jones *et al.*, 2016; EU COM, 2020; Corvellec *et al.*, 2020; Hermelin and Ström, forthcoming).

The origins of the CE model in policy explain why, from an academic perspective, it seems to be an elusive model that is open to different interpretations. Nevertheless, academic

research work on CE is proliferating (Dominko *et al.*, 2023). The dominant approach of industrial ecology for research on CE has involved important work on industrial symbiosis and industrial metabolism, with analogies to natural and biological ecosystems (Gregson *et al.*, 2015; Chertow and Ehrenfeld, 2012; Wassenaar, 2015). The debate through industrial ecology is described as framing CE within three levels of initiatives: the single enterprise, inter-firm clusters and industrial symbiosis (Murray *et al.*, 2017). It has been suggested that discussions about CE through industrial ecology focus on "(non-human) technocratic solutions to close existing material flow loops and stocks within a certain defined bounded region or city", which is understood as contrasting with the conception of CE that focuses on "socio-environmental and socioeconomic aspects" (Van den Berghe and Vos, 2019, p. 5; cf. Gregson *et al.*, 2015). This paper hopes to contribute to the latter approach by integrating socio-spatial relations with a focus on how multi-level and cross-sector networks impact the regional implementation of CE.

Since territoriality, encompassing specific geographical areas with physical infrastructure and the presence of industries and other actors, is important for CE, calls have been made to study the impact of CE implementation with a regional approach (Scarpellini *et al.*, 2019; Van den Berghe and Vos, 2019). Nevertheless, these aspects of CE seem to be under-researched, and calls have recently been made to study how CE involves social and economic transformation, and the winners and losers in a spatial context (Hobson, 2020). In general, the state of the art for research on CE is considered less developed in its socio-economic and socio-political aspects (Schulz *et al.*, 2019, citing Lewandowski, 2016; Merli *et al.*, 2018). This involves how actors become motivated and capable of changing their strategies and behaviour (Schulz *et al.*, 2019) for which the constellations of networks are important organisational platforms.

Hence, this paper aims to contribute to the debate on the role of geographical contexts and network relations for socio-economic and socio-political aspects impacting the implementation of CE models, embedded within spatial relations of governance and institutional environment (Tapia *et al.*, 2021). The geographical approach for the discussion in this paper builds on earlier scholarly work on the green economy, exploring different environmental aspects in relation to industry and regions (e.g. Gibbs and Healey, 1997; Angel and Rock, 2005; Gibbs 2006, 2020). This involves discussing how economic geography can contribute to a contextual understanding of how particular geographical settings impact the way transformations towards CE take place, which involves conceiving of the role of generative spaces and socio-material practices (Hobson 2016, 2020). Using this geographical approach of CE implementation, we hope to expand the debate and raise questions about how CE – through its impacts on industrial restructuring – needs to be considered based on its effects on potentially uneven regional development as an outcome of CE policy implementation (EU COM, 2019; Ström, 2020).

In line with this aim, the paper investigates how networks for implementing CE for different industries are formed through different industrial and geographical contexts. The analytical approach of the paper involves investigating how the interplay of network constellations, industrial profiles and innovation strategies forms the implementation of CE. The research at hand, however, does not aim to engage with the more normative aspects of whether CE will be the key to the future of sustainable development. Rather, it is the potential impacts of the implementation of CE for uneven industrial development that are in focus.

The rest of the paper is structured as follows. Below, a literature and theoretical background is provided Section 2. The next section presents the empirical setting and results Section 3. The paper then continues with a discussion of the results and ends with a conclusion and avenues for future research Sections 4 and 5.

2. Literature background – a governance approach to circular economy

As explained above, the ideal of CE is fostered and endorsed through a number of international institutions. This is integrated within "the political logics of governance [dealing] with the production of norms and rules" with impacts on decisions across sectors and areas (Savini and Giezen, 2020, p. 881). Thus, the model for CE develops policy which motivates initiatives and actions (Tapia *et al.*, 2021) within regions, for which financial resources, knowledge bases and company capabilities are often seen as essential elements (e.g. Mathews and Tan, 2011; Demirel and Danisman, 2019; Hojnik and Ruzzier, 2016; Keshminder and del Río, 2019; Cainelli *et al.*, 2020; Albrecht and Lukkarinen, 2020). The emergence of the concept of CE promoted by the EU also has implications on the international governance through effects in international relations and business structures. As the EU develops various policy frameworks it will be difficult for stakeholders to ignore them as they diffuse in areas of governance (e.g. Kern *et al.*, 2020). An example of this diffusion and impact shows how Japanese manufacturing industry need to align and adapt to EU policy frameworks (Umeda *et al.*, 2020). The development and governance of urban transitions towards sustainability point towards the potential of these larger policy schemes to push for a CE (Fratini *et al.*, 2019) and the similar complexity in governance in establishing Smart cities (Cavallo, 2022). In terms of governance related to the CE in general, the importance of public and network governance has been put forward (Cramer, 2022). These need to be aligned to create effectiveness. Recent studies of how networks are developed in areas of the CE also show the complexity of governance in relation to generated economic values of less tangible character such within the cultural and creative sectors (Pratt, 2022). With this backdrop, to understand governance for CE through industrial and regional contexts, we have framed the analytical approach to focus on the interplay of network constellations, industrial profiles and innovation strategies (Figure 1). This approach entails a relational view of spatial configurations for industrial and regional development (Dicken and Malmberg, 2001; Bathelt and Glückler 2003, 2005) and is explained as follows:

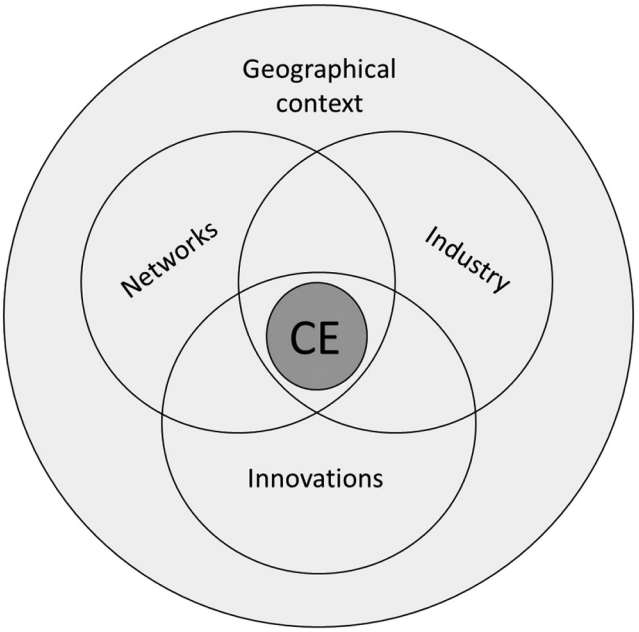
> Processes, such as the exchange of implicit knowledge and the control of complex configurations of production, can be organized quite efficiently within a local or regional context – because of the advantages of sharing the same interpretative schemes and engaging in face-to-face communication – but they are not limited to that context. (Bathelt and Glückler, 2005, p. 1558.)

Such a relational spatial approach contributes to the CE discussion with an understanding of how CE plays out in different ways within different geographical contexts and how this drives industrial restructuring with impacts on regional development. This aligns with arguments on environmental economic geography, apprehending the spatial implications of environmental change (e.g. Bridge, 2002; Jones *et al.*, 2016; Soyez and Schulz, 2008; Gibbs, 2020).

The analytical approach of this paper focuses on how the interplay of networks, industrial profiles and innovation strategies conditions how the ideal of CE is adopted through regional contexts. Below, we will define this approach in greater depth.

2.1 Networks for cross-sector and cross-organisation interactions

Governance for CE has motivated different cross-sector interactions, inducing formations of cross-sector and multi-organisational dialogues. This can be illustrated by the Swedish Government's 2018 decision to consolidate a commission for CE. The members of this commission's board represented different sectors, including national politics, a technical university, the forest industry, waste management companies, local utility plants and the



Source: Authors' own work

Figure 1.
Analytical model to investigate how governance for implementing CE for different industries is formed through regional contexts

retail sector (Tillväxtverket, online). Such a central government initiative is an important background to how the wider policy ideals are formed, impacting on sub-national governance for implementing CE. This involves regional institutional arrangements being developed, including business specific networks for CE, as investigated in this paper. Such networks are important institutions for promoting CE principles and enhancing knowledge development and collaboration between actors and organisations (Tapia *et al.*, 2021). Networks for CE are imbued with the general challenges of collaborations across organisations and sectors, and need resources that will enable them to be resilient and have the capacity to make changes. This includes financial and knowledge resources, as well as an informal institutional environment that is open to learning and implementing innovations (Scarpellini *et al.*, 2019). Such resources may be sourced through the capabilities of actors within the political sector, the company sector and higher education institutions, as well as social networks within particular geographical contexts (Bathelt and Glückler, 2003, 2005; Ström and Wahlqvist, 2010).

Networks may be quite different; they can be policy networks for which political bodies are anchor tenants, triple-helix and quadruple-helix organisations formed through models of innovation policy, or business specific networks grounded in particular industries or industry clusters. Different networks may function as intermediaries for brokerage, and as facilitators and legitimisers driving the shift towards CE (Hermelin and Rämö, 2017; cf. Störmer, 2008). The interconnection of actors across industries in network constellations is assumed to facilitate value creation through new configurations of complex value chains, where services and manufacturing come together in solutions rather than remaining as separate functions (e.g. Bryson and Daniels, 2015; Raddats *et al.*, 2019).

2.2 Industrial profiles and dematerialisation

Particular regional profiles of industrial specialisation and of economic relations within wider national and international value chains are important contexts for regional variations for the development of CE. In addition, CE involves ideals of developing business models for sharing (e.g. leasing) and the provision of services (Völker *et al.*, 2020), which fosters geographically closer relations between consumers and producers.

Importantly, the vision for CE aligning with strives to decoupling economic activities from demands for natural resources leads to promotion of provision of values through dematerialised services (Nikolaos Voulvoulis, 2022). In relation to the increasing importance of services in the value chain, there is a connection to how dematerialisation can transform the ways in which firms work with their products and services. From a policy standpoint, this development is one of the essential aspects of enhancing green economic growth and development towards CE (Ström, 2020). Thus, when considering industrial development for CE, the role of the constantly increasing share of the service industry, measured through its contribution to GDP and employment in mature economies (EU HLG, 2014), makes a difference. The impact of the rise of service industries and added service value in the economy as a whole – as well as in the manufacturing sector, more specifically – is seen in both mature and emerging markets (Bryson, 2007; Hermelin and Rusten, 2007; Alvstam *et al.*, 2016), which is set to influence the pathways of CE development. Value creation within traditional manufacturing industries has become dependent upon how a service can be attached or developed in relation to the original business model (Stabell and Fjeldstad, 1998; Vargo and Lusch, 2014). Studies also show the importance of managing the complexity of stakeholders in facilitating a green strategy among service firms (Rueda-Manzanares *et al.*, 2008). This discussion on strategies and pathways towards dematerialisation is integrated with discussions on innovations, which is the third pillar of the analytical frame defined in the next section.

2.3 Innovation strategies

As explained above, EU policy for CE has a strong focus on innovations. The conception of innovations for the discussion of this paper is broad, aligning with how this concept is adopted for the EU's regional development and innovation policy. This involves considering how CE develops through technological innovations, innovations for business models and production-consumption systems (Andrews, 2015; McDowall *et al.*, 2017). Considering technological innovations, this is key for the development of the Internet of Things in a geographical context (Xu and Ström, 2016) and Industry 4.0 (Rajput and Singh, 2019). With aspects of business model innovation, the development of production systems in which products and services are intertwined (Gustafsson and Bowen, 2017) to a much larger degree than before is referred to as servitisation and the rise of product-service systems (PSS) (Neely, 2008; Nilsson *et al.*, 2018). This also involves shifts of business models towards dematerialisation, as discussed above, which is highly relevant for CE.

Through the regional approach of the discussion of this paper innovations for CE overlap with innovations for regional development. We assume that innovations are fostered through regional and extra-regional relations, such as the CE policy framework initiated by the EU and later translated into national and regional geographical contexts. This involves recognising the role of multi-level governance and wide geographical relations for regional development.

Innovation is a factor that drives economic restructuring, and which always poses a threat to existing industrial structures, but also generates new possibilities (Ström, 2020), as shown by studies of the Swedish context (e.g. Ström and Wahlqvist, 2010; Neffke *et al.*, 2011). Industrial

restructuring and regional economic change seem to be dependent on using the contextualised capabilities of stakeholders at different levels. Thus, the way innovations are adopted for developing CE needs to be considered within the wider context of how innovations drive economic restructuring with impacts on uneven regional development.

The process of dematerialisation develops through innovation processes, and involves firms that we have traditionally seen as manufacturing companies largely redesigning their business models in relation to how the combination of products and services can generate value for the customer and wider society. This relates to models for PSS. Pieroni *et al.* (2019) show that PSS can be a viable concept for industry to enhance the sustainability of industrial processes and manufacturing. However, there are also critical reflections on how PSS may offer solutions for sustainable development. Tukker (2015) highlights the risk that firms are moving too quickly when implementing a PSS approach, without carefully evaluating the business model or their position in the value chain to create revenue. One of the key aspects of the PSS concept is seeing production from a wider perspective, with activities throughout the process being considered vital for overall value. Therefore, the product life cycle perspective is an integrated approach in which design, production, recycle/reuse and minimising waste – all important for CE (Bramklev and Ström, 2011; Matschewsky *et al.*, 2018) – are key components.

3. Empirical setting and method

The region of West Sweden (Västra Götalandsregionen) constitutes the geographical context for the network constellations of CE investigated in this paper. This is a political-administrative region of Sweden covering 53 municipalities. The population was around 1.7 million in 2018 (corresponding to 17% of the national population), and the number of employees was 850,000 in 2017 (corresponding to 17% of national employment). The region comprises a number of different locations with a strong legacy of manufacturing within different industrial specialisations, including the urban centre of Gothenburg. In all, employment in manufacturing in West Sweden accounted for around 120,000 employees in 2017 (corresponding to 21% of the national workforce in manufacturing). Around 40% of regional employment in manufacturing was located in the urban centre of Gothenburg.

The economic geography of West Sweden has been thoroughly analysed from both economic and governance positions in recent decades (e.g. Henning *et al.*, 2016; Andersson and Larsson, 2019). These studies have often been initiated by the regional planning body as a foundation for future policy development and governance structures. Within the Swedish multi-level political system, the region is the political body with primary responsibility for implementing the EU's policy for innovation and economic growth. Studies of the regional development in West Sweden describe how regional economic development during the past two decades points to the increasing importance of larger urban regions, where Gothenburg stands out. Among other urban areas, the region around the city of Borås shows stronger regional economic development measures such as employment and salaries compared with the regional area around Skövde. This shows that areas of thinner industrial diversity and development are facing challenges in present industrial restructuring and the transition towards advanced services within the value chain. Other reports show the importance of larger firms in the industrial transition and the reconfiguration of the economy in the geographical context (Ström *et al.*, 2005; Henning *et al.*, 2017).

The geographical context of the empirical cases is relevant for several reasons. Firstly, the political body for this region has been described as an early mover in implementing policy and taking initiatives to support sustainable development. It is even claimed that this region produced the "world's first regional green strategy in the early 2000s" (Cooke, 2011, p. 136).

This region (i.e. the regional government) of West Sweden, in comparison to other regions in Sweden, is resourceful. These resources derive from its extensive scale, tax revenue and its institutional consolidation achieved through stable organisational conditions. Secondly, the geographical context represents a major industrial region of Sweden. This region has a strong manufacturing base within the broader automotive industry sector, where the service component of value creation, in general, has become more important over time.

Within the region of West Sweden, we were able to identify three networks for CE that have been consolidated for some time. These have different locations within the region, and are consolidated within and across the policy and company sectors and through the involvement of higher education institutions. They have different industrial bases within the textile industry, the furniture industry and engineering-based industries. The particular constellations of stakeholders in these networks and how they interpret and endorse CE varies, and have an impact on the directions of the investigated initiatives. Table 1 presents key aspects for each of the three networks.

The networks specialising in textiles and furniture are located in what can be described as second-tier and third-tier urban centres: Borås and Skövde. The third network for advanced engineering-based products is located in Gothenburg, which is the regional centre as well as the second largest urban centre in Sweden. Table 1 gives some basic information about the networks and shows that their main anchor actors and innovation targets vary. Such variations will be described in greater depth in the section below on the results of the study.

The methods applied for the study include a qualitative study comparing the examples of three network initiatives (Hojnik and Ruzzier, 2016) and illustrating how these are contextualised within the geographical setting and within governance relations. The key empirical material for the study is derived from interviews with a planner for the regional body (with the main responsibility of overseeing the CE initiative in the region) and respondents who manage and lead the work through the three different networks. These respondents are informed actors who can contribute information on the specific industrial settings and their geographical context. The respondents are the key persons responsible for implementation of the CE agenda in the respective network initiatives. The interactions with the respondents build on the methodological concept of informed dialogue (Clark, 1998). This method builds on a good understanding of the regional and industry characteristics by the researchers. Both researchers for the study at hand have prior conducted in-depth regional studies of economic growth and dynamics in the specific geographical area involving private and public actors. The respondents from the networks have been interviewed on two

Location	Network	Industry	Innovations
Borås	Triple helix, for which the science park is an important anchor tenant	Textiles	Models for reuse and upcycling
Skövde/Tibro	Constellation of SMEs	Furniture	Business models for leasing furniture
Gothenburg	"Think tank" and constellation of large industries and technical university	Engineering	Internet of Things, Industry 4.0, smart maintenance

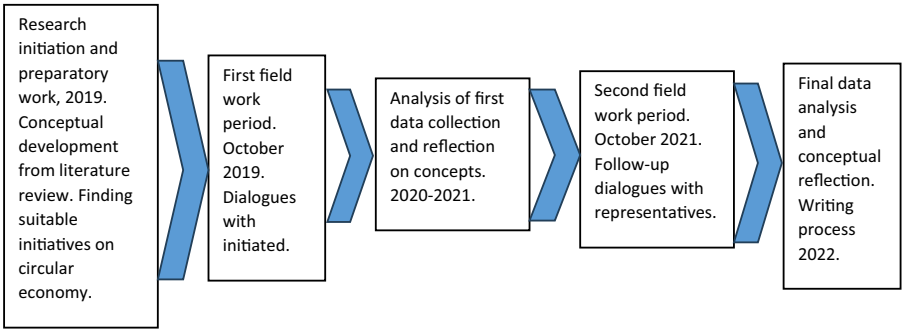
Source: Authors' own work

Table 1.
Overview of locations of investigated networks in the region of West Sweden

different occasions, in October 2019 and October 2021. The second round of dialogue was extremely valuable, because it made it possible to interpret the perseverance and sustainability of the networks and the subsequent progress of implementing CE for each industrial specialisation. The respondents from the networks were the same individuals interviewed in both 2019 and 2021. This made a difference for the interview situation, as we sensed a more informed interview discussion in 2021, which enabled us to deepen our understanding of what had been described in 2019. Having the ability to interview the same key persons has a positive impact on validity and reliability of data, as they have the complete understanding of the reasons for implementing CE from the policy sector, and then trying to operationalise CE activities in their respective network initiative over time. This generates a longitudinal research design with the same data points. In this way, we have gained access to informative empirical material, enhancing our understanding of how actors become motivated and capable of changing their strategies and behaviour over a certain time period (Schulz *et al.*, 2019). See Figure 2 for the overall research process.

A total of seven dialogues were conducted, lasting between 1 and 2 h. The first meeting in 2019 with the representative from the textile case was conducted on site, as was the meeting with the representative from the region of West Sweden. The dialogues with the engineering industry representative in Gothenburg and the furniture case were both conducted via the internet and by telephone. The interview data has been supplemented with documents and information from websites. In all, it is important to acknowledge that the empirical material primarily reflects the regional conditions driving these networks and the approach for the management of the investigated networks and how this, in turn, illustrates the different elements of the analytical framework as defined above. These elements refer to network organisation, industrial profiles and innovation strategies. Thus, the research design is motivated by the ambition of this paper to contribute to the debate on the role of geographical contexts and network relations for socio-economic and socio-political aspects impacting the implementation of CE models.

This empirical material was analysed in different rounds, the first of which was explorative. The aspects that seemed to condition the different network initiatives were identified and compared with the discussion in the literature. For the detailed analysis, we used the analytical model as described above with a focus on the interplay between network constellations, industrial profiles and innovation strategies.



Source: Authors' own work

Figure 2.
Research process

4. Results: networks for circular economy

Although the three investigated networks share similar overall strategic priorities for sustainable and competitive industrial development and a focus on circular business models, there are important contrasts between the investigated cases. These contrasts reflect varying conditions for different industries in combination with their different geographical locations. The contrasts between the investigated networks also show that the implementation of CE is quite demanding, as it requires the capacity of actors to access general knowledge about implementing CE, as well as translating these for different solutions applicable to specific conditions of industrial and geographical structures. It was noted that the embeddedness of the investigated networks within wider governance relations, in combination with their local constellations of actors, impacts their capacity to meet these advanced requirements and how the networks are able to anchor resources for place-specific industrial transformation towards CE. The strategies for implementing CE will be presented in this section, based on the analytical scheme focusing on network organisation, industrial profiles and innovation strategies. The role of governance relations and regional context are aspects considered for all the different focus areas of the analytical scheme. For an overview of the results of the empirical study, please see the Appendix.

The particularities of industrial trajectories and the structures of the different geographical settings where the networks are located are important conditions for how these initiatives may mobilise resources to support a transformation to CE with sustained economic development.

4.1 Network organisation and structure

Overall, the three industry structures of the investigated networks share a strong legacy within their local context. This has developed social ties between actors within the local environments for each industrial specialisation. For two of the investigated networks within furniture (in Skövde) and engineering (in Gothenburg), the company sector is an important driver. The company sectors involved, however, are quite different in terms of their profiles and available resources. The network in Gothenburg involves large-scale companies, which entails having power within the wider regional policy networks due to their sheer economic importance, but also through building close collaborations with public entities such as hospitals via business agreements. In contrast, the network within in furniture is dominated by SMEs. The network for textiles (in Borås) relies heavily on the institutional resources of a university college and a science park. The advanced engineering industry network in Gothenburg also has close relations with a higher education institution, represented in this case by the technical university in the city.

Governance relations for the textile and furniture networks with the region have been quite important and have involved sourcing continuous financial support. These two industrial milieus are relatively small in terms of the size of the companies and the number of employees. Important motivations for the region to invest in these constellations relate to the aim of supporting areas outside the main node of Gothenburg for economic development. Thus, this strategy can be considered to reflect the region's development policy of supporting areas outside the main urban node of Gothenburg. Besides the uneven funding streams from the region, there are also other differences for the networks pertaining to access to resources. While the resources and initiatives for textiles (in Borås) are framed within a triple-helix structure, including setting up relatively long-term externally funded projects, the initiatives for furniture (in Skövde) and engineering-based industry (in Gothenburg) are more industry-led through the resources of the industry, making the two recent networks focused on concrete business models.

The three networks investigated prove that actors in different sectors and industrial specialisations are motivated to become involved in network initiatives for CE. This can be understood from the need to gain access to resources (knowledge, collaborative partners and funding) to achieve such a transformation.

By following the CE policy that is being implemented over time, it is evident that long-term commitment is needed. The respondents from the different industry networks play important roles in promoting the idea of CE across actors, as clearly explained by the interviewee for the network in Gothenburg. This respondent described experiencing challenges in terms of persuading senior management within the industry of the importance of transforming production systems towards CE. It was only when the opportunity to discount investments and business-model change in future revenue or increased competitive advantage became clear that senior management became motivated to drive the development more forcefully. The network structure established around the concept of smart maintenance has proven to be extremely important for motivating actors to become involved and join forces. This has included dialogues and sharing insights across companies, organisations and academia.

4.2 Industrial profiles

Moving on to how industrial profiles are an important condition for implementing CE, and starting with the textile industry specialisation in one of the investigated networks, it is important to consider how the general trajectory of this industry for Western economies has been deeply affected by de-industrialisation. This has affected the regional context of the textile network in Borås, where major parts of the local textile industry closed. This explains why the textile network initiative involves ambitions to re-establish the textile industry. In contrast to such a strategic goal, the furniture network (in Skövde) and the engineering-based network (in Gothenburg) are focusing on securing the capacity of existing industrial activities to sustain growth. The respondents from these networks in Skövde and Gothenburg expressed concerns about the urgency for their industrial specialisations to transform into sustainable production systems.

The differences in industrial profiles of the different network initiatives impact upon how models for CE become relevant and are used (see Appendix). The network for the engineering-based industries (in Gothenburg) exposes how transformation towards CE is tightly integrated with transformation towards Industry 4.0 and the Internet of Things. This network develops knowledge for managing maintenance systems, and has a strong focus on what is presented as management systems for "smart maintenance". The furniture industry has a strong focus on aspects of quality and the value chain relations involving different actors and stakeholders representing different producers, as well as buyers and the intermediator roles of architects. The textile industry, with its close relations with the fashion industry, needs to integrate strategies of design and symbolic values. A spatial aspect of the implementation of CE for consumption industries occurs through the adaptation of upgrade garments and developing strategies for upcycling various textile products.

The industrial basis of the networks affects the differences in terms of resource availability. The relevant companies in Gothenburg are large engineering-based companies with global networks of affiliates, and are anchor firms within the region. The mobilisation of this industry in Gothenburg represents a resourceful network of stakeholders. This provides what seems to be quite a sustainable foundation for the network, combining manufacturing industries with strong legacy with high-end PSS development (Ström *et al.*, 2005). This industrial base of strong actors is different to the less knowledge-intensive,

smaller companies located in the settings for the network initiatives with a focus on furniture (in Skövde) and textiles (in Borås). These descriptions of varying resource structures of the different local industrial specialisations and the CE model becoming relevant in different ways indicate that it is to be expected that the implementation of CE will be uneven, and will have uneven regional effects.

4.3 Innovation strategies

While the structure of collaborations and the implementation of CE seem quite different between the three networks, they nevertheless share general ideals about the importance of new knowledge and the sense of urgency for innovation. The Gothenburg case stresses technological innovations with a strong foundation in large-scale industrial companies, whereas the furniture cluster initiative focuses on small-scale, low-tech business system innovations. The textile network's innovation work relates to identifying consumer markets, with a clear focus on value creation through dematerialisation. The three networks share concerns about the importance of developing new business systems that can achieve the goals of closing the material loops. For this ideal, PSS becomes a focused strategy – often in combination with dematerialisation of value creation.

Strategies for increasing value within the textile sector through business systems for reuse and upcycling may lead to regional and national location structures, in contrast to current global production chains. This exemplifies the implications of CE for the fashion industry and its employment model (Henninger *et al.*, 2017), and how this may involve changing location structures. By contrast, the implementation of digitalisation and the Internet of Things through the engineering-based network in Gothenburg suggests quite different directions and that PSS may extend across extensive geographical distances. The "smart maintenance" model strives for product-life extension, as its strategy of closing material loops is tightly integrated within the visions of digitalisation and the ideals of Industry 4.0.

Drivers for the textile and furniture networks to develop PSS to leverage CE refer to attempts to meet demands from employees and end-customers for sustainable production. The drivers to implement PSS at the engineering companies in the Gothenburg constellation seem to derive primarily from within the industry and the collaborating companies, and the assessment of resources that companies can gain by offering their clients maintenance and after-sales service. The engineering industry profile involves a focus on technological qualities and efficiency. It is maintained that engineering skills are the key to achieving CE, and the respondent from this initiative emphasises that "the PR people" are less important. This is in contrast with the industry profiles for the textile and furniture networks, which are sensitive to aspects of design, symbolic values and images of products among customers.

Public procurement through the regional body has proven to be of great importance for smaller firms in the furniture industry in Skövde to develop in the direction of CE. Small batches of high-end furniture could fit here. PSS for business models aligning with CE for the furniture industry in Skövde is not as well developed yet, and there is a challenge relating to connection to the manufacturing side, architects and the potential market in future business-model development. This motivated the respondents in this initiative to highlight interior designers and architects with influence over the procurement of furniture for office spaces as important resources for developing PSS for the furniture industry.

A final note on the empirical results in relation to the aspect of innovations with a focus on developing business models for PSS involves how the issue of value is central to the way in which CE is developed. This is described as being difficult to measure across different stakeholders. It illustrates that business models for CE involve different priorities for the

different networks, such as upgrading for the textile industry in Borås, procurement strategies for the furniture industry in Skövde and green accounting for engineering-based industry in Gothenburg. Firms struggle with the concept of "value for whom" in their business models, and with determining the price that end-consumers in industrial configurations or private consumers will be willing to pay. The long-term value in relation to process upgrading, such as maintenance, is also challenging to capture through traditional accounting. Similar concerns have been raised by the public body of West Sweden. Time and value in write-off structures will need to be developed to function within the CE. This also shows that new initiatives for accounting with CE business models are of great importance and remain to be resolved. This needs to be done in wider national and international contexts to transform general standards for financial accounting.

All the investigated networks share the focus for their innovation aims of closing their material loops and adding intangible value, often with a PSS approach. This may be achieved through upcycling and extending the product's life cycle, and involves expanding the ideals of CE in relation to what has been the traditional focus of waste management and recycling, with services likely to become a more important component.

5. Conclusions

The aim of this paper has been to contribute to the debate on the role of geographical contexts and network relations for socio-economic and socio-political aspects, impacting the implementation of CE models. We also position the discussion in relation to the debate on governance within the CE, where it is clear that complexities exist on several levels to successfully implement a CE. The analytical approach of the paper has involved investigating how the interplay of network constellations, industrial profiles and innovation strategies forms the implementation of CE.

The empirical study has investigated three industry-specific networks and how they implement CE. This has contributed to insights into the conceptual model developed for this paper related to different aspects:

- The industrial profile of respective network aligns with industrial trajectories of each location, indicating the role of social capital to mobilise for such collaborative structures.
- The various focus of the different networks illustrates the demand to translate the model for CE to make it relevant for specific industrial-regional profiles. This is demanding for individual companies and an important motivation to join forces through collaborative networks.
- The aspect of de-materialisation is evident in different ways; through extending product life cycle for the engineering companies, and through re-cycling and up-cycling for the furniture and textile production. This is a clear indication of the increased service component for the development of CE.

In line with other studies on the development of CE policies, the complexity of resources, network constellations and a combination of public and private commitment are needed (e.g. Cavallo, 2022). In addition, the results point towards the indirect effect of this type of policy initiatives, as companies that are working on the global market need to adapt. This is clear for companies using regions within the EU as their home market, but interestingly to a larger degree even firms originating from outside the EU single market, such as Japanese multinational firms (Umeda *et al.*, 2020). This study also shows the importance of a product

life cycle perspective, the increased importance of a product services system and digital platforms.

A potential implication for the future could be the importance of using the contextual specific advantages existing in different regions when firms outside the EU considering acquisitions or joint business collaboration. Regions with a strong commitment and governance of public and private initiatives could well be more attractive from an investment perspective. Hence, with the increasing international impact of CE, the research at hand shows the importance of local and regional competitive advantage in facilitating a transition towards the green economy.

Regarding the contrasts between the investigated initiatives, the results clearly show how the interplay of networks, industry and innovation strategies creates different possibilities to use CE as a strategy for transformation towards a green economy. The alignment of the idea of maintenance with Industry 4.0 for the Gothenburg constellation of firms is embedded in the industrial culture of large-scale management. This contrasts with small-scale early prototypes for textiles and the impression of a limited set of tools for the furniture industry to leverage what are, so far, quite abstract ideas about procurement strategies facilitating upcycling and dematerialisation. It is interesting to note that, for the furniture network, the public sector also involved stimulating the development of strategies for CE by directing its demands for procuring furniture designed for material loops. In this way, the role of the public sector was both to constitute the market and to contribute support infrastructure. These illustrations from the empirical results point to the need to understand what are the relevant translations of the CE model for particular industrial and regional settings.

Overall, this study proves the importance of capacity to translate the policy-initiated models of CE into the specific regional-industrial contexts; this demands resources, with knowledge and learning capacity being particularly important. This conclusion motivates concerns about the uneven capability of regional industrial specialisations, in line with broader industrial configuration (Henning *et al.*, 2017; Andersson and Larsson, 2019) with uneven regional effects. The investigation through this paper contributes with illustrations of aspects impacting such uneven capacity for different industrial profiles and environments. Important arguments for this point at the uneven presence of large companies and access to research infrastructure, which can be expected to leave the furniture network with comparative smaller capacity compared to the engineering industry network and the textile network.

This picture indicates that the transformation towards sustainable production may enforce the dominance of major urban centres for employment and economic activities through the geographical concentration of strong institutional structures containing knowledge-driven companies, organisations and higher education institutions. Thus, one effect of the transformation towards CE might be that industrial constellations in more peripheral regions will face difficulties in sustaining long-term competitiveness. This is primarily due to limitations in their capacity to achieve the shift to a knowledge- and innovation-driven economy that CE is assumed to represent. In addition, expanding the service components of production may demand closer relations within production and production-consumer networks, which may prove disadvantageous for smaller economic environments. These structural challenges call for more targeted, geographically context-based specific policy initiatives rather than broad initiatives. In all, the results point towards economic geographical challenges when translating the broader idea of a green economy through CE as a tool for regional economic development.

It is also important to consider the limitations of the empirical study of this paper in relation to the specific selection of examples of network initiatives for CE. However, we hope that our results are convincing in terms of the importance of a geographical approach to CE, and that our analytical framework can inspire future research. As more policy initiatives involving CE are launched within the green economy approach or in relation to the sustainable development goals for implementing Agenda 2030, there is need to learn more about how CE develops through regional environments and how this involves uneven regional development.

References

Albrecht, M. and Lukkarinen, J. (2020), "Blue bioeconomy localities at the margins: reconnecting Norwegian seaweed farming and Finnish small-scale lake fisheries with blue policies", *Environment and Planning C: Politics and Space*, Vol. 38 Nos 7/8, pp. 1465-1483.

Alvstam, C.G., Ström, P. and Wentrup, R. (2016), "Heterogeneous economic space in a global archipelago: an economic-geography perspective of emerging markets", in Merchant, H. (Eds), *Handbook of Contemporary Research in Emerging Markets*, Edward Elgar Publishing, London.

Andersson, M. and Larsson, J.P. (2019), "Västsverige: ekonomisk utveckling och ekonomisk geografi, ny teori och empiri", *VGR Analys*, Vol. 2019, p. 14.

Andrews, D. (2015), "The circular economy, design thinking and education for sustainability", *Local Economy: The Journal of the Local Economy Policy Unit*, Vol. 30 No. 3, pp. 305-315.

Angel, D.P. and Rock, M.T. (2005), "Global standards and the environmental performance of industry", *Environment and Planning A: Economy and Space*, Vol. 37 No. 11, pp. 1903-1918.

Bathelt, H. and Glückler, J. (2003), "Toward a relational economic geography", *Journal of Economic Geography*, Vol. 3 No. 2, pp. 117-144.

Bathelt, H. and Glückler, J. (2005), "Resources in economic geography: from substantive concepts towards a relational perspective", *Environment and Planning A: Economy and Space*, Vol. 37 No. 9, pp. 1545-1563.

Bhatt, D., Silverman, J. and Dickson, M.A. (2019), "Consumer interest in upcycling techniques and purchasing upcycled clothing as an approach to reducing textile waste", *International Journal of Fashion Design, Technology and Education*, Vol. 12 No. 1, pp. 118-128.

Bramklev, C. and Ström, P. (2011), "A conceptualization of the product/service interface: case of the packaging industry in Japan", *Journal of Service Science Research*, Vol. 3 No. 1, p. 21.

Bridge, G. (2002), "Grounding globalization: the prospects and perils of linking economic processes of globalization to environmental outcomes", *Economic Geography*, Vol. 78 No. 3, pp. 361-386.

Bryson, J.R. (2007), "The 'second'global shift: the offshoring or global sourcing of corporate services and the rise of distanciated emotional labour", *Geografiska Annaler: Series B, Human Geography*, Vol. 89, pp. 31-43.

Bryson, J.R. and Daniels, P.W. (Eds) (2015), *Handbook of Service Business: Management, Marketing, Innovation and Internationalisation*, Edward Elgar Publishing, Cheltenham.

Cainelli, G., D'Amato, A. and Mazzanti, M. (2020), "Resource efficient eco-innovations for a circular economy: evidence from EU firms", *Research Policy*, Vol. 49 No. 1, p. 103827, doi: 10.1016/j.respol.2019.103827.

Cavallo, M. (2022), "Smart sustainable cities: synergies between circular economy, innovative policies and European projects", *International Journal of Business and Management (IJBM)*, Vol. 1 No. 2, pp. 1-13.

Chertow, M. and Ehrenfeld, J. (2012), "Organizing self-organizing systems: toward a theory of industrial symbiosis", *Journal of Industrial Ecology*, Vol. 16 No. 1, pp. 13-27.

Clark, G.L. (1998), "Stylized facts and close dialogue: methodology in economic geography", *Annals of the Association of American Geographers*, Vol. 88 No. 1, pp. 73-87.

Cooke, P. (2011), "Transition regions: regional–national eco-innovation systems and strategies", *Progress in Planning*, Vol. 76 No. 3, pp. 105-146.

Corvellec, H., Böhm, S., Stowell, A. and Valenzuela, F. (2020), "Introduction to the special issue on the contested realities of the circular economy", *Culture and Organization*, Vol. 26 No. 2, pp. 97-102.

Cramer, J. (2022), "Effective governance of circular economies: an international comparison", *Journal of Cleaner Production*, Vol. 343, p. 130874.

Demirel, P. and Danisman, G.O. (2019), "Eco-innovation and firm growth in the circular economy: evidence from European small- and medium-sized enterprises", *Business Strategy and the Environment*, Vol. 28 No. 8, pp. 1608-1618.

Dicken, P. and Malmberg, A. (2001), "Firms in territories: a relational perspective", *Economic Geography*, Vol. 77 No. 4, pp. 345-363.

Dominko, M., Primc, K., Slabe-Erker, R. and Kalar, B. (2023), "A bibliometric analysis of circular economy in the fields of business and economics: towards more action-oriented research", *Environment, Development and Sustainability*, Vol. 25 No. 7, pp. 5797-5830.

Ellen MacArthur Foundation (EMF) (2015), "Growth within: a circular economy vision for a competitive Europe".

EU COM (2019), "Political guidelines for the next European commission 2019-2024", available at: https://ec.europa.eu/commission/sites/beta-political/files/political-guidelines-next-commission_en.pdf (assessed 2 March 2020).

EU COM (2020), "Circular economy action plan", available at: https://eur-lex.europa.eu/resource.html?uri=cellar:9903b325-6388-11ea-b735-01aa75ed71a1.0017.02/DOC_1&format=PDF (assessed 12 March 2020).

EU HLG (2014), "High-level group on business services", *Final Report. April*.

Fratini, C.F., Georg, S. and Jørgensen, M.S. (2019), "Exploring circular economy imaginaries in European cities: a research agenda for the governance of urban sustainability transitions", *Journal of Cleaner Production*, Vol. 228, pp. 974-989.

Ghisellini, P., Cialani, C. and Ulgiati, S. (2016), "A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems", *Journal of Cleaner Production*, Vol. 114, pp. 11-32.

Gibbs, D. (2006), "Prospects for an environmental economic geography: linking ecological modernization and regulationist approaches", *Economic Geography*, Vol. 82 No. 2, pp. 193-215.

Gibbs, D. (2020), "Green economy", *International Encyclopedia of Human Geography*, 2nd ed., Vol. 6, Elsevier, Amsterdam, doi: 10.1016/B978-0-08-102295-5.10792-9.

Gibbs, D. and Healey, M. (1997), "Industrial geography and the environment", *Applied Geography*, Vol. 17 No. 3, pp. 193-201.

Giunta, A., Lagendijk, A. and Pike, A. (2016), "Restructuring industry and territory: the experience of Europe's regions", *Restructuring Industry and Territory: The Experience of Europe's Regions*, The Stationary Office, Norwich.

Gregson, N., Crang, M., Fuller, S. and Holmes, H. (2015), "Interrogating the circular economy: the moral economy of resource recovery in the EU", *Economy and Society*, Vol. 44 No. 2, pp. 218-243.

Gustafsson, A. and Bowen, D.E. (2017), "The curious case of interdisciplinary research deficiency: cause or symptom of what truly ails us?", *Journal of Business Research*, Vol. 79, pp. 212-218.

Henning, M., Boström Elias, J., Jakobsson, J. and Lavén, F. (2017), "Kompetenslandskapets omvandling mot industri 4.0", *CRA Working Paper, 2017:1*.

Henning, M., Borggren, J., Boström Elias, J., Enflo, K. and Lavén, F. (2016), *Strukturomvandling Och Automatisering, Konsekvenser På Regionala Arbetsmarknader*, University of Gothenburg, Centre for Regional Analysis, Gothenburg.

Henninger, C.E., Alevizou, P.J., Goworek, H. and Ryding, D. (2017), *Sustainability in Fashion: A Cradle to Upcycle Approach*, Palgrave Macmillan, London.

Hermelin, B. and Rämö, H. (2017), "Intermediary activities and agendas of regional cleantech networks in Sweden", *Environment and Planning C: Politics and Space*, Vol. 35 No. 1, pp. 130-146.

Hermelin, B. and Rusten, G. (2007), "The organizational and territorial changes of services in a globalized world", *Geografiska Annaler: Series B, Human Geography*, Vol. 89 No. sup1, pp. 5-11.

Hobson, K. (2016), "Closing the loop or squaring the circle? Locating generative spaces for the circular economy", *Progress in Human Geography*, Vol. 40 No. 1, pp. 88-104.

Hobson, K. (2020), "The limits of the loops: critical environmental politics and the circular economy", *Trajectories in Environmental Politics*, Routledge, New York, NY, doi: 10.1080/09644016.2020.1816052.

Hobson, K. and Lynch, N. (2016), "Diversifying and de-growing the circular economy: radical social transformation in a resource-scarce world", *Futures*, Vol. 82, pp. 15-25.

Hojnik, J. and Ruzzier, M. (2016), "What drives eco-innovation? A review of an emerging literature", *Environmental Innovation and Societal Transitions*, Vol. 19, pp. 31-41.

Jones, A., Ström, P., Hermelin, B. and Rusten, G. (Eds) (2016), *Services and the Green Economy*, Palgrave Macmillan, London.

Keshminder, J.S. and del Río, P. (2019), "The missing links? The indirect impacts of drivers on eco-innovation", *Corporate Social Responsibility and Environmental Management*, Vol. 26 No. 5, pp. 1100-1118.

Kern, F., Sharp, H. and Hachmann, S. (2020), "Governing the second deep transition towards a circular economy: how rules emerge, align and diffuse", *Environmental Innovation and Societal Transitions*, Vol. 37, pp. 171-186.

Köhler, J., Dahl Sönnichsen, S. and Beske-Jansen, P. (2022), "Towards a collaboration framework for circular economy: the role of dynamic capabilities and open innovation", *Business Strategy and the Environment*, Vol. 31 No. 6, pp. 2700-2713.

Larsson, M. (2018), *Circular Business Model. Developing a Sustainable Future*, Palgrave Macmillan, Cham.

Lewandowski, M. (2016), "Designing the business models for circular economy—Towards the conceptual framework", *Sustainability*, Vol. 8 No. 1, p. 43.

Llorente-González, L.J. and Vence, X. (2019), "Decoupling or 'decaffing'? The underlying conceptualization of circular economy in the European union monitoring framework", *Sustainability*, Vol. 11 No. 18, p. 4898.

McDowall, W., Geng, Y., Huang, B., Barteková, E., Bleischwitz, R., Türkeli, S. and Doménech, T. (2017), "Circular economy policies in China and Europe", *Journal of Industrial Ecology*, Vol. 21 No. 3, pp. 651-661.

Mathews, J.A. and Tan, H. (2011), "Progress toward a circular economy in China: the drivers (and inhibitors) of eco-Industrial Initiative", *Journal of Industrial Ecology*, Vol. 15 No. 3, pp. 435-457.

Matschewsky, J., Lindahl, M. and Sakao, T. (2018), "Capturing and enhancing provider value in product-service systems throughout the lifecycle: a systematic approach", *CIRP Journal of Manufacturing Science and Technology*, Vol. 29, pp. 191-204.

Merli, R., Preziosi, M. and Acampora, A. (2018), "How do scholars approach the circular economy? A systematic literature review", *Journal of Cleaner Production*, Vol. 178, pp. 703-722.

Milios, L. (2018), "Advancing to a circular economy: three essential ingredients for a comprehensive policy mix", *Sustainability Science*, Vol. 13 No. 3, pp. 861-878.

Morgan, K. and Marques, P. (2019), "The public animateur: mission-led innovation and the 'smart state' in Europe", *Cambridge Journal of Regions, Economy and Society*, Vol. 12 No. 2, pp. 179-193.

Murray, A., Skene, K. and Haynes, K. (2017), "The circular economy: an interdisciplinary exploration of the concept and application in a global context", *Journal of Business Ethics*, Vol. 140 No. 3, pp. 369-380.

Neely, A. (2008), "Exploring the financial consequences of the servitization of manufacturing", *Operations Management Research*, Vol. 1 No. 2, pp. 103-118.

Neffke, F., Henning, M., Boschma, R., Lundquist, K.J. and Olander, L.O. (2011), "The dynamics of agglomeration externalities along the life cycle of industries", *Regional Studies*, Vol. 45 No. 1, pp. 49-65.

Nikolaos Voulvoulis, N. (2022), "Transitioning to a sustainable circular economy: the transformation required to decouple growth from environmental degradation", *Frontiers in Sustainability*, Vol. 3, p. 859896.

Nilsson, S., Sundin, E. and Lindahl, M. (2018), "Integrated product service offerings–challenges in setting requirements", *Journal of Cleaner Production*, Vol. 201, pp. 879-887.

Obersteg, A., Arlati, A., Acke, A., Berruti, G., Czapiewski, K., Dąbrowski, M. and Knieling, J. (2019), "Urban regions shifting to circular economy: understanding challenges for new ways of governance", *Urban Planning*, Vol. 4 No. 3, pp. 19-31.

Pieroni, M.P.P., McAloone, T. and Pigosso, D.C.A. (2019), "Configuring new business models for circular economy through product–service systems", *Sustainability*, Vol. 11, p. 3727.

Pratt, A.C. (2022), "Toward circular governance in the culture and creative economy: learning the lessons from the circular economy and environment", *City, Culture and Society*, Vol. 29, p. 100450.

Raddats, C., Kowalkowski, C., Benedettini, O., Burton, J. and Gebauer, H. (2019), "Servitization: a contemporary thematic review of four major research streams", *Industrial Marketing Management*, Vol. 83, pp. 207-223, doi: 10.1016/j.indmarman.2019.03.015.

Rajput, S. and Singh, S.P. (2019), "Connecting circular economy and industry 4.0", *International Journal of Information Management*, Vol. 49, pp. 98-113.

Rueda-Manzanares, A., Aragón-Correa, J.A. and Sharma, S. (2008), "The influence of stakeholders on the environmental strategy of service firms: the moderating effects of complexity, uncertainty and munificence", *British Journal of Management*, Vol. 19 No. 2, pp. 185-203.

Savini, F. and Giezen, M. (2020), "Responsibility as a field: the circular economy of water, waste, and energy", *Environment and Planning C: Politics and Space*, Vol. 38 No. 5, pp. 866-884.

Scarpellini, S., Portillo-Tarragona, P., Aranda-Usón, A. and Llena-Macarulla, F. (2019), "Definition and measurement of the circular economy's regional impact", *Journal of Environmental Planning and Management*, Vol. 62 No. 13, pp. 2211-2237.

Schulz, C., Hjaltadóttir, R.E. and Hild, P. (2019), "Practising circles: studying institutional change and circular economy practices", *Journal of Cleaner Production*, Vol. 237, p. 117749.

Soyez, D. and Schulz, C. (2008), "Facets of an emerging environmental economic geography (EEG)", *Geoforum*, Vol. 39 No. 1, pp. 17-19.

Stabell, C.B. and Fjeldstad, Ø.D. (1998), "Configuring value for competitive advantage: on chains, shops, and networks", *Strategic Management Journal*, Vol. 19 No. 5, pp. 413-437.

Störmer, E. (2008), "Greening as strategic development in industry change – why companies participate in eco-networks", *Geoforum*, Vol. 39 No. 1, pp. 32-47.

Ström, P. (2020), "The European services sector and the green transition, brief, European parliament, IMCO committee", PE 648-768, available at: www.europarl.europa.eu/RegData/etudes/BRIE/2020/648768/IPOL_BRI(2020)648768_EN.pdf

Ström, P. and Wahlqvist, E. (2010), "Regional and firm competitiveness in the service-based economy: combining economic geography and international business theory", *Tijdschrift Voor Economische En Sociale Geografie*, Vol. 101 No. 3, pp. 287-304.

Ström, P., Zaring, O., Egels, N., Eriksson, M. and Wolff, R. (2005), "Företagen som aktörer i den regionala tillväxtstrategin – ur ett företagsledarperspektiv", Chalmers Tekniska Högskola och Handelshögskolan vid Göteborgs Universitet.

Sung, K., Cooper, T. and Kettley, S. (2019), "Factors influencing upcycling for UK makers", *Sustainability*, Vol. 11 No. 3, p. 870.

Tapia, C., Bianchi, M., Pallaske, G. and Bassi, M.B. (2021), "Towards a territorial definition of a circular economy: exploring the role of territorial factors in closed-loop systems", *European Planning Studies*, Vol. 29 No. 8, pp. 1438-1457.

Tukker, A. (2015), "Product services for a resource-efficient and circular economy–a review", *Journal of Cleaner Production*, Vol. 97, pp. 76-91.

Umeda, Y., Kitagawa, K., Hirose, Y., Akaho, K., Sakai, Y. and Ohta, M. (2020), "Potential impacts of the European union's circular economy policy on Japanese manufacturers", *International Journal of Automation Technology*, Vol. 14 No. 6, pp. 857-866.

Vanhamaki, S., Medkova, K., Malamakis, A., Kontogianni, S., Marisova, E., Dellago, D.H. and Moussiopoulos, N. (2019), "Bio-based circular economy in European national and regional strategies", *International Journal of Sustainable Development and Planning*, Vol. 14 No. 1, pp. 31-43.

Van den Berghe, K. and Vos, M. (2019), "Circular area design or circular area functioning? A discourse-institutional analysis of circular area developments in Amsterdam and Utrecht, The Netherlands", *Sustainability*, Vol. 11 No. 18, p. 4875.

Vargo, S.L. and Lusch, R.F. (2014), *The Service-Dominant Logic in Marketing: Dialog, Debate, and Directions*, Routledge, New York, NY.

Völker, T., Kovacic, Z. and Strand, R. (2020), "Indicator development as a site of collective imagination? The case of European commission policies on the circular economy", *Culture and Organization*, Vol. 26 No. 2, pp. 103-120.

Wassenaar, T. (2015), "Reconsidering industrial metabolism: from analogy to denoting actuality", *Journal of Industrial Ecology*, Vol. 19 No. 5, pp. 715-727.

Xu, X. and Ström, P. (2016), "The transformative roles of knowledge-intensive business services in developing green ICT: evidence from Gothenburg, Sweden", *Services and the Green Economy*, Palgrave Macmillan, London, pp. 99-124.

Further reading

Bryson, J.R. and Rusten, G. (2008), "Transnational corporations and spatial divisions of 'service' expertise as a competitive strategy: the example of 3M and Boeing", *The Service Industries Journal*, Vol. 28 No. 3, pp. 307-323.

Castán Broto, V., Allen, A. and Rapoport, E. (2012), "Interdisciplinary perspectives on urban metabolism", *Journal of Industrial Ecology*, Vol. 16 No. 6, pp. 851-861.

Eisenhardt, K.M. (1989), "Building theories from case study research", *The Academy of Management Review*, Vol. 14 No. 4, pp. 532-550.

Felländer, A., Ingram, C. and Teigland, R. (2015), "Sharing economy. In Embracing Change with Caution", *Näringspolitiskt Forum Rapport (No. 11)*.

Kama, K. (2015), "Circling the economy: resource-making and marketization in EU electronic waste policy", *Area*, Vol. 47 No. 1, pp. 16-23, doi: 10.1111/area.12143.

MacKinnon, D., Dawley, S., Pike, A. and Cumbers, A. (2019), "Rethinking path creation: a geographical political economy approach", *Economic Geography*, Vol. 95 No. 2, pp. 113-135.

Maciejewski, M., Fischer, N.I.C. and Roginska, Y. (2014), "Streaming and online access to content and services, European parliament, policy department for economic, scientific and quality of life policies", p. 23-24, available at: www.europarl.europa.eu/RegData/etudes/etudes/join/2014/492435/IPOL-IMCO_ET(2014)492435_EN.pdf (assessed 23 March 2020).

Murphy, J.T. (2015), "Human geography and socio-technical transition studies: promising intersections", *Environmental Innovation and Societal Transitions*, Vol. 17, pp. 73-91.

Steen, M. and Hansen, G.H. (2018), "Barriers to path creation: the case of offshore wind power in Norway", *Economic Geography*, Vol. 94 No. 2, pp. 188-210.

Sundin, E., Lindahl, M. and Ijomah, W. (2009), "Product design for product/service systems", *Journal of Manufacturing Technology Management*, Vol. 20 No. 5, pp. 723-753.

Zwiers, J., Jaeger-Erben, M. and Hofmann, F. (2020), "Circular literacy. A knowledge-based approach to the circular economy", *Culture and Organization*, Vol. 26 No. 2, pp. 121-141.

Appendix

Location	Networks	Industry	Innovations
Borås/Triple helix	• Aims to understand the future consumer • The perspective of circular economy motivates new constellations of interaction among stakeholders connection to the car industry and its development work • Strong foundation in local science park • University college • Funded projects with national and international partners • Body for business development and infrastructure, owned by the local authority • Financial resources for the "platform" through the region • New constellations of public and private stakeholders • Seminars, workshops to facilitate industrial restructuring and competence building • Companies are seeking to be part of the meeting place and network hub. Organised seminars and workshops to trigger processes	• Regional economic resilience, saving competence from the textile industry • Endeavours to upgrade garment • Retail centres may be repair centres • The industry realises the importance of sustainability since around 2010 • Human capital in textile across the value-chain • Project funding; short term support both positive and negative • Strong company relations; reuse and re-design in collaboration with MNCs • Regime shift is difficult for individual companies – it is about systems and that different competences and companies join forces • Consumer awareness; workforce and buyers • Connection to the consumption driven industry • Companies involved into the projects are from different locations in Sweden and from different industries • Start-ups of complete micro-plants with multi-national company to transform garment. This connection to indirect CE abroad due to configurations of global value chains	• Product life cycle perspective for products and services • To add value and gain income in several rounds on the same garment • Employees that want their employers to work for sustainability • Value is created in the circular economy through Product-Service-Systems • Business-model workshop to invent ways for upgrading • Transformation to new business models may be achieved through new constellations of companies

(*continued*)

Table A1.
Result from the geographical context – regional variations of CE policy implementation and development

Location	Networks	Industry	Innovations
Skövde/Tibro/ constellation with SMEs	• Consensus and sense of urgency • Generosity to share among network • Creates a local brand identity • Adopts that CE is high on the public agenda • Connection to the car industry, and its development work • Industry association (IDC) wanting to facilitate industrial transformation for future competitiveness • Circular hub consolidates a formal network, with funding for three years • Strong in project applications with multiple stakeholders • Strong local networks connected to regional, national and EU initiatives and agencies • IDC has its background from IUC (local and specialised platforms for industry development) • Cooperation across the value-chain • Cross industry stakeholder workshop – buyers, sales, architects, city and region representatives, larger companies throughout the value chain	• Sustainable development goals • Knowledge dissemination about best practice and bench-mark • Individual companies cannot solve this • Human capital; connection among decision makers in business and policy • Geographical context and mix of stakeholders and competence • Connections to committed multi-national company within the industry • Companies that are avant-garde are transparent. They share because it establishes credibility • Challenge with profitability for firms	• It is about psychology and commitment to change business models in a traditional industry • Customer demands for changes is important driver • Interior designers and architects • Public procurement • New business models • Procurement strategy • Shortage of people with specialised skills for CE business development
Gothenburg/ "Think tank" large industries and technical university	• Industrial sustainability through sustainable development goals • External horizontal integration of activities	• Economic sustainability • Maintenance is now a top management issue, complex systems	• Smart maintenance – connected to Industry 4.0

Table A1. (*continued*)

Location	Networks	Industry	Innovations
	• Economic rent is important • Pressure on industrial transformation – create incentives • Industrial core in the local economy • Strong social networks • IoT capability, smart factories • Broad stakeholder networks with companies and universities • Initiatives with 50 different firms 10 years ago – now more rapid development • Think tank for industrial sustainable development, to strengthen competitiveness among the member companies, and leverage for a positive development	• Green book-keeping to understand the value • Communicate numeric value of CE activity • Industrial competence and research competence • Big data and databases connected to service business models and IoT • International standards and certifications • Smart maintenance	• Profit for companies through maintenance and after sale • To identify new ways to manage and communicate value • Incomes through maintenance and after sale • Capability to implement (PSS) throughout the product life cycle • Sensors in many different processes and industries • Green book-keeping to understand the value on firm level • Maintenance creates sustainability • To use censors for a technology for upcycling of modules that are sustainable • Modules can be recycled and the rest can be reused • Cross industry development

Source: Authors' own work

Table A1.

About the authors

Patrik Ström. Director of EIJS and Associate Professor of Economic Geography. Specialising in studies of regional economic integration and development in Europe and Asia, focusing on the development of service industries and sustainability. Patrik Ström can be contacted at: patrik.strom@hhs.se

Brita Hermelin. Professor of Human Geography. Specialising in studies of governance for regional development and for transformation towards sustainability.