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RESEARCH ARTICLE

Regenerative Practices in Circular Economy SMEs

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Abstract

Circular economy (CE) companies have increasingly adopted business models that strive to balance economic, social, and environmental value creation. As a result, sustainable business models within the CE domain have gradually evolved to incorporate regenerative elements. However, the concept of regeneration remains ambiguous in the context of CE, particularly regarding how regenerative business models differ from sustainable and circular ones. This paper aims to identify and describe the key elements of regenerative business models implemented by CE companies. It presents a multiple case study of five Finnish SMEs operating within the CE domain, all of which follow regenerative principles. The theoretical framework is based on three primary business model types: circular, sustainable, and regenerative. The findings reveal that these companies generate clearly positive impacts on both societal and planetary well-being. Notably, a positive impact on nature is central to the business models of all case companies. The paper also outlines several policy implications derived from the case analysis.

Keywords Circular economy · business models · regeneration · net-zero · sustainability · triple bottom line

1. Introduction

Circular economy (CE) has recently attracted growing interest among companies, governments, investors, and civil society as a means of achieving environmental goals and economic sustainability (Boons et al., 2013; Geissdoerfer et al., 2017; Geissdoerfer et al., 2018). Business models based on CE principles have traditionally emphasized circularity, focusing on material productivity and the conservation of natural resources through reuse (e.g., Bocken et al., 2014; Geissdoerfer et al., 2018; Lüdeke-Freund et al., 2018). In recent years, however, CE companies have begun adopting business models that extend beyond material productivity and recycling. These models increasingly emphasize the balance between economic, social, and environmental value creation—commonly referred to as the triple bottom line (Bocken et al., 2014; Geissdoerfer et al., 2018; Boons et al., 2013). Consequently, regenerative business models have gradually established their place among other sustainable business models within the CE domain (Konietzko et al., 2023; Morseletto, 2020; Das & Bocken, 2024).

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Much of the existing CE literature adopts the definition provided by the Ellen MacArthur Foundation (2015, p. 2): "A circular economy is one that is restorative and regenerative by design and aims to keep products, components, and materials at their highest utility and value at all times, distinguishing between technical and biological cycles." In this context, restoration refers to reversing damage caused by human activity, typically by returning to an unspecified original condition (Morseletto, 2020). Regeneration, by contrast, goes beyond restoration by contributing positively to society and the environment, leaving both in a better state than before (Bocken et al., 2022; Hahn & Tampe, 2021). Thus, while restoration aims "to make something well again," regeneration seeks "to make it better" than its original condition (Morseletto, 2020).

Although regeneration is frequently highlighted in CE discussions, the concept remains underdefined and underexplored in CE literature (Morseletto, 2020; Järvenpää et al., 2023). This has led to ambiguity regarding what constitutes regenerative practices and which strategies CE companies can adopt (Morseletto, 2020; Konietzko et al., 2023). Previous research on sustainable business models has identified regenerative or "net positive impact" models (Konietzko et al., 2023; Bocken & Short, 2021; Das & Bocken, 2024) as a distinct category within the broader field of sustainability (Bocken & Short, 2021). Nevertheless, the use of the term regeneration in CE remains unclear (Tedesco et al., 2022; Järvenpää et al., 2023; Morseletto, 2020), particularly in distinguishing regenerative models from sustainable and circular ones. Konietzko et al. (2023, p. 385) propose that regenerative business models differ from sustainable and circular models by creating and delivering value across multiple stakeholder levels. They also offer a general definition of regenerative business models but emphasize that "more research will be needed to provide alternative frameworks and go deeper into the institutional, strategic and operational aspects of doing business in regenerative ways." Similarly, Das and Bocken (2024) note that "much of the research on this topic is conceptual and there is a need for more empirical insights on how regenerative strategies can be implemented." Moreover, existing research on regenerative business models is largely situated within general business model literature and lacks specificity in the CE context—particularly regarding small and medium-sized enterprises (SMEs), which play a crucial role in CE implementation and account for the majority of employment in these sectors (Prieto-Sandoval et al., 2019).

In this article, we aim to address the identified gap by conducting a multiple case study involving five Finnish SMEs operating within the CE. Through this case study, we seek to enhance understanding of how regenerative practices are being implemented in practice within the CE SME sector. Based on the case analysis, the article aims to deepen insights into the regenerative strategies adopted by CE SMEs, identify which components of their business models are regenerative, and explore additional strategies they employ to achieve regenerative outcomes. The primary objective of this paper is to identify and describe key elements of regenerative business models implemented by CE companies, with a particular focus on SMEs. In doing so, the study seeks to clarify the concept of regeneration in the CE context by addressing the following research question: How have regenerative principles been implemented in the business models of CE SMEs? To answer this question, the article develops a theoretical framework grounded in prior research on CE business models (Konietzko et al., 2023; Morseletto, 2020; e.g., Bocken et al., 2014; Geissdoerfer et al., 2018; Boons et al., 2013), focusing on three main business model types: circular, sustainable, and regenerative.

This study aims to provide empirical evidence by analyzing five ventures in Finland that have adopted regenerative business models. The analysis explores which aspects of their business models are regenerative and what additional strategies—beyond the business model—they apply to achieve regenerative outcomes. Finland presents a compelling context for studying the circular economy. The Finnish government and organizations such as Sitra (the Finnish Innovation Fund for the Future) actively promote regenerative and circular economy practices by offering funding, resources, and policy support to encourage sustainable business adoption. In 2016, Finland developed the world's first circular economy roadmap, which has been regularly updated. Sitra has also played a key role in promoting the circular economy globally, for example by coordinating the World Circular Economy Forum events. Furthermore, Finland's government program for 2019–2023 set a national goal to become a circular economy pioneer—specifically, "a carbon-neutral circular economy: a new basis for an economy where production and consumption are within the limits of the Earth's carrying capacity" (Finnish Government, 2021, p. 26).

This study makes two primary contributions. First, it advances the literature on sustainable business models by shedding light on the relatively underexplored concept of regeneration within the CE, particularly in the context of SMEs. Second, it contributes to CE research by deepening the understanding of regenerative strategies adopted by CE companies and providing empirical evidence that distinguishes regenerative business models from other sustainable and circular models within the CE domain. The remainder of the paper is structured as follows. Section 2 provides an overview of the theoretical background. Section 3 outlines the methodological choices made in the study. Section 4 presents the analysis of case studies involving CE-oriented SMEs that follow regenerative business models, using the three core dimensions of the triple bottom line: economic, social, and environmental value creation. This is followed by a discussion of the results, highlighting the key characteristics of regenerative business models in CE, as well as the distinctions and overlaps between regenerative, sustainable, and circular business models. The paper concludes with a discussion of limitations and directions for future research, and a summary of the answers to the research questions.

2. Business models in circular economy

Previous research suggests that flexible, resilient, and innovative firms are more likely to survive and thrive in rapidly changing and turbulent environments (Yadav & Yadav, 2024). Therefore, it is essential for firms of all sizes to explore the interconnections between sustainability, innovation, and resilience in order to identify nature-positive, long-term solutions (Bustinza et al., 2019). Business model frameworks have been widely used to conceptualize new systems of production and consumption within the CE context (e.g., Geissdoerfer et al., 2018). The ability to rapidly and effectively transition to new business models is a critical source of sustainable competitive advantage and a key lever for improving organizational sustainability performance (Geissdoerfer, 2018). Adopting principles of circularity or regeneration requires fundamental changes in how companies create value, perceive their role, and conduct business (Pieroni, 2019). This transition necessitates a rethinking of business models to enable the decoupling of value creation from resource consumption (Bocken et al., 2014). Consequently, the capability to innovate business models toward sustainability and circularity is essential for companies operating in this sector (Pieroni, 2019).

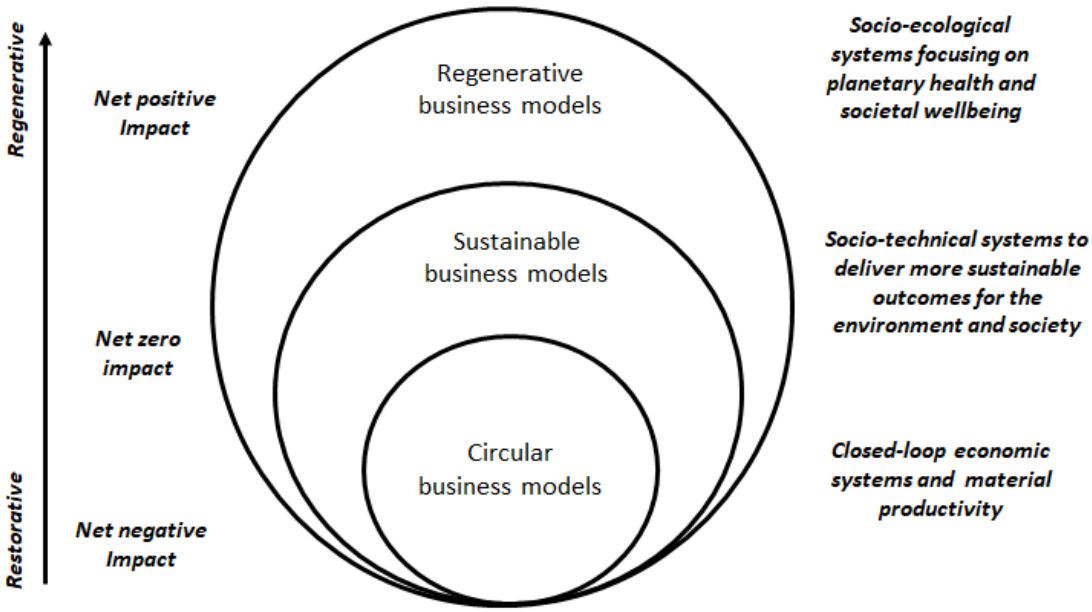

Figure 1. Hierarchical model of business models in CE.

2.1. Circular business models

CE is widely regarded as an economic framework that promotes the conscious and efficient use of products and resources through reuse, reduction, and recirculation, long-term value retention, and the closing of production and consumption loops (Morseletto, 2023). Accordingly, business models grounded in CE principles aim to integrate economic performance, social inclusiveness, and environmental resilience—commonly referred to as the triple bottom line (Bocken et al., 2014; Geissdoerfer et al., 2018; Boons et al., 2013). Previous literature has proposed typologies for sustainable business models. Bocken et al. (2014) identified eight business model archetypes, representing an early typology that synthesizes literature on models capable of delivering improved environmental and societal outcomes while maintaining economic viability. Building on the hierarchical illustration of sustainable business models originally presented by Bocken & Short (2021), and the work of Konietzko et al. (2023)—which distinguishes between circular, sustainable, and regenerative models—Figure 1 presents a modified version of this hierarchy adapted to the CE context. In this model, business models progress from being "less unsustainable" to "strongly sustainable." The key characteristics of these models are summarized in Table 1. The first level of Figure 1 represents traditional circular business models, which focus on closed-loop economic systems where material productivity and the conservation of natural resources through reuse are central (e.g. Geissdoerfer et al., 2018; Bocken et al., 2014). These models aim to enhance material efficiency but place relatively less emphasis on the health of nature and the planet (Konietzko et al., 2023). While circular models are restorative in the sense that they significantly reduce the consumption of natural resources, they typically fall short of achieving a net positive environmental impact.

2.2. Sustainable business models

Sustainable business models have been positioned as a key enabler for addressing systemic societal and environmental challenges within the business context (Stubbs & Cocklin, 2008). In their widely cited article, Bocken et al. (2014) proposed a typology of sustainable business model archetypes to provide a unified understanding of the types of business models that can facilitate or deliver more sustainable outcomes for both the environment and society, while maintaining economic viability. In sustainable business models, value capture is expanded beyond economic value to include social and environmental dimensions. These models aim to achieve a balance across the three pillars of the so-called triple bottom line: economic, social, and environmental value creation (Bocken et al., 2014; Geissdoerfer et al., 2018; Boons et al., 2013). Economic value typically refers to savings and gains in terms of money, but also includes time and effort (Sweeney & Soutar, 2001). Social value, although not uniformly defined in the literature, generally refers to non-financial outcomes such as the wellbeing of individuals and communities (Wood & Leighton, 2010; Mulgan, 2010). Environmental value can be exemplified through practices such as material reuse, utilization of underused resources, and reduction of carbon dioxide emissions (Oskam et al., 2021). A central challenge in these models lies in designing business strategies that simultaneously generate economic value and deliver environmental and social benefits (Vermunt et al., 2019). According to Boons (2013), sustainable business models primarily focus on socio-technical systems, where value capture is broadened to include social and environmental aspects (Bocken et al., 2014; Boons et al., 2013; Vermunt et al., 2019), thereby promoting more sustainable outcomes in line with the principles of the triple bottom line (Geissdoerfer et al., 2018; Bocken et al., 2014; Boons et al., 2013). However, despite their contribution toward achieving at least a net-zero impact, sustainable business models continue to prioritize economic sustainability (Raufflet, 2000).

2.3. Regenerative business models

Previous research has identified various perspectives on regenerative business models (Konietzko et al., 2023). Morseletto (2020) defines regeneration as "*the promotion of self-renewal capacity of natural systems with the aim of reactivating ecological processes damaged or over-exploited by human action,*" distinguishing it from restorative systems, which are defined as "*the return to a previous stage*" (Morseletto, 2020). In the business

model literature, regenerative models are often described through the concept of *net positive impact*, which occurs when an organization's *handprint* (positive impact) exceeds its *footprint* (negative impact) (Norris et al., 2021). The handprint represents the beneficial difference a product or service makes in the market, while the footprint refers to the negative impact generated throughout its life cycle. Regenerative business models acknowledge nature as an irreplaceable foundation of human health and wellbeing, recognizing that human societies are deeply embedded within the biosphere. Drawing on existing literature and their own research, Konietzko et al. (2023, p. 384) propose three core principles for regenerative organizations. First, the organizations recognize that human societies are deeply embedded in the biosphere, and that they depend on the health of the biosphere for their own health. Second, they focus on the value proposition of planetary health and societal wellbeing to nature and society at large, and third, they give more than they take and strive for net positive impact. Based on these principles, they define regenerative business models as follows: "*Organizations with regenerative business models focus on planetary health and societal wellbeing. They create and deliver value at multiple stakeholder levels—including nature, societies, customers, suppliers and partners, shareholders and investors, and employees—through activities promoting regenerative leadership, co-creative partnerships with nature, and justice and fairness. Capturing value through multi-capital accounting, they aim for a net positive impact across all stakeholder levels.*" (Konietzko et al., 2023, pp. 375–376). Thus, regenerative business models place particular emphasis on planetary health and societal wellbeing, aiming not merely to minimize negative impacts but to generate a clear net positive impact by balancing economic, social, and environmental value creation (Hahn & Tampe, 2021; Konietzko et al., 2023; Muñoz & Branzei, 2021; Das & Bocken, 2024). In the CE context, this translates into a deliberate focus on generating net positive impact, where societal wellbeing and planetary health are considered equally important alongside profitability—in other words, the triple bottom line (Bocken et al., 2014; Geissdoerfer et al., 2018). The purpose of this article is to explore how these goals are implemented in CE companies.

Table 1. The main characteristics of CE business models.

	Circular BMs	**Sustainable BMs**	**Regenerative BMs**
Dominant system view	Closed-loop economic systems	Socio-technical systems	Social-ecological systems
Approach to business and environment	Aiming to close, slow and narrow resource loops, making business and consumption systems as resource efficient and self-sustaining as possible	Reducing the environmental footprint and minimizing harm to business	Focusing on the role of economic activity within ecological systems and how that activity can contribute to the health and prosperity of the ecological system
Main goals	Material productivity and saving natural resources	Delivering more sustainable outcomes to environment and society	Planetary health and societal wellbeing
Impact	Net negative	Net zero	Net positive

3. Methodology

Given that the case study approach is particularly effective for examining complex and evolving relationships in real-life contexts (Easton, 2010; Bryman & Bell, 2011), it was selected as the research method for this study. Furthermore, a multiple case study design is appropriate when data is collected from various sources with the aim of developing a holistic understanding through an iterative research process (Easton, 2010, p. 119). The richness and diversity of the data sources (Yin, 2018) also enable the researcher to engage more closely with

the constructs and to illustrate causal relationships more directly (Beverland & Lindgreen, 2010). The multiple case study approach is especially suitable in research settings where the objective is to understand complex phenomena in dynamic, real-world contexts (Beverland & Lindgreen, 2010). In such settings, research questions are typically explanatory in nature, often framed as "how" and "why" questions (Yin, 2018). This approach has also been employed in previous studies on CE-oriented SMEs (Järvenpää et al., 2025). For the selection of case companies, we followed the principles originally proposed by Konietzko et al. (2023) and further developed by Das and Bocken (2024) for identifying regenerative organizations. First, regenerative companies shift from prioritizing shareholder profits to creating value for all stakeholders. Second, they enable value capture across natural, social, and cultural capital at each stage of production. This is operationalized through the development and delivery of products and services that enhance planetary health. Moreover, rather than focusing solely on minimizing negative impacts (e.g., environmental footprint), regenerative business models also aim to maximize positive impacts—their handprint—created by their products and services.

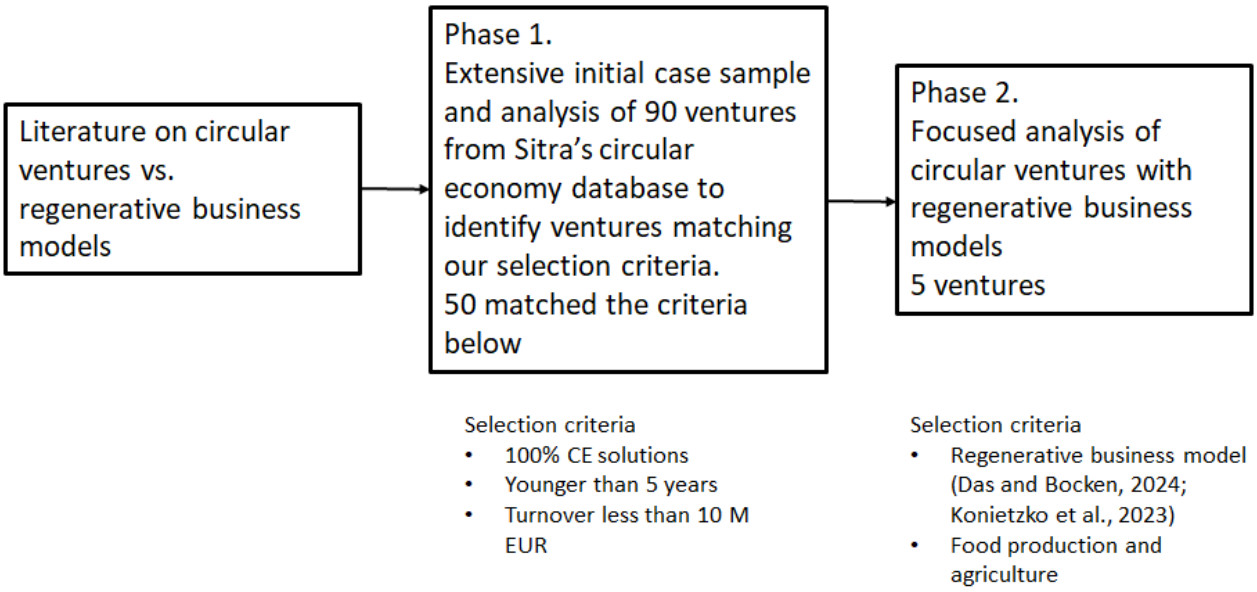

Figure 2. Data collection process.

3.1. Data collection

Figure 2 illustrates the data collection process. We began by identifying ventures in Finland using the circular economy database maintained by the Finnish Innovation Fund (Sitra), focusing specifically on ventures that implement 100% circular economy solutions—namely, recycling, reusing, and reducing. This initial screening resulted in a longlist of 50 ventures spanning various industries and stages of development. From this list, we selected ventures operating within the food production chain and agriculture sectors, as these are typically considered regenerative domains (Das & Bocken, 2024). Agriculture is particularly relevant due to its significant environmental impact: it accounts for approximately one-third of global land use and is a major driver of land use change worldwide (Searchinger et al., 2014). Additionally, agricultural production contributes roughly 15% of global greenhouse gas emissions (Newton et al., 2020). Regenerative agriculture has been proposed as an alternative approach to food production that may yield lower—or even net positive—environmental and social impacts (Rhodes, 2017). Based on these criteria, we identified five ventures that exemplify regenerative practices (see Table 2).

Table 2. Description of the case ventures

	Case 1	Case 2	Case 3	Case 4	Case 5
Industry	Manufacturing of recycled fertilizers and nitrogen compounds	Horticultural retail store	Industrial waste management	Other management consulting	Wholesale of other intermediate products
Business area	Recycled agricultural fertilizers and soil improvement products	Production of mushrooms by using used coffee grounds	Industrial plants for organic side stream processing	Wastewater treatment technologies	Hybrid biofilters for wastewater treatment
Operation started	2015	2016	2003	2010	2014
Turnover 2022	10 196 000 €	116 000 €	1 234 000 €	3 305 000 €	257 000 €
Number of employees	24	2	5	4	1

3.2. Data analysis

In case study research, established scholars such as Yin (2018) and Stake (1995) emphasize the importance of clearly defining case boundaries, using multiple data sources, and ensuring methodological rigor through triangulation and transparent documentation. In this study, we adopt an abductive approach, beginning with the construction of short life stories of the selected ventures, supported by media and web-based sources (e.g., articles). Subsequently, we examined recent typologies of regenerative business models proposed by Das and Bocken (2024) and Konietzko et al. (2023). These typologies were used to ensure that the selected cases could be considered regenerative. In addition, we applied the following guiding questions in our analysis: 1) What aspects of the business model are regenerative? 2) What additional strategies (beyond the business model) do the case ventures employ to be regenerative? 3) What elements of their business are being regenerated? and 4) What are the typical features of regeneration in agriculture?

4. Results

As discussed above, sustainable business models aim to balance economic, social, and environmental value creation—commonly referred to as the triple bottom line (Bocken et al., 2014; Geissdoerfer et al., 2018). Regenerative business models pursue this same balance but extend it further by emphasizing planetary health and the wellbeing of social-ecological systems (Hahn & Tampe, 2021; Muñoz & Branzei, 2021). The purpose of this section is to examine the value creation in the five cases, based on this division into economic, social, and environmental dimensions. The results are also summarized in Table 3.

Table 3. Economic, social and environmental value creation in the case companies.

Case	Economic value	Social value	Environmental value
1	The company offers industrial actors a service for processing side streams. For farmers, it sells organic soil improvers and fertilizers designed for sustainable agriculture.	Consumers gain access to food produced in a climate-friendly manner, with minimized environmental impact.	The use of organic soil improvers enhances carbon sequestration, soil fertility, crop yields, and biodiversity. This contributes to reducing the environmental footprint of farming.
2	The company cultivates mushrooms using spent coffee grounds as a growing medium. It sells mushrooms and DIY growing kits to private consumers and restaurants.	The solution enables consumers to choose locally grown mushrooms as a sustainable and healthy alternative to meat.	Mushrooms are among the most carbon-neutral food sources. Using coffee grounds as a substrate can make them carbon-negative, while also reducing organic waste.
3	The company designs and constructs industrial plants that convert organic side streams into renewable energy (biogas) and soil improvement products.	Renewable energy produced can replace fossil fuels, e.g., in public transportation. The process also reduces the volume of organic waste.	The solution transforms harmful waste or unused biomass into valuable resources—renewable energy and fertilizer products.
4	The company provides wastewater treatment solutions that separate solids and nutrients from water. Its business model includes constructing, renovating, and operating treatment facilities, particularly in developing countries.	The technology improves access to clean water and enhances farming opportunities through the use of sludge-based soil conditioners.	Treated water can be reused for irrigation or drinking, while sludge can be repurposed for cultivation and land improvement.
5	The company manufactures hybrid biofilters that help farmers mitigate the environmental impact of agriculture. Nutrients captured by the filters are reused as fertilizers and soil improvers.	The solution enhances community resilience and well-being by promoting cleaner groundwater and supporting terrestrial and aquatic ecosystems.	It reduces nutrient runoff, preventing eutrophication and biodiversity loss. Used biofilters also combat soil degradation and increase carbon content.

4.1. Economic value

There is widespread agreement in the literature that regenerative businesses aim to give more than they take, striving for a net positive impact (Muñoz & Branzei, 2021; Polman & Winston, 2021; Mang & Reed, 2020; Perey & Benn, 2015). To achieve this, regenerative business models pursue multi-capital optimization and impact accounting, considering both positive and negative effects. Case 1 represents a circular economy (CE) company that manufactures recycled agricultural fertilizers and soil improvement products from side streams (waste streams) received from the agricultural, forestry, and bioenergy industries. As part of its business model, the company also provides side stream management services to industrial partners. The final products—organic soil improvers and fertilizers—are made entirely from recycled industrial side streams and are sold to farmers who follow sustainable farming practices. Case company 2 produces mushrooms using spent coffee grounds as a cultivation medium. It sells both fresh mushrooms and do-it-yourself kits for individuals interested in growing their own mushrooms. The mushrooms are also sold directly to restaurants. Case company 3 designs and constructs industrial plants where organic side streams (waste) are processed into renewable energy (biogas) and soil improvement and fertilizer products. The biogas is delivered for use as vehicle fuel, while the fertilizer products are sold for agricultural purposes. In the solution provided by case company 4, wastewater is treated through a biological-chemical process that separates water, solids, and nutrients. The treated water can be reused for irrigation or recycled as drinking water. In collaboration with its

partners, the company produces organic fertilizers and soil conditioners from sludge, which can be used for cultivation or other land improvement purposes. Case company 5 manufactures hybrid biofilters that offer affordable and practical solutions for reducing the environmental impact of agricultural activities. The nutrients captured by the biofilters can be reused as fertilizers, thereby reducing the need for chemical alternatives.

4.2. Social value

Creation of social value is central to regenerative business models. Morseletto (2020) argues that regenerative organizations promote the self-renewing capacity of natural systems through a co-evolutionary process, in which organizational activities are aligned with the living systems that surround them. This alignment fosters resilience and adaptive capacity in the face of disturbances, enhancing the health of both nature and human communities—within what are known as social-ecological systems (Hahn & Tampe, 2021; Muñoz & Branzei, 2021). The literature consistently suggests that organizations operating under regenerative business models offer a value proposition centered on planetary health, benefiting both nature and society at large (Gerhards & Greenwood, 2021; Hahn & Tampe, 2021; Konietzko et al., 2023). The company cases presented in this paper illustrate this value proposition in various societal contexts. For example, the solution offered by case company 1 makes sustainable agricultural practices more accessible to farmers by utilizing recycled materials in a cost-effective manner and supporting their transition to regenerative farming. This, in turn, promotes climate-smart and environmentally friendly food production. Case company 2 enables consumers to choose locally grown mushrooms over meat, offering a more ecologically sustainable and health-conscious dietary option. In case 3, social value is created through a business model that transforms organic waste from households and industry into valuable resources such as biogas and nutrients. The biogas is used to fuel buses, thereby enabling low-emission public transportation. The solution developed by case company 4 provides an ecological wastewater treatment system designed for use in developing countries. Through the separation of solids and nutrients from water, the company improves access to clean water while also producing sludge-based soil conditioners that enhance farming opportunities. Finally, the biofilter technology manufactured by case company 5 helps reduce the environmental impact of agriculture, resulting in cleaner and healthier groundwater. This contributes positively to community resilience and social well-being.

4.3. Environmental value

Organizations with regenerative business models offer a value proposition centered on planetary health, benefiting both nature and society at large (Gerhards & Greenwood, 2021; Hahn & Tampe, 2021). In terms of value creation for society and nature, these organizations co-create products and services that are beneficial to both people and the environment, in collaboration with customers, suppliers, and partners (Konietzko et al., 2023). One of the core principles of regenerative business models is the concept of net positive impact, which is achieved when an organization's handprint exceeds its footprint (Muñoz & Branzei, 2021; Norris et al., 2021). The handprint refers to the positive impact or contribution a product or service makes in the market, while the footprint represents the negative impact it generates throughout its life cycle. Thus, regenerative organizations can achieve a net positive impact on nature when their ecological footprint is smaller than their handprint. This can be realized by creating products and services that, for example, store more carbon than they emit, replenish more water than they consume, or contribute to increased species abundance (Norris et al., 2021; Hahn & Tampe, 2021). This principle of maximizing ecological handprint while minimizing footprint is clearly evident in the CE-based cases discussed in this article. In case 1, the organic soil improvers produced from industrial side streams can enhance carbon sequestration in agricultural fields, while also improving soil fertility, crop yields, and biodiversity—resulting in a clear positive environmental impact. The solution of case company 2 involves local mushroom production using recycled coffee grounds as a growing medium, which can even render the process carbon negative. Simultaneously, it utilizes organic waste, making the handprint significantly larger than the footprint. In case company 3, the solution transforms otherwise

harmful waste or unused biomass into renewable fuels (biogas) and fertilizer products. A single biogas plant can reduce approximately 9,000 tons of carbon dioxide equivalent emissions annually. The biogas is used as fuel in vehicles, such as public transport buses, which emit significantly less than those powered by fossil fuels. Additionally, the renewable fertilizers contribute to improved soil fertility, together resulting in a substantially greater handprint than footprint. In case 4, the business model focuses on renewing water treatment facilities, particularly in developing countries. The solution generates multiple positive impacts (handprints), including the production of clean water for agricultural irrigation or drinking purposes. Moreover, the sludge is repurposed for cultivation and land improvement in agriculture. The biofilter technology developed by case company 5 reduces nutrient runoff into waterways, thereby preventing eutrophication and biodiversity loss. Further positive impact is achieved through the reuse of spent biofilters, which help mitigate soil degradation and increase carbon content.

5. Discussion

Building on previous research on CE business models (e.g. Konietzko et al., 2023; Morseletto, 2020; Bocken et al., 2014; Geissdoerfer, Vladimirova, and Evans, 2018; Boons et al., 2013; Hahn and Tampe, 2021), the theoretical framework of this article is structured around three main business model types: circular, sustainable, and regenerative, as illustrated in Figure 1 and summarized in Table 1. The literature largely agrees that these categories overlap, making it difficult to draw precise boundaries between them. As Konietzko et al. (2023) conclude, these models "provide different normative and sometimes overlapping perspectives on value creation for future-fit organizations." However, a primary distinction can be made based on the principles outlined in Section 2.

From a research perspective, this study makes two key contributions. First, it addresses existing gaps in sustainable business model research by providing empirical insights into regenerative concepts and strategies, particularly how they are implemented in CE SMEs. In doing so, the study responds to calls for a comprehensive evaluation of regenerative business cases and patterns (Das and Bocken, 2024; Konietzko et al., 2023). As Das and Bocken (2024, p. 530) note, "not much is known about how regenerative business models are realized in practice, how they relate to their social and ecological environment, and how firms can approach embedding such strategies in their business models." Konietzko (2023, p. 384) identifies three key principles of regenerative organizations, derived from literature and empirical findings: 1) recognition that human societies are deeply embedded in the biosphere, and that they depend on the health of the biosphere for their own health; 2) value proposition of planetary health and societal wellbeing to nature and society at large; and 3) giving more than they take and strive for net positive impact. The analysis of five CE SMEs that have adopted regenerative principles reveals alignment with these principles. First, all case companies go beyond balancing economic, social, and environmental value creation (i.e., the triple bottom line) by explicitly contributing to planetary health and wellbeing, as summarized in Table 3. Second, each business model clearly aims for a net positive impact (Norris et al., 2021). These models are designed not only for profitability but also to generate positive societal and ecological outcomes. Central to each case is the ambition to maximize their handprint—actively improving nature rather than merely reducing harm.

Second, this study advances understanding of regenerative strategies in CE companies and highlights distinctions between regenerative, sustainable, and circular business models. According to Konietzko et al. (2023), the key difference lies in their foundational perspectives. Sustainable models focus on reducing environmental harm; circular models aim for resource efficiency and closed-loop systems; regenerative models adopt a holistic view, emphasizing how economic activity can enhance ecological systems. Thus, regenerative models create and deliver value across multiple stakeholder levels (Hahn and Tampe, 2021; Konietzko et al., 2023; Das and Bocken, 2024). Morseletto (2020) further distinguishes regenerative models by their goal of reactivating ecological processes degraded by human activity, as opposed to merely restoring previous states. The literature consistently emphasizes that regenerative models aim not only to minimize negative impacts but to achieve a net positive impact (Hahn and Tampe, 2021; Konietzko et al., 2023; Muñoz and Branzei,

2021). This is realized when an organization's handprint exceeds its footprint (Norris et al., 2021), achieved through a balance of economic, social, and environmental value creation. The business models of the CE companies analyzed in this study were examined through these three theoretical lenses. The findings show that all cases aim to improve and renew natural processes—such as soil and water conditions—thus positioning nature as a key stakeholder. In this sense, regenerative business models in CE differ from others by explicitly targeting a net positive impact on nature. Rather than merely minimizing environmental harm or conserving resources, these models actively seek to enhance natural systems. Importantly, all cases also demonstrated positive societal impacts, such as cleaner environments and improved access to fresh water.

6. Conclusion

When considering sustainable development and sustainability, companies typically focus on reducing their negative environmental impacts—in other words, the goal is to do less bad. Regenerative activities, by contrast, go a step further by aiming to improve the state of nature and generate positive outcomes for society and the economy—essentially, to do more good. This study provides initial empirical insights into the regenerative business models of SMEs. It contributes to the business model literature, particularly to research on sustainable business models, by clarifying the definition and framework of regenerative business models. This is achieved through practically oriented evidence from CE SMEs that have embedded regenerative principles into their business models. The findings and perspectives on how regenerative models differ from sustainable or circular ones may be of particular interest to both scholars and practitioners in these fields. The illustrative cases presented in this paper demonstrate that regenerative companies can also be profitable, and that regenerative business models can be successfully applied and developed within the SME sector.

6.1. Practical implications

Understanding and applying regenerative principles within CE business models can pave the way toward a more responsible future. These principles incorporate strategies that go beyond achieving net-zero goals by actively restoring the natural and social systems in which companies operate—ultimately aiming to create a net positive impact. Regeneration is increasingly recognized as a necessary concept, and prior literature suggests that adopting regenerative practices can offer strategic advantages, such as improved future risk management and the development of resilient business ecosystems. The real-world cases presented in this study provide practical examples of CE SMEs integrating regenerative and socially responsible practices into their business models. These cases demonstrate that small businesses, too, can adopt regenerative strategies and leverage various CE-related innovations while maintaining financial viability to support both their operations and employees.

6.2. Policy implications

Policy work at various levels offers multiple opportunities to promote social equality and planetary health by supporting the dissemination and implementation of regenerative principles. These principles represent a logical next step in enhancing the impact of sustainable development—often guided by the United Nations' Sustainable Development Goals—by providing more powerful means to address global grand challenges such as climate change, biodiversity loss, and growing social inequality. The findings of this study have several implications for policymakers aiming to foster the development and diffusion of regenerative business models within the CE, particularly in the SME sector. Based on the observed gaps in conceptual clarity and practical implementation, the following policy actions are proposed. First, there is a need to develop a shared understanding and formal definition of regenerative business models—not only within the CE sector but also more broadly across the business landscape. Although the concept of regeneration is frequently referenced in CE contexts, it remains ambiguously defined and inconsistently applied. Policymakers, in collaboration with

researchers, industry stakeholders, and other relevant actors, should initiate the development of a comprehensive framework that clearly distinguishes regenerative business models from sustainable and circular ones. Such a framework would provide a solid foundation for coherent policy design, funding allocation, and business support. Second, there is a need to develop evaluation frameworks and metrics to better understand the impact of regenerative activities. Policymakers should support and promote the creation of standardized indicators that capture the economic, social, and environmental dimensions of regeneration. These metrics could be used to monitor progress, inform policy adjustments, and guide decision-making. Third, to accelerate the adoption of regenerative practices among small companies, targeted policy actions for SMEs are essential. This is particularly important, as many regenerative companies are small and operate within local ecosystems. Scaling up their operations and replicating their regenerative practices is therefore crucial for increasing their impact on a broader scale. Given their limited resources and capacity for experimentation and development, SMEs would benefit from dedicated policy measures that specifically reward regenerative strategies. These could include, for example, funding instruments, tax incentives, and innovation support schemes. Such incentive structures should prioritize business models that demonstrate positive environmental and social impacts beyond resource efficiency and recycling. Fourth, the development of capabilities and the dissemination of knowledge are essential to overcoming the current lack of empirical guidance on implementing regenerative strategies. Policymakers could support the creation of training programs, practical toolkits, and learning platforms that enable SMEs to adopt, develop, and scale regenerative practices. Facilitating collaboration between academia, business networks, and public agencies can further enhance the diffusion of best practices and foster a supportive ecosystem for regenerative innovation.

6.3. Limitations

This study aimed to enhance the understanding of regenerative business models through a multiple case study approach. Throughout the research process, several methodological choices and limitations were made, leaving multiple promising avenues for future exploration. First, the scope of this study is limited to Finnish CE SMEs operating in the agriculture and food production sectors. This focus restricts the generalizability of the findings to other national contexts, company sizes, and industry sectors. Future research should incorporate empirical case studies from diverse regional and industrial settings to enable comparative analyses. The emphasis on SMEs was intentional, given the current scarcity of larger companies actively engaging in regenerative business practices. At present, SMEs appear to be the primary drivers of regenerative innovation. Nevertheless, it would be valuable to investigate how regenerative principles are—or could be—adopted by larger corporations. Second, the empirical data used in this study was secondary and collected through qualitative methods. As a result, the study lacks quantitative evidence, and the researchers had no control over the data collection process or the interview themes emphasized. Future research should aim to gather both quantitative data and rich, first-hand qualitative data, using methods such as interviews, workshops, and direct observations. Third, all SMEs examined in this study were characterized by regenerative business models. To enable empirical comparisons across different types of CE business models, further research should also include cases representing circular and sustainable models. Finally, the CE business model framework employed in this study focused on three value creation dimensions: economic, social, and environmental. This framework could be expanded to include additional dimensions—such as emotional value—which may offer new insights, particularly when examining value creation from a more holistic perspective.

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Data Availability The interview data is confidential and is not publicly available. Summaries of the materials can be found on the Sitra webpage (https://arkisto.sitra.fi/en/projects/interesting-companies-circular-economy-finland/), and some of the company cases used in this paper are also summarised there.

Declarations

Competing interests The authors declare no competing interests.

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