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Scaling of Circular Business Models in Europe's Circular Economy

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1 Introduction

Scaling circular business models is crucial to realising the transition towards a truly circular economy in Europe. While recent years have witnessed a surge in pilot projects, innovative start-ups and niche initiatives demonstrating circular practices, their overall scaling and thereby impact remains limited without broader systemic uptake across Europe. Scaling circular business models is not only about achieving greater market presence. It is about building the foundation for a resilient economy, through structural shifts in how products and services are designed produced, processed, used, reused and recycled.

At its core, scaling is about amplifying the positive environmental, climate and social impacts of circular innovation. Scaling circular business models also raises new questions. Unlike traditional business models, that are focused on maximising growth or turnover, circular business models often have more heterogenous motivations. While cost savings, new business opportunities, profit and growth are definitely important factors supporting economic resilience, also factors alike emission reductions, reducing environmental and climate impacts, sustainable consumption, social inclusion and biodiversity protection can be motivators. Scaling circular business models thus requires a balance between this broad set of factors. Understanding what successful and optimal scaling means for circular business models is therefore essential for guiding policy, business strategy, and investment priorities.

Despite their potential, circular business models often encounter significant obstacles when trying to scale. Many promising models remain confined to local initiatives or early adopter markets, facing barriers related to supply chain rigidity, technological limitations, producer and consumer behaviour, and policy or other lock-ins. Others may suffer from viability or investment challenges, since revenues in circular business models are typically long-term and may pose different risks and uncertainties, making it challenging to attract funding. Scaling may also generate trade-offs: while growth may bring efficiency gains and economies of scale, it may also risk losing connection with original sustainability aspirations or cause environmental, climate or social rebound effects if not carefully managed.

Furthermore, not all circular business models follow the same scaling pathways. Models based on eco-design and longer product lifetimes, for example, face different challenges than access-based or recycling business models (Mejía-Vélez et al., 2026). Context matters as well: scaling a circular start-up differs fundamentally from scaling circular initiatives within large existing firms. Recognising these variations is key to identifying conditions for success.

In 2021, the European Environment Agency (EEA) developed a conceptual framework for enabling circular business models (EEA, 2021; ETC/WMGE, 2021b). It identified three types of innovation (business model, technical and social innovation) and two types of enablers (policy and education/behavioural change) that are key drivers of circular business models. This framework remains the foundation for understanding how circular initiatives can emerge and be supported. Building further on this framework, this report takes the next step by investigating how emerging circular business models can scale beyond pilot success or niche scale. By integrating insights from the EEA framework with recent literature and real-world developments, we explore the conditions under which circular models move from niche to norm. We also connect to related ETC/EEA work and illustrate insights with examples from key value chains.

This report addresses four main questions:

1. What do we mean by scaling circular business models?
   Scaling can involve a business model growing larger, the replication of smaller models, or systemically embedding circular practices through scaling up, scaling out, or scaling deep. Importantly, scaling circular business models is not necessarily synonymous with growth; it may also aim towards other aims, such as environmental or social impact, resilience, sufficiency and wellbeing.

2. Why do some circular business models scale and others not?
   We examine the drivers, enablers and barriers to scaling, considering differences across innovation and business types and identifying lock-ins that hinder broader adoption.

3. What is optimal scaling of circular business models?
   We explore whether there is a minimum viable scale and when a transformation point towards widespread adoption can be reached. We also study potential unintended rebound effects of scaling, balancing economic viability with desirable environmental and climate impact.

The analysis in this report is based on a combination of complementary research methods. First, a literature review was conducted to synthesise existing knowledge on circular business model scaling, drawing from academic research, EU institutions, international organisations, policy reports and sector-specific studies. Second, case studies were selected from different value chains to illustrate how circular business models scale in practice, capturing tangible examples of challenges and successes. Third, targeted expert interviews were carried out to fill gaps in the literature, validate key findings, and provide additional insights into emerging trends, scaling dynamics, and boundary conditions affecting the scaling of circular models.

The structure of the report is as follows:

Chapter 2 outlines recent trends in the uptake of circular business models in Europe, examining available data and knowledge, identifying developments across different business model archetypes (longevity and durability models, access-based models, reuse/remanufacture and recycling/material reuse), and highlighting some knowledge gaps.

Chapter 3 reflects on the EEA's existing framework for circular business models and advances the discussion by introducing different perspectives on scaling, including concepts such as scaling out, up, and deep, as well as the conditions necessary for successful scaling.

Chapter 4 applies this adapted framework to five key enablers, studying their impact on the core of circular business models; how they contribute to different scaling strategies; and how they support the achievement of different leverage points along the scaling journey. Concrete examples are given throughout this chapter to illustrate. Each section is concluded with actionable insights for key stakeholders, such as policymakers, businesses, civil society and researchers.

2 Circular business models in Europe

Developing and adopting circular business models at a wider scale is necessary to achieve circularity ambitions in the EU and to meet overarching environmental and climate goals. Interest in such models from policymakers is already high and continues to grow. This is reflected in the European Green Deal, the EU Circular Economy Action Plan (CEAP) and the forthcoming Circular Economy Act (CEA), which together set out a policy framework to accelerate the shift to resource-efficient, low-waste and climate-neutral production and consumption, including the promotion of circular business models. Circular businesses aim to use resources more efficiently over product and material lifecycles, contributing to reduced resource use and associated environmental impacts.

In this report, circular business models are understood in a broad sense, encompassing both new circular ventures and changes to existing businesses. This includes the creation of circular start-ups, the diversification of incumbent firms into circular activities, acquisitions of circular businesses, and the transformation of conventional business models towards circular strategies (Geissdoerfer et al., 2023).

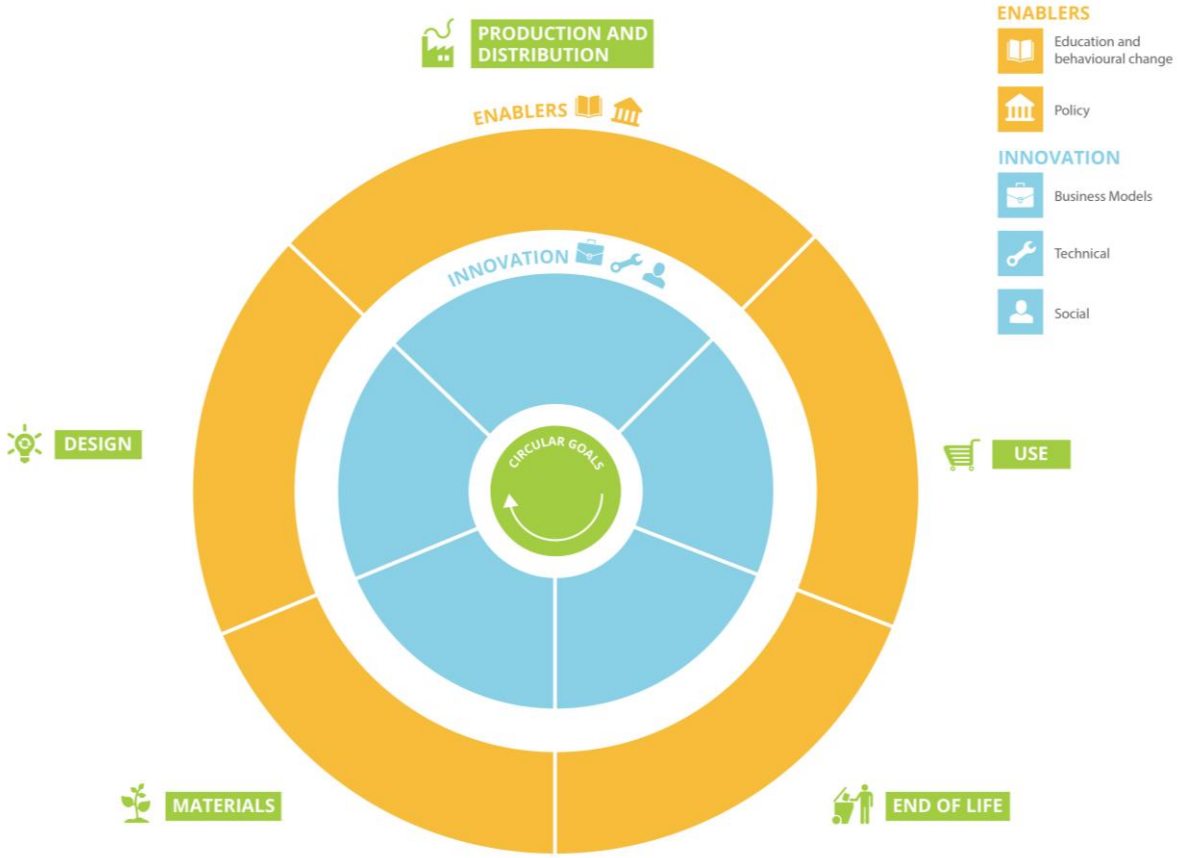
The European Environment Agency's framework on circular business models (EEA, 2021; ETC/WMGE, 2021b) highlighted that a successful circular economy relies on innovation supported by key enablers as a basis for the circular business models to achieve circular goals. This chapter takes stock of how circular business models are evolving in Europe, with examples from key value chains. It explores developments across the main circular business model archetypes – longevity and durability, access-based, reuse and remanufacture, and recycling and material reuse – and points to opportunities to strengthen monitoring of circular business activity.

2.1 Enabling circular business models: The EEA framework from 2021

In 2021, the EEA published an analytical framework for circular business innovation, starting from circular goals throughout the value chain, integrating different types of innovation (business model, technical and social) and relying on different enablers (policy and education/behavioural change) (EEA, 2021; ETC/WMGE, 2021b).

In a circular business model, circular activities such as reuse, repair and recycling, can be implemented in all phases of the life cycle or value chain by implementing different strategies to create, deliver and capture value. Each value chain phase encompasses different actors and activities, and thus circularity goals and adopted strategies can differ. The development and scaling of circular business models requires an interplay and alignment between technical, social and business model innovation (Coscieme et al., 2022). Moreover, enablers need to be in place to support their implementation and adoption, to create a circular ecosystem (Konietzko et al., 2020, 2024). These elements are presented in Figure 2.1 and briefly described in Box 1.

Figure 2.1 EEA 2021 Analytical framework for circular business models



Source: ETC/WMGE (2021b), EEA (2021)

Box 1: Elements of the EEA Framework for Enabling Circular Business Models

Business model innovation refers to changes in a company's value proposition, the way it creates and delivers value, and how it captures value. In the context of circularity, this innovation could involve designing an entirely new business model or adopting a model that, while common in other companies or sectors, is new to the company itself.

Technical innovation is an iterative process of developing a technology-based invention, as well as the identification of new market or service opportunities for this development.

Social innovation involves creating new solutions and processes that achieve societal goals. It fosters changes in behaviour, enhances capabilities and relationships, and promotes the more effective use of resources and assets.

Policy enablers play a vital role by creating a supportive environment for the different types of innovation. This includes establishing appropriate laws and regulations, offering financial support, providing economic incentives, and implementing other supportive policies.

Behavioural and educational enablers are essential for scaling innovations as the purchasing choices of millions of consumers can either accelerate or hinder the adoption and scaling of circular business models. For this transition to succeed, consumers must be informed, enabled, and motivated to embrace circular products and services.

Building on the EEA framework, this chapter provides an overview of the current status and recent trends in the development and adoption of circular business models across Europe. It assesses the extent to which key types of innovation have happened and how enabling conditions have progressed, while also identifying persistent challenges. Drawing on available data, research, and sector-specific examples, the chapter examines the evolution of different circular business model archetypes — including longevity and durability models, access-based models, reuse and remanufacture models, and recycling and material reuse models — to offer a nuanced picture of circular economy developments across systems of production and consumption.

2.2 Developments in circular business models in Europe

General developments of circular business models in Europe

There has been general but rather slow progress towards a circular economy across Member States in the EU, and widespread adoption of circular business models is not yet evident (ECA, 2023) (EEA, 2024a). In this section, progress is assessed using a set of complementary indicators: economy-wide material flow metrics (in particular the circular material use rate), statistics on the size and employment of circular economy sectors, data on private and public investment, and selected proxies for business practice such as eco-innovation and ecolabel uptake, as well as survey results. None of these measures on its own fully captures the development of circular business models in Europe, but together they provide an indication of the overall scale and direction of change.

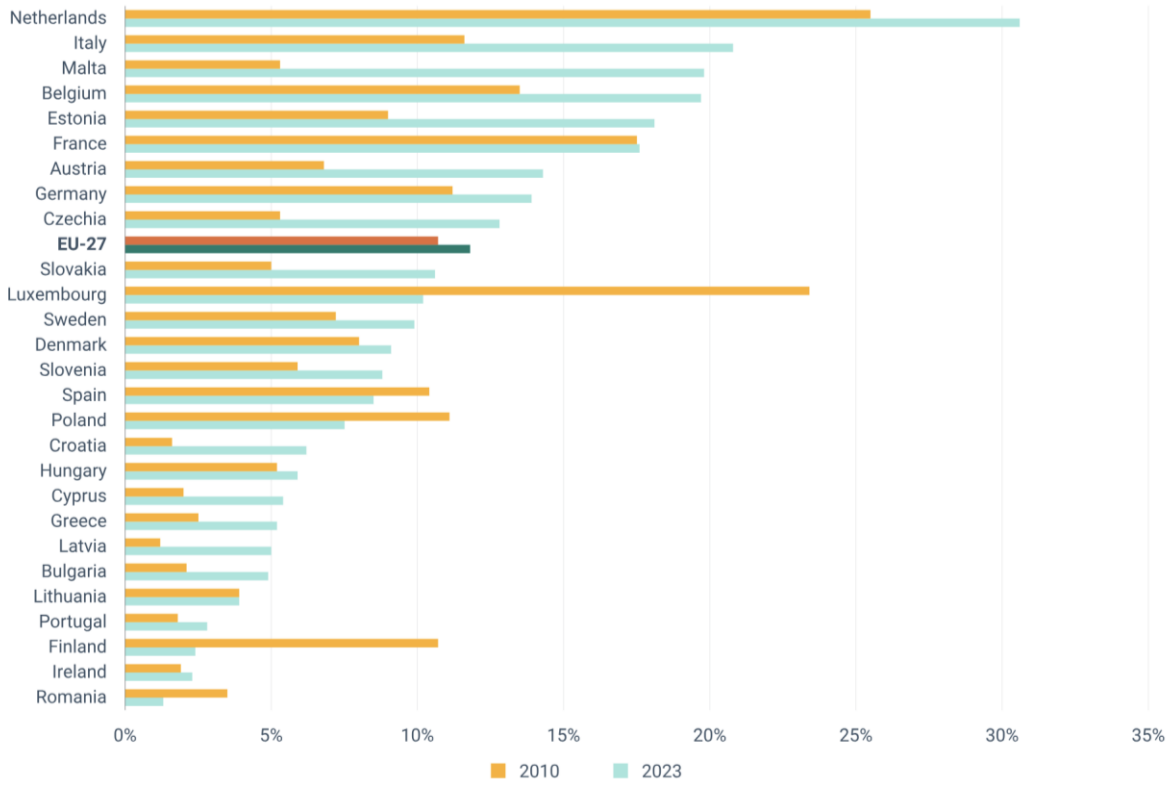
While some indications exist that companies and other economic actors operating in Europe have made progress in the adoption of technical, business and/or social innovations for sustainability and circularity (e.g. design for durability or repair services), overall circular business practices still account only for a small share of EU economic activity. Similarly, progress has been made in developing enabling policies, such as the Ecodesign for Sustainable Products Regulation (ESPR) and sector-specific legislation. Still, more efforts are needed to achieve the goals of the Circular Economy Action Plan (CEAP) to move to a resource-efficient, low-waste, and climate-neutral economy.

From a material-flow perspective, circularity is captured primarily through the circular material use rate (CMUR), which measures the share of secondary materials in total material use. Thus, the CMUR can be improved by increasing the use of recycled materials and/or reducing the use of primary materials. Other circular strategies, such as reuse, repair, product-life extension or product-as-a-service models, are only reflected indirectly through reduced waste generation and lower demand for primary materials and are discussed in more detail in later sections of this report. The EU aims to double the share of recycled materials in total material use between 2020 and 2030. By 2023, recycled materials accounted for 11.8% of material use, representing an increase of just 1.1 percentage points since 2010 (European Environment Agency, 2025c). This indicates rather slow progress and that Europe's economy remains mostly linear in terms of resource inputs. Moreover, as the circular material use rate (CMUR) is a relative measure, the environmental and climate impacts associated with material use are expected to worsen, since overall material supply and demand are projected to rise further by 2030. The circular material use rate varies considerably between material types, ranging from nearly 25% for metal ores to just over 3% for fossil-based materials in 2023 (European Environment Agency, 2025c).

This variation is largely due to differences in composition and use, as metals are technically easier and more economically feasible to recycle, whereas fossil fuels are predominantly burned during use, rendering recycling impossible. Structural factors such as available recycling capacities and levels of material consumption between EU countries also have a significant impact on the CMUR. In 2023, the CMUR ranged from 30.6% in the Netherlands to just 1.3% in Romania. The highest absolute increases between 2010 and 2023 were observed in Malta, Italy, Estonia, Austria, Czechia, Belgium and Slovakia. However, the trend is not uniformly positive. Several countries, including Luxembourg, Finland, Spain, and

Poland, experienced a decline in their CMUR over the same period (European Environment Agency, 2025c) (Figure 2.2).

Figure 2.2 Circular Material Use Rate (CMUR) by EU country, 2010 and 2023

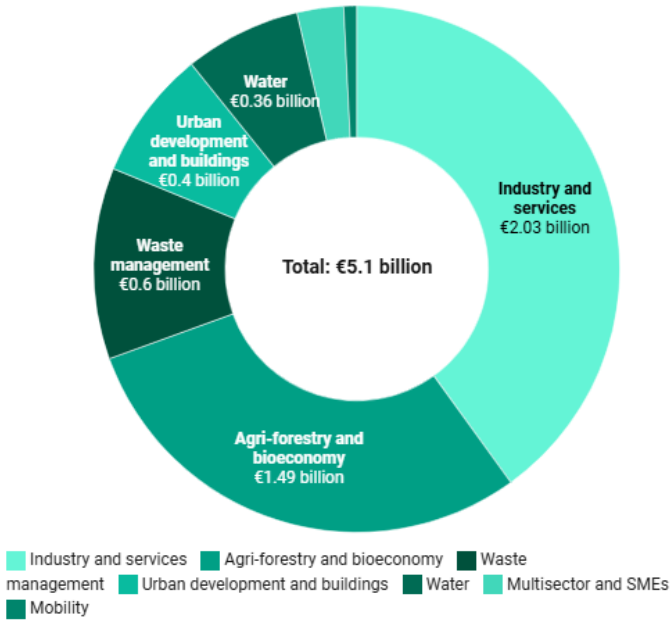


Source: Graphic from (European Environment Agency, 2025c) based on data from Eurostat (env_ac_cur).

At the overarching economic level, circular economy sectors accounted for 1.8% of the gross domestic product (GDP) in the EU in 2023, compared 1.6% in 2008 (Eurostat, n.d.). Employment in these sectors followed a similar upward trend between 2005 and 2021, although a slight decline occurred after 2021. The most recent employment data, from 2023, indicates that approximately 4.4 million people were employed in the circular economy, representing about 2% of all jobs in the EU (Eurostat, n.d.). These numbers include activities related to several circular strategies, including recycling, repair and reuse, while jobs related to circular product design remain more difficult to assess or estimate.

Between 2008 and 2023, private investments in these sectors have remained relatively constant between 0.7% - 1% of GDP, reaching 0.8% in 2023 (European Environment Agency, 2024b; Eurostat, n.d.). In parallel, financing from public institutions has grown, with the European Investment Bank (EIB) increasing its support for circular economy projects from EUR 3.83 billion in 2019–2023 to EUR 5.1 billion in 2020–2024, co-financing 153 projects across a range of sectors (European Investment Bank, 2024, 2025) (Figure 2.3). Overall, circular economy business models and other initiatives are attracting a significant amount of finance from both private and public funding. The Platform on Sustainable Finance (PSF) estimates current annual circular economy investment at the EU-level at EUR 18 billion out of EUR 764 billion of sustainable investment flows (PSF, 2025).

Figure 2.3 EIB circular economy financing (2020-2024)

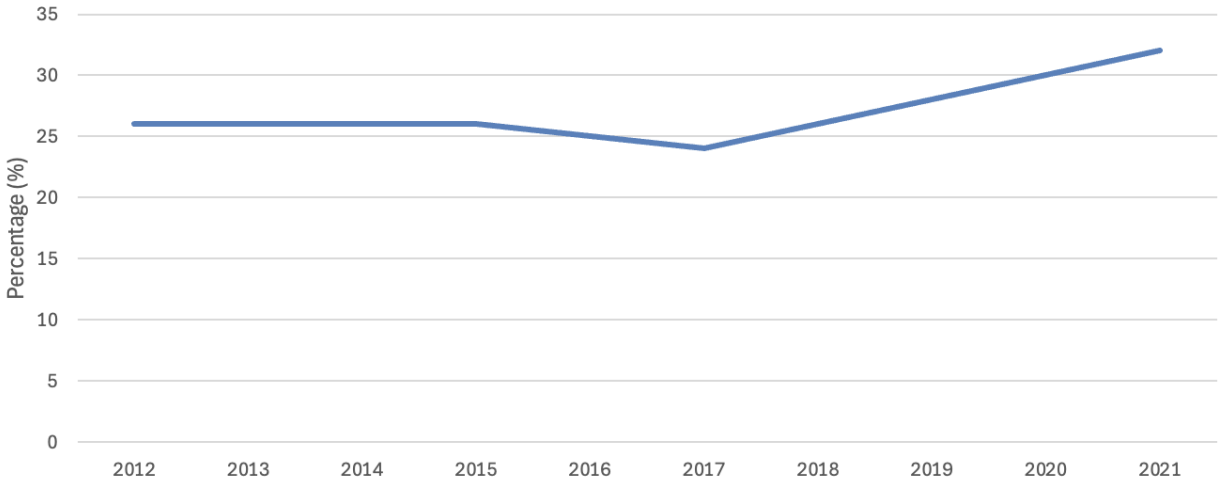


Source: EIB (2025)

Looking at Environmental, Social and Governance (ESG) performance of the largest European companies, metrics have improved, but additional efforts are required to align their greenhouse gas (GHG) emission reduction targets with the 1.5°C climate goal (European Environment Agency, 2024c). While no comparable data are available for small and medium-sized enterprises (SMEs), it is expected that they will drive much of the pioneering and innovative circular business development. According to Eurobarometer surveys, 32% of SMEs in the EU already offer products or services that aim to reduce environmental risk and minimise pollution and resource use (Figure 2.4), while an additional 11% plan to do so in the next two years (European Environment Agency, n.d., 2024a). As this definition is very broad, it leaves room for and cannot be equated directly with increased circularity. Furthermore, the data are based on self-reported data by companies, which may distort the picture as firms can overstate their environmental engagement for reputational reasons or interpret the definition of those activities differently. For the textile sector, a recent survey with 326 textile companies shows a similar trend. Here, 42% of companies state that they have adopted a green technology or business model (Izsak & Moreno, 2024). While this indicates some progress, it is mainly related to the use of recycled materials and thus represents a limited aspect of the circular economy.

Increasing efforts to drive environmentally focused innovation are also reflected in the steadily improving performance of the EU in the Eco-innovation index, which is mostly related to increased resource efficiency and reduction in GHG emissions per unit of production (EC, 2024; European Environment Agency, 2024e). However, this also measures other outputs and activities, such as the number of patents related to eco-innovation or the number of ISO 14001 certificates by companies implementing environmental management systems. While this is thus not limited to implementing circular economy activities, it still reflects a broader shift towards business practices that seek to be environmentally beneficial. However, these data also show that the change is happening gradually and not (yet) at a disruptive scale or speed.

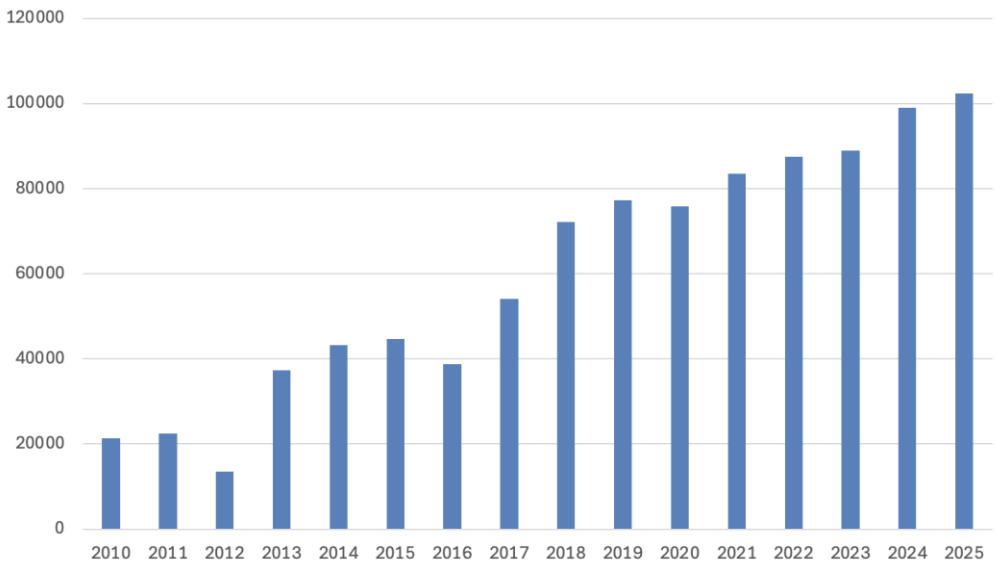
Figure 2.4 Share of SMEs in the EU offering products and services that aim to reduce environmental risk and minimise pollution and resource use, 2012-2021



Source: ETC CE, based on data from EEA Circular Metrics Lab (2023)

Furthermore, certifications of the European Ecolabel are the highest ever registered, with over 100 000 certified products in 2025 (DG Environment, 2024) (Figure 2.5). Among all certified products, the certification is most popular for indoor and outdoor paints and varnishes (36%), tissue paper and tissue products (19%) and textiles (11%), while the highest growth rate is in the tourist accommodation services (DG Environment, 2024). From a circular economy perspective, the relevance of the European Ecolabel lies primarily in its ecodesign criteria, for example on durability, reparability, recyclability and reduced use of hazardous substances, which are closely aligned with current developments under the Ecodesign for Sustainable Products Regulation (ESPR). The growth in certifications can therefore be read as an indication that such circular design principles are gaining traction in these product groups. More broadly, it points to a shift towards production with lower environmental impacts and a growing consumer demand for products and services that are less harmful to the environment. At the same time, studies of eco-labelling point to a risk of moral licensing and rebound effects, where buying "environmentally friendly" products is associated with higher overall resource use and can legitimise higher levels of consumption (Barkemeyer et al., 2023).

Figure 2.5 Number of EU Ecolabel Certifications, 2010-2025



Source: ETC CE, based on data provided from DG Environment (2024)

Looking at circular business models specifically, there are only limited data available, which are mostly anecdotical. There is evidence of successful cases in many different sectors, such as construction, textiles and packaging, where companies have adopted circular approaches and firmly integrated these principles into their business models. More than 300 companies in the Nordics provide product-as-a-service solutions, which can contribute to reducing environmental and climate impacts compared to traditional ownership models (Egebæk et al., 2024). This includes a wide range of companies, such as clothing rental services, reusable cup systems, and car-sharing models.

However, despite stronger regulatory support and growing investment in circular innovation, circular businesses remain niche. This reflects the persistence of technical, cultural, economic and political barriers, which will be discussed further in the following chapters of this report. There are only a few cases that have the potential to disrupt the status quo and lead to more fundamental changes within a sector or system. One example is Vinted, a fast-scaling digital marketplace for second-hand fashion that now operates in 23 countries across Europe and demonstrates how circular business models can reach a wider consumer segment. At an overarching level, however, the focus continues to lie predominantly on waste management, with end-of-life handling of products remaining the most mature and established area of the circular economy (EEA, 2024a). Thus, more support is needed to implement circular practices on a wider scale so that they can create large scale systemic impacts.

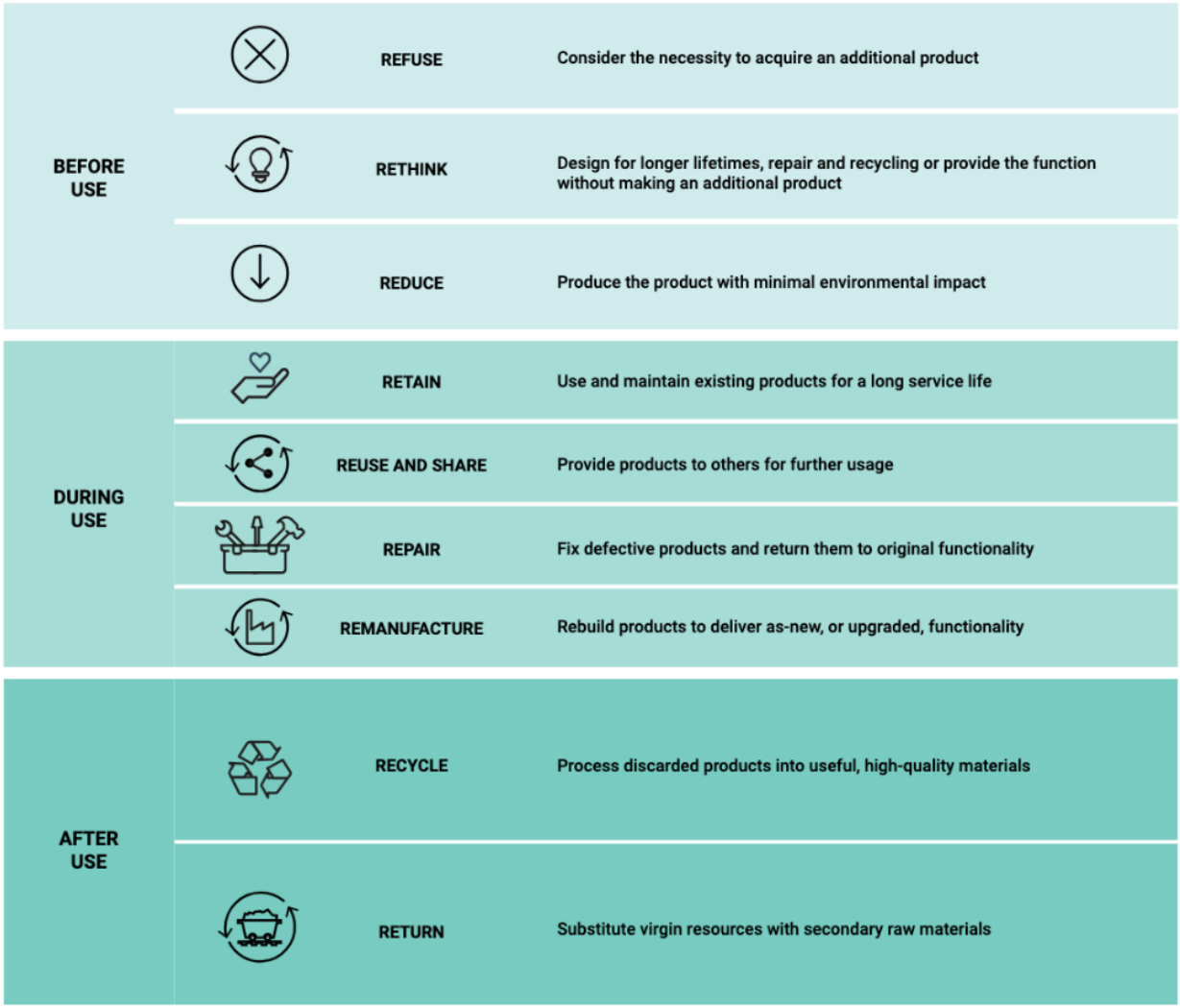
Archetypes of Circular Business Models

There are many ways to assess and classify different business models for a circular economy. Most commonly, the classification is based on their value strategy, that is, how circular business models propose, create, deliver and capture value (Bocken et al., 2016). Through this perspective, it is possible to understand what value is generated and for whom, as well as the mechanisms behind it. Depending on their value strategy, circular business models incorporate different actions for increased circularity within the product or service chain. This value strategy will also determine the specific scaling challenges and opportunities these business models may face.

The EEA has identified actions needed to transition to increased circularity successfully as a further elaboration of the “Reduce, reuse, recycle” concept and the R-strategies developed by Potting et al. (2017) (European Environment Agency, 2024a; Potting et al., 2017) (Figure 2.6). Each of the R-strategies contributes to preserving resource use or keeping products and materials circulating longer. There is a hierarchy in the R-strategies, reaching from higher sustainability at the beginning of the material value chain to lower sustainability at the waste recovery and treatment stage. Hereby, actions are distinguished before, during, and after use that contribute to retaining the value of products and materials (European Environment Agency, 2024a). It is a useful framework for categorising the key actions for the circular economy along the entire product lifecycle, from design to end-of-life treatment.

Despite the hierarchy, the best circularity approach depends on the specific case and should always be based on a system-wide approach (Circularise, 2023). Furthermore, since resource efficiency gains are often offset by increasing production and consumption levels, there is an increasing focus on sufficiency to stay within planetary boundaries (European Environment Agency, 2024a; Niessen & Bocken, 2021). This entails limiting unnecessary demand and supply and hence requires a critical assessment of circular business models regarding their actions *before use*.

Figure 2.6 Actions for increased circularity within the product chain



Source: Developed by EEA based on Potting et al., 2017.

Source: European Environment Agency, 2024a

Another way of categorising the implementation of circular strategies by companies is to focus on narrowing, slowing and closing production and use loops, as well as regenerating natural systems (Bocken et al., 2016; Konietzko et al., 2020):

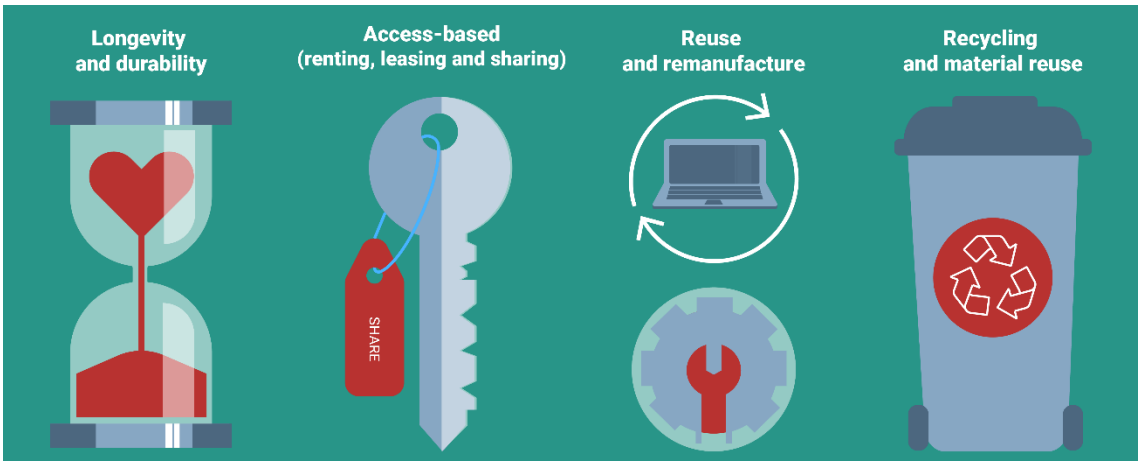
- **Narrowing loops:** increasing resource efficiency, using less material and energy in production and use.
- **Slowing loops:** keeping resources such as products and components in use for longer, extending their lifetime.
- **Closing loops:** using products, components and materials again (e.g. through recycling), eliminating waste.
- **Regenerating natural systems:** ensuring that whatever is used in production does not damage our ecosystems but helps to regenerate them.

Within this categorisation, sufficiency-based approaches are mostly reflected in 'slowing the loops' to reduce overall consumption and material flows, rather than merely increasing resource efficiency. This implies a focus on fulfilling human needs and ensuring decent living standards, while not exceeding the regenerative capacities of natural systems (Kromand et al., 2025). It also aligns with the focus on 'regenerating natural systems' since this would also require the development of business models that integrate system-level goals for sustainability, such as the aim to remain within planetary boundaries

(European Environment Agency, 2024a; Konietzko et al., 2020). In addition, sufficiency-oriented business models also include explicit "refuse" strategies that avoid resource use altogether, for instance by reducing product assortments, limiting the number of collections, or discontinuing low-value products.

Building on previous work by the EEA (ETC/WMGE, 2021a), four (arche)types of circular business models can be distinguished that support the transition towards circularity (Figure 2.7). Each clearly focuses on either narrowing, slowing, or closing the loop, for which they incorporate multiple actions for increased circularity and value retention (R-strategies).

Figure 2.7 Types of circular business models



Source: illustration by EEA

Understanding the different archetypes of circular business models not only sheds light on how circular value is currently created and captured but also provides important insights into the specific scaling challenges and opportunities each model presents.

- **Longevity and durability:** business models focused on producing and selling high-quality, durable products, allowing for a long product life, both from a technical and an emotional perspective. This also includes the provision of modular products that can be easily repaired and where parts can be replaced and reused. This approach is often combined with offering customers maintenance and repair services, or independent businesses offering repair services.

  Business models that incorporate strategies of rethink, retain and repair fall into this category, with the potential to slow down loops of resource use. They are closely linked to sufficiency-based consumption, as they encourage consumers to use fewer products for longer periods of time, thereby reducing overall demand for new resource inputs.

- **Access-based models, based on renting and leasing:** product-as-a-service models create value by providing consumers temporary access to products through sharing, renting, or leasing instead of product ownership. In some cases, companies provide a platform where users can share products with each other. These models can help to increase the use rate of products.

  Business models that incorporate strategies of reuse and share fall into this category, with the potential to narrowing loops of resource use. This requires that companies rethink product design to ensure durability, ease of maintenance, and adaptability, so products can withstand multiple users and extended use over time. These models also align with sufficiency-based consumption, as they shift the focus from ownership to access, encouraging consumers to meet their needs with fewer products overall.

- **Reuse and remanufacture business models:** business models focused on extending the useful life of products and parts beyond the first user. This includes brands taking back their own products for resale in second-hand markets, companies operating in the second-hand market that offer products from different brands, or platforms facilitating second-hand sales between users. In some cases, companies refurbish or remanufacture products before selling them again.

  Business models that incorporate strategies of reuse and share and remanufacture fall into this category, with the potential to slowing down loops of resource use. This requires companies to rethink product design, e.g. to produce modular products that are easy to repair and remanufacture. These models are also connected to sufficiency-based consumption, as they promote extended use and multiple life cycles for products, reducing the need for new production and encouraging consumers to meet their needs with existing resources.

- **Recycling and material reuse:** business models focused on closing the loop, by collecting and sorting discarded products and reusing materials and parts or turning waste into secondary raw materials. This can be pre-consumer waste, such as unsold stock, or post-consumer waste, that is either reused in the production of new products or recycled into new raw materials. Other business models focus on the uptake of reused and recycled materials and hence return them into the product cycle.

  Business models that incorporate strategies of recycle and return fall into this category, with the potential to closing the loop of resource use. This requires companies to rethink product design—not only to ensure products can be easily recycled at the end of their life, but also to enable the use of secondary raw materials in the production process. While less directly linked to sufficiency-based consumption, recycling can support it indirectly by reducing reliance on virgin resources and lowering the material intensity of products consumed.

It is important to note, that many circular business models operate at the intersection of narrowing, slowing, and closing the loops and across multiple R-strategies. For example, design choices that enable product disassembly contribute both to slowing loops by facilitating repair and reuse, and to closing loops by making recycling more feasible. Typically, companies apply a combination of strategies to be most effective in achieving circularity.

For example, business models aiming at enhancing product longevity might focus on rethinking product design, retaining value and repairing products. Furthermore, this might often create opportunities for other companies in the value chain to engage in circular activities. It can be argued that all circular business models ultimately seek to contribute to reduce resource use, and the negative environmental effects related to it. However, there are cases where circular rebound effects occur. This means that potential resource savings are offset by increased productivity and consumption (Zink & Geyer, 2017). From a sufficiency perspective, this highlights the need to complement circular business models with strategies that explicitly promote consuming less overall, not just differently. Without such sufficiency-based approaches, efficiency gains from circularity can be undermined by rebound effects, as lower costs (e.g. from buying used products) or greater access to products (e.g. from renting products) may stimulate additional demand.

There are no official statistics on the prevalence of the different types of circular business models. However, different data sources provide insights into the adoption of circular practices and business models across Europe. While it is not possible to get detailed insights into all sectors, examples from sectors with high circularity potential, such as transportation, construction and textiles, provide a more nuanced understanding of the developments.

2.3 Longevity and durability models – what developments do we see?

Extending product lifespans is central to advancing circularity and reducing the environmental and climate impacts related to consumption since it can contribute to lowering the demand for new materials and products. Premature disposal of consumer goods leads to 261 million tons of CO2-equivalent emissions, 30 million tonnes of resources, and 35 million tonnes of waste in the EU each year and citizens lose around 12 billion Euro each year by replacing goods rather than repairing them (EC, 2023). This illustrates the role of both technical innovation (durable products) and social innovation (shifting producer and consumer behaviour) towards longer use. At EU level, recent legislation seeks to enable this shift. The Ecodesign for Sustainable Products Regulation (ESPR) aims to incentivise the shift towards more repairable and durable products, while the Right to Repair Directive explicitly strives to strengthen the provisions related to the repair of goods, allowing consumers to seek affordable repair from professional repairers. However, recent analysis of the ESPR preparatory work on textiles and footwear has questioned whether the eco-design criteria and related performance indicators for durability and lifetime extension are underpinned by robust evidence (Kassatly & Townsend, 2024). At a national and regional level, Member States such as France and Germany have implemented additional policy measures to support the uptake of professional repair activities.

In France, a repair bonus scheme was introduced in 2022 for electronic and household appliances and extended in 2023 to textiles and shoes. Under the scheme, consumers receive an immediate discount when using an authorised repairer, with funding provided through Producer Responsibility Schemes. The results have been significant: in 2023, more than 165.000 electronic repairs were subsidised, and by 2024 over 5.000 companies had been certified for electronic product repairs (Halte à l'Obsolescence Programmée, 2024). For textiles and shoes, more than 1500 professional repair shops have joined the scheme, supporting over one million repairs to date (Re_fashion, 2025). Despite these successes, challenges remain. An evaluation by the French NGO HOP found that consumer awareness of the scheme remained low after its first year, the number of certified repairers remained limited, and the eligibility criteria for subsidised repairs were initially too restrictive (Halte à l'Obsolescence Programmée, 2024). These findings underline the importance of further strengthening such initiatives to ensure they reach their full potential. Consistent with this need for stronger measures, France is also advancing a draft law to reduce the environmental impacts of the textile sector, including provisions for a future ban on advertising for 'ultra-fast fashion', thereby complementing repair incentives by addressing the promotion of short-lived products (Service d'Information du Gouvernement, 2025).

In Germany, regional repair bonus schemes have been introduced, such as the Reparaturbonus Thüringen for domestic electrical appliances. This support programme has been in place since 2021 and reimburses 50 % of repair costs up to 100 euros per person and year; as well as all costs for spare parts for repairs carried out in repair cafés (Verbraucherzentrale Thüringen, n.d.). An evaluation for the funding period 2021–2023 finds that the scheme has supported around 30.000 repairs, avoided approximately 2.970 tonnes of CO_2 equivalents and prevented about 390 tonnes of electronic waste. More than one-third of surveyed consumers stated they would not have repaired their appliances without the bonus, and many professional repairers report increased appreciation for repair services (Poppe et al., 2024).

Developments in product repair

The provision of repair services enables products to be used longer, extending their lifespan. In the coming years, an increase in repair activity is expected due to the implementation of the EU Right to Repair Directive and other EU legislation such as the ESPR. In the EU, access to repair is also closely linked to consumer protection regulation. The Sale of Goods Directive (EU 2019/771) defines a legal guarantee of conformity which gives consumers a right to free repair or replacement of non-conforming goods for at least two years after delivery, with refund as an alternative option where repair or replacement is not possible. In practice, however, product replacement – and not repair - has been the standard solution. Thus, the new Right to Repair Directive aims to shift incentives towards repair (Right to Repair & IFIXIT,

2024). Repair activities are typically labour-intensive, and the development of jobs in this sector therefore reflects the trends in professional repair activities. Most repair activities are performed by SMEs contributing to local job creation in the EU (EEA, n.d.).

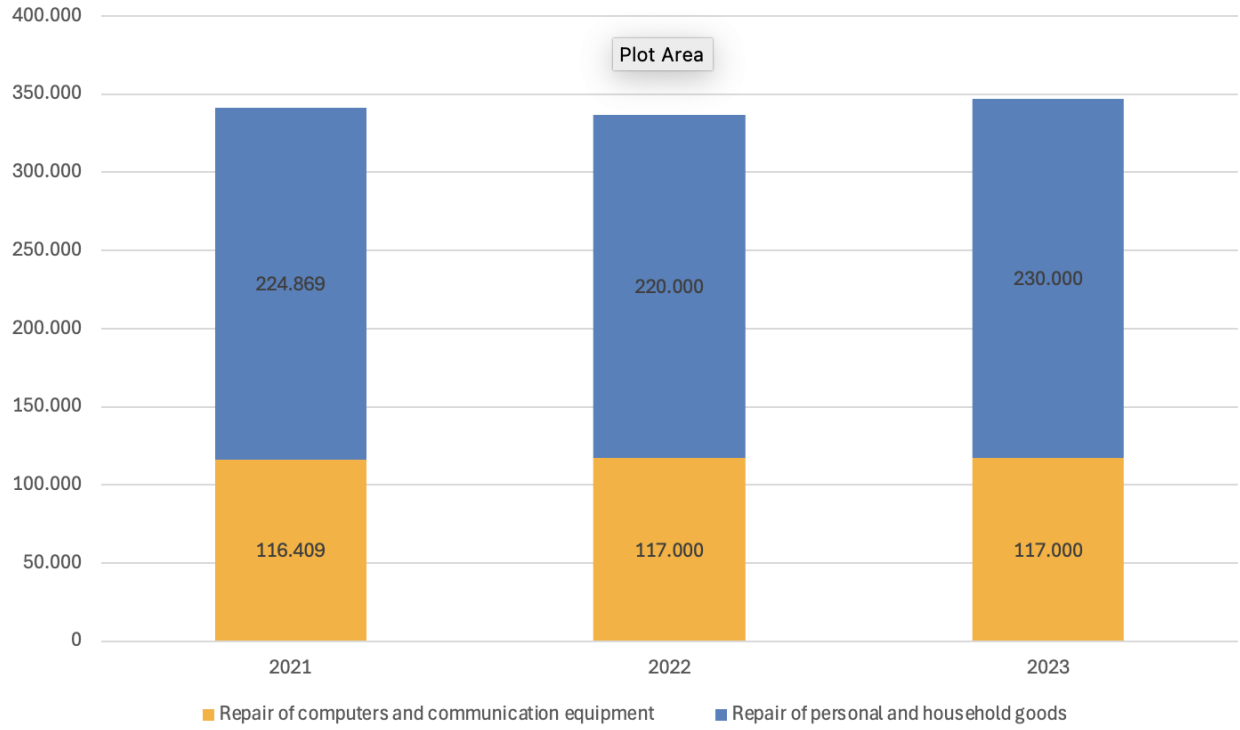
Between 2021 and 2023, employment in the formal repair sector across the EU remained relatively stable, with nearly 350,000 individuals working in the sector[1]. This corresponds to less than 0.2% of total employment in the EU. The majority are employed in the repair of personal and household goods—a category that encompasses a broad range of services, including the repair of household appliances, home and garden equipment, furniture, watches, bicycles, clothing, and more. Around 50,000 people are employed specifically in the repair of computers and communication equipment, covering devices such as desktop computers, laptops and mobile phones, among others.

In those repair categories combined, there was a slight increase in employment from 2022 to 2023, while the number of registered companies in these categories declined slightly, from nearly 198.000 to 196.436 (Figure 2.8). Although most repair businesses remain small in size, this slight drop in the number of companies could suggest a shift towards fewer but larger enterprises with more employees. Interestingly, despite the significant disparity in employment between the repair of personal and household goods and the repair of computers and communication equipment, both categories generated a similar turnover of approximately EUR 13 billion in 2023, indicating a much higher productivity in the latter.

Note that these figures are an underestimation of the true scale of repair activities. Many repair shops are micro-enterprises consisting of only the owner, who is not formally registered as an employee, and thus not reflected in employment statistics. In addition, a substantial share of repair work, e.g. warranty-related repairs, is carried out by staff in retail establishments, such as electronics or appliance stores, who are classified under NACE retail categories rather than repair, and therefore fall outside the scope of the reported data. Thus, these official statistics only include data from companies that operate within repair as their main activity.

[1] Based on Eurostat data for NACE Codes 95.1 «Repair of computers and communication equipment» and 95.2. «Repair of personal and household goods». Note that data for 2022 and 2023 is still provisional or estimated (as of 23 April 2025).

Figure 2.8 Number of employees in the B2C repair sector in the EU, 2021-2023



Source: ETC CE, based on Eurostat data (sbs_sc_ovw).

Some professional repair activities take place within the informal economy. A study on smartphone repair in the Netherlands, Poland, and China found that official stores often compete with informal repair services. Additionally, many business owners engaged in informal repair work before formalising their operations (Türkeli et al., 2019). However, there are currently no comprehensive studies on the prevalence of informal repair activities for the EU across other sectors (Van Opstal et al., 2025).

Evidence from regional and city-level studies provide insights into how repair is currently practiced, and what factors are important for the scaling of circular business models in repair. Data from Flanders for 2023 show that most repairs are done at home or through family. Professional repairs accounted for 16.7 % (independent repairers), 12.4% (seller/retailer) and only 5.3% by the producer (Circular Flanders, n.d.c).

A recent study on the informal circular economy in Flanders further indicates that the informal sector plays a substantial role in specific product groups, accounting for almost 20% of paid repairs for household electronic and electronic equipment and around 15% for bikes and multimedia (Van Opstal et al., 2025).

Similar findings emerge from Catalonia, where self-repair is highly, with nearly 70% of respondents having undertaken some form of repair themselves and 60% reporting that they had a product repaired in the past six months. While the study did not differentiate by product type, it highlighted contextual drivers: the proximity of repair services was identified as the most important factor facilitating access to repair. In addition, 80% of respondents stated that they would be willing to pay more for repairable products or services, underlining both the demand for accessible repair and the value placed on durability (Inedit, 2024).

A citizen survey on circular consumption in Copenhagen confirms the variation between product types. Here, 13% of respondents indicated that they had their furniture professionally repaired within the past year, 23% did so for clothing or shoes, 46% for white goods, and 58% for electronic devices such as mobile

phones, computers, cameras, and lamps (Copenhagen Municipality, 2024). This aligns with the findings from Flanders, where professional repair was most common for cars, and very common for bikes and multimedia (Van Opstal et al., 2025).

Developments in product lifespan

Repair plays a critical role in extending the active lifespan of products by keeping them in use and reducing the need for new production. However, repair alone cannot ensure longer product use-times. The potential to extend lifespans is shaped already at the design stage through durability, modularity and ease of disassembly. Circular product design and repair are therefore mutually reinforcing: design determines whether products can be repaired efficiently and affordably, while accessible repair services allow these design features to translate into longer lifespans in practice.

Despite more supportive policy frameworks and first signs of increasing repair activity, there is still limited evidence that product lifespans are improving. Available data suggest that product longevity across Europe is not increasing overall. Household consumption of new products continues to rise, and many items are discarded while still functional or even before being used (EEA, 2024b). A wardrobe study from Norway found that about two-thirds of items are discarded, mainly because of issues regarding size and fit and perceived value, not due to technical wear (Laitala & Grimstad Klepp, 2022). Thus, to successfully extend the active use-time of products, it also requires changes in consumer behaviour and business practices that go beyond the design phase.

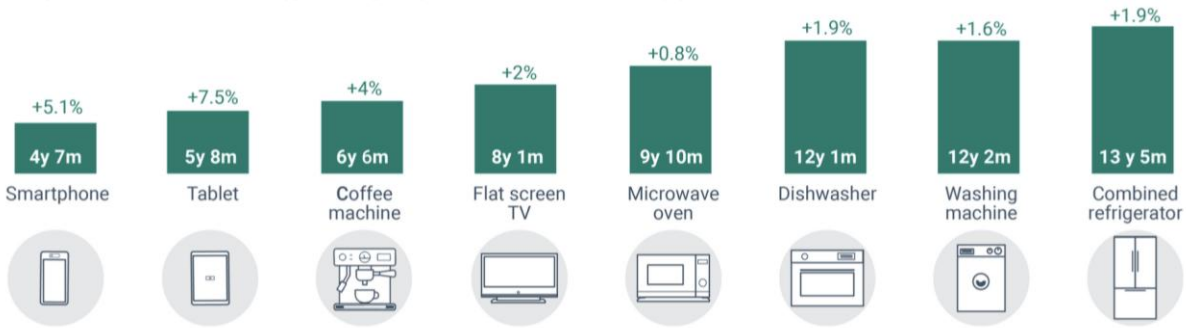
Meanwhile, dominant business models continue to rely on mass production and a continuous quest for cost reductions, which often comes at the expense of quality and leads to premature product breakdown (EEA, 2024a). Evidence from the textiles sector illustrates how this affects product lifespans: A Dutch study finds a decline in the average quality of used garments, as thinner fabrics and cheaper tailoring cause items to fade, deform and wear out after fewer wash cycles (Human Environment and Transport Inspectorate, 2025). Textile sorting centres indicate that a substantially smaller share of collected clothing remains suitable for reuse compared with some years ago, signaling that design and production choices are increasingly limiting the potential use-time of garments from the outset (Human Environment and Transport Inspectorate, 2025). Planned obsolescence further exacerbates the problem, as manufacturers may deliberately limit product durability through technical, software, or aesthetic strategies, thereby accelerating replacement cycles and fuelling overconsumption (HOP, n.d.). According to a EU-wide survey, 77% of EU citizens would rather repair their devices than replace them, and 79% agree that manufacturers should be required to make it easier for digital devices to be repaired or to replace parts (Eurobarometer, 2020).

Nonetheless, some exceptions exist where product lifespans have slightly increased. Euroconsumers collects survey data from consumers on product lifespans and reasons for replacement, showing that the lifespans on household appliances increased by almost 2% between 2019 – 2023. However, respondents preferred replacement over repair for both small and large household appliances since this is considered too costly, both in monetary and non-monetary terms (EEA, 2024b). The high repair costs are driven by wages, spare parts and transport, as well as the increased complexity of products (ETC CE, 2022). Other reasons for replacement were outdated software, such as for hi-tech appliances. Despite the small increase in lifespans for this product category in recent years, more efforts are needed to extend product life, specifically the possibility to repair and upgrade products (EEA, 2024b).

Product lifespans also depend on usage intensity. Previous work by the EEA has examined the use of washing machines to explore this dynamic (European Environment Agency, 2024d) (Figure 2.9). While the average load per cycle has grown, machine sizes have increased in parallel, meaning that a smaller share of the maximum capacity is utilised. Moreover, the stock of washing machines has grown, driven by greater individual ownership. Despite a rise in the overall volume of laundry per person, washing machines are

now used less intensively, with the average number of cycles per year falling from 226 in 1995 to 174 in 2020 (European Environment Agency, 2024d).

Figure 2.9 Lifespan of selected household appliances (years) and increase in 2019-2023 (%)



Source: EEA, 2024d

Summary of developments in longevity and durability models

Recent policy initiatives at EU and national levels mark important steps towards extending product lifespans, particularly by strengthening the conditions for repair. The Ecodesign for Sustainable Products Regulation and the Right to Repair Directive establish new legislative foundations, while national measures such as France's repair bonus illustrate the potential of targeted incentives, alongside the challenges of consumer awareness and scheme design.

Data show that repair activity in the EU is relatively stable, with employment levels steady but a slight decline in the number of companies, which may point to consolidation trends. At the same time, evidence from regional and city-level studies highlights the continued importance of informal and self-repair, with accessibility and affordability shaping consumer behaviour.

Despite these developments, there is little indication that overall product lifespans are increasing. Household consumption of new products continues to rise, and premature replacement remains common due to cost, emotional obsolescence, software obsolescence, or declining product quality. While modest improvements are observable in certain product groups such as household appliances, these remain exceptions rather than widespread trends.

Scaling business models for longevity and durability requires more than technical innovation in product design; it also hinges on supportive policy enablers (e.g., right to repair legislation) and shifts in producer and consumer behaviour towards valuing longevity over novelty. Chapters 3 and 4 explore how scaling strategies can help overcome barriers such as limited repair infrastructure and behavioural inertia.

2.4 Access-based models – what developments do we see?

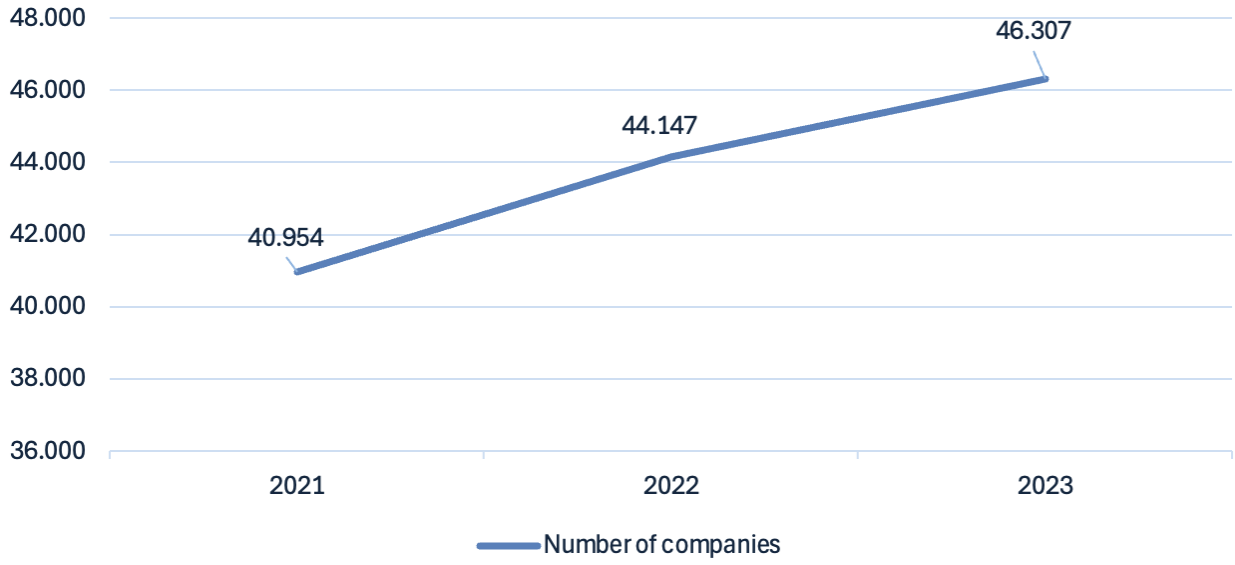
In access-based business models, the ownership of the product remains with the provider, while the customer pays for having access to the product. This illustrates the role of both business model innovation (service offerings) and social innovation (shifting consumer behaviour towards use instead of ownership). For certain product groups, such product-as-a-service (PaaS) models are already widely established, such as linen rental in the hospitality industry and workwear rental services (Egebæk et al., 2024; European Environment Agency, 2024a). In general, such business models are more likely to succeed in B2B[2] markets,

[2] B2B: business to Business; B2G: Business to government; B2C: Business to Consumer

where economies of scale, more efficient customer acquisition and long-term contracts make it easier to achieve economic viability. The expansion into B2C and B2G markets often proves more challenging, as it requires changes in consumer habits and navigation of rigid public procurement processes (Egebæk et al., 2024). Although these models have the potential to reduce environmental and climate impacts from consumption, whether they are realised depends on the design of the business model, user behaviour, and wider system conditions (Sarasini et al., 2024). In some cases, emissions are not reduced and may even be higher than for traditional product sales.

Official statistics on the increase of access-based business models remain scarce since there are few codes in the European statistical classification of economic activities related to rental and leasing services. Statistical data are available for economic activities related to the renting and leasing of personal and household goods, covering a wide range of products including recreational and sports equipment, video tapes and disks, and various other personal and household items (Figure 2.10). This mostly covers short-term rental of goods, although it can, in some instances, also include goods that are leased for longer periods of time. Between 2021 and 2023, the number of companies operating in this sector increased by 13%, with over 46,000 businesses active in the EU in 2023. Turnover grew even more significantly during this period, rising by 26% to reach EUR 21 billion in 2023. Employment also experienced growth, albeit to a lesser extent, with an 8% increase resulting in more than 155,000 people employed in the sector by 2023. This upward trend might indicate a growing demand for access-based consumption, where consumers increasingly opt for renting over ownership. The stronger rise in turnover compared to the number of companies or employees may also indicate gains in efficiency or higher-value services. However, not all of these activities are rooted in circular business principles or explicitly position themselves as part of the circular economy, despite offering rental or leasing services.

Figure 2.10 Number of enterprises in renting and leasing of personal and household goods, 2021-2023



Source: ETC CE, based on Eurostat data (sbs_sc_ovw).

In a citizen survey from Copenhagen (2024), 40% of respondents who had rented or borrowed items in the past year did this via a professional rental service or sharing platform, indicating the relatively high popularity of such services in general, but not providing information on specific product groups (Copenhagen Municipality, 2024). A recent study from Flanders showed that professional suppliers for product sharing are most popular for cars (26.2% of households engaging in product sharing) and, to a much lesser extent, for gardening equipment (5.3%) and bikes (4.8%) (Van Opstal et al., 2025).

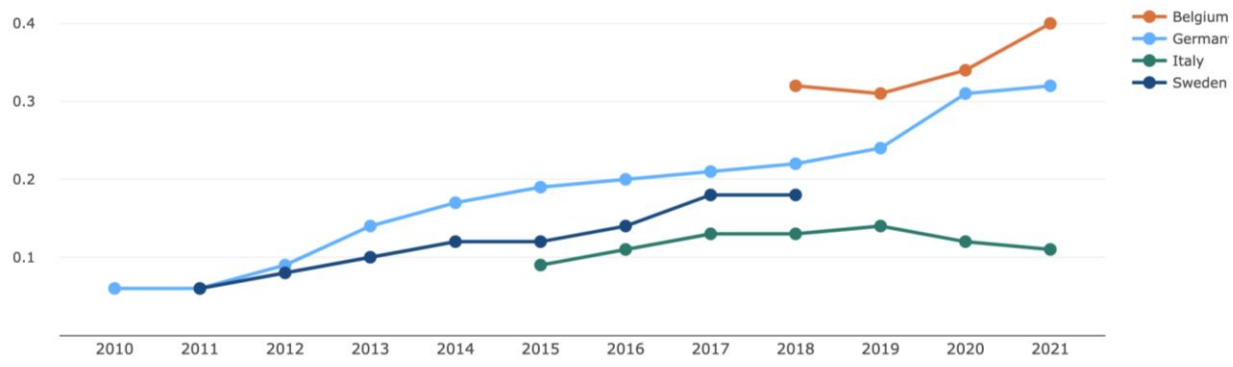
Development of shared mobility models

Additional data exist on the establishment of access-based services for certain sectors, such as car- and bike-sharing models that aim to increase circularity in the transport sector. Car sharing can optimise the intensity of car usage and ideally helps to meet mobility needs with fewer cars. Today, many different product-service solutions exist, such as ride-hailing services (taxis), short-term renting, pay-as-you-go rental and peer-to-peer apps for ridesharing and carpooling (Egebæk et al., 2024). However, while these models may reduce individual car ownership, they also facilitate access to car use, hence potentially leading to increased overall car usage.

Looking at market developments alone does not necessarily provide clear insights into the environmental gains related to this since this depends on what form of transport they replace (Egebæk et al., 2024; ETC CE, 2025). For example, a recent study on free-floating car-sharing services in Copenhagen has found that it mostly substitutes public transport, rather than complementing it. According to their model, free-floating car sharing is a strong competitor to public transport and bike trips, but less so to private car trips (Ingvardson et al., 2023). Thus, while shared mobility models have the potential to lower resource use, they also carry a risk of rebound effects, whereby increased accessibility and convenience may in fact raise overall transport demand and associated resource use.

On a national level, several EU countries have collected data on car sharing in the past years (Figure 2.11). Here, Belgium achieves a higher number of shared cars per 1000 citizens than Germany, Italy, and Sweden. However, the largest increase can be seen in Germany, where the number of cars per 1000 people increased by 460% between 2010 and 2021 (EEA, 2025). While these data do not reflect the uptake of car sharing by members, it still indicates an increased business opportunity that companies are willing to invest in. In Flanders, the trend for car sharing shows a clear acceleration, with more than 170,000 registered users in 2022. Out of these, over 67,000 members made at least one trip with a car-sharing car in the past year (Circular Flanders, n.d.b).

Figure 2.11 Evolution of number of shared cars per 1000 people in Italy, Belgium, Sweden and Germany, 2010-2021



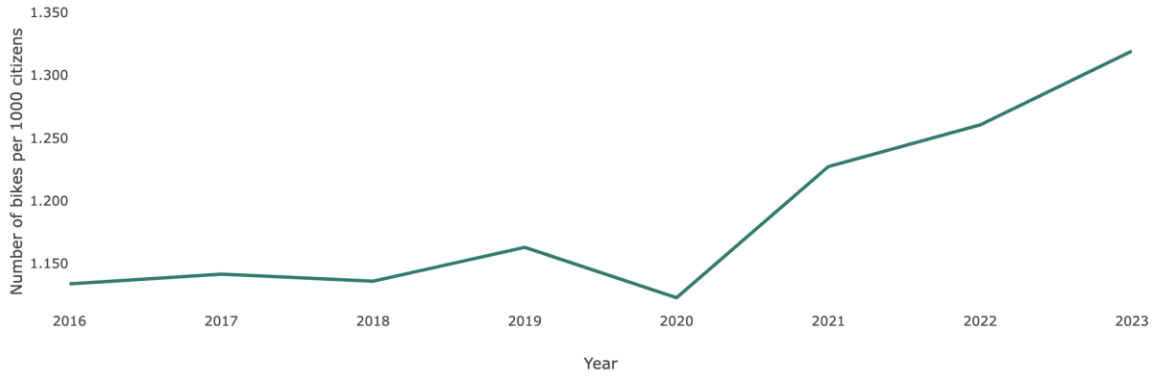
Source: EEA Circularity Metrics Lab (EEA, 2025).

Similarly, bike-sharing systems have been gradually introduced in many European cities and are now an integral part of urban mobility across Europe (Figure 2.12). This includes product-service models such as short-term rentals, long-term rentals or leasing which often includes maintenance and repair services, and bike-sharing systems with designated station for pick up and drop off (Egebæk et al., 2024).

Data for eight European cities show an increasing trend in the availability of bikes per inhabitant in all of them, except in Brussels and Vilnius. Especially the cities Ljubljana, Lund, Luxemburg and Lyon have all witnessed a sharp increase in rental bikes (European Environment Agency, 2025a). The successful establishment and scaling are inter alia driven by investments into cycling infrastructure, integration with other forms of public transport, digitalisation and support from local governments. This highlights the importance of a supportive network and infrastructure for the success of circular business models.

However, many companies still struggle to establish economically viable business models for bike rental and sharing. A key challenge is that these services typically require high levels of support to deliver a flexible, reliable service to customers, thereby increasing maintenance costs (Egebæk et al., 2024). For example, the Dutch bike subscription service Swapfiets had a turnover increase of 37%, with almost 270,000 subscriptions across nine European countries in 2022, but still reported major financial losses (Bike Europe, 2023). The case study "Making Cycling Circular: the case of Swapfiets" shows how existing tax and accounting rules further undermine the financial viability of such product-as-a-service models, as current tax incentives and financial reporting practices tend to favour linear business models over circular ones (Coalition Circular Accounting, 2023).

Figure 2.12 Development of bike sharing systems in European cities, number of bikes per 1000 citizens, 2016-2023



Source: EEA Circularity Metrics Lab (European Environment Agency, 2025a)

Summary of developments for access-based models

Access-based business models are expanding in scope, particularly in rental and leasing services for personal and household goods, where recent years have shown growth in the number of companies, turnover and employment. Survey-based data from Copenhagen and Flanders suggest that consumers are increasingly engaging with such services, though uptake varies considerably across product groups, with stronger demand for cars and mobility-related services than for other categories.

Shared mobility models, especially car- and bike-sharing, are becoming more prominent and illustrate both the opportunities and complexities of access-based approaches. While these models can reduce individual ownership and raise utilisation rates, their environmental and climate benefits are not guaranteed, as substitution effects depend on whether they replace private car trips or more sustainable transport modes. Evidence from several European countries and cities indicates strong growth in the availability of shared vehicles and bicycles, underlining the role of supportive infrastructure and public policy in enabling these services.

Despite positive trends, the economic viability of access-based business models remains a challenge, as rapid expansion has not always translated into profitability. This underlines that scaling such models is not

only a matter of consumer uptake, but also of creating the right conditions for durable success. Access-based models, such as renting and sharing, hold promises for narrowing resource loops by raising product use rates, yet this potential can only be realised if businesses are able to redesign products for multiple users and embed new consumption behaviours. Achieving this requires supportive frameworks that enable both financial sustainability and consumer confidence. As we will discuss in Chapters 3 and 4, this involves strong social innovation, digital infrastructure, and policy measures that level the playing field between access-based and ownership-based models.

2.5 Reuse and remanufacture business models – what developments do we see?

In reuse and remanufacture business models, the focus is on extending the useful life of products and parts beyond the first user. Reuse typically involves passing on a product in its original form with minimal processing, whereas remanufacturing, often referred to as refurbishment, entails restoring a used product to like-new condition through disassembly, repair, and replacement of components.

Development of the reuse sector

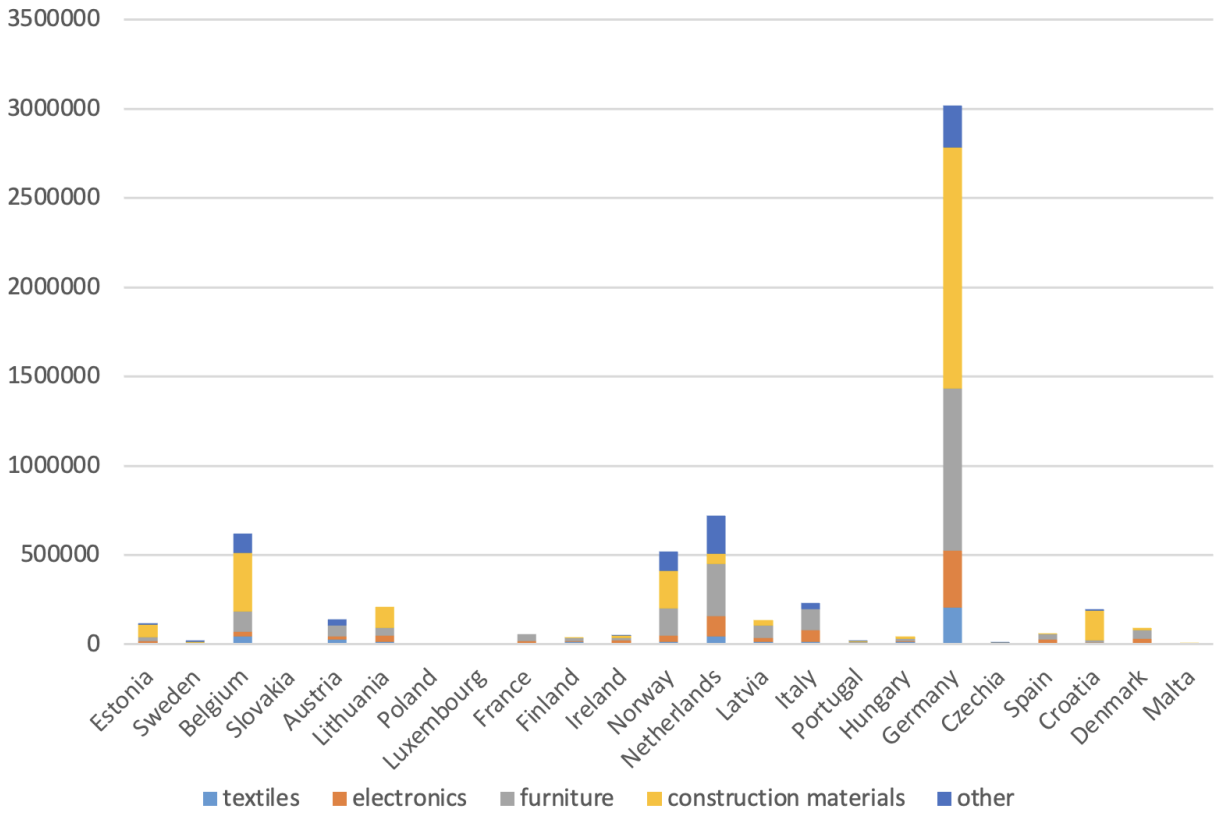
Circular business models in the field of reuse range from charities that offer reuse services to online platforms transforming this sector with web shops and peer-to-peer platforms for selling used goods. However, data on the amount of reuse is generally very limited, and it is important to recognise that informal channels also play an important role in facilitating reuse (Delanoeije & Bachus, 2022). In EU statistics, data are only available for retail sales of second-hand goods in stores[3]. These exclude data on informal reuse channels as well as more recent trends linked to the rise of online marketplaces. For these, only limited company-level data are available. Examples include:

> **Vinted:** a European online marketplace for second-hand clothing and other goods, which had over 105 million registered users in 2023 (Business of Apps, 2025).
>
> **DBA:** a Danish online platform for second-hand items, which registered more than 11 million sales announcements between April 2023 and March 2024 (DBA, 2024).
>
> **CircularPlace:** a French B2B platform focused on promoting the reuse and circular management of business assets, which raised EUR 1.4 million funding in 2024 (CircularPlace, 2024)

As from 2023, Member States are also obliged to monitor reuse for certain product groups, including electrical and electronic equipment, furniture, textiles and construction materials and products, implementing Decision (EU) 2021/19 on the Waste Framework Directive. So far, data are only available for the first reference year, 2021 (Figure 2.13). However, the approaches to data collection vary between Member States, and inter-country comparisons cannot be made on this basis. For example, Belgium extrapolates data from yearly reuse statistics from accredited reuse shops whereas Spain obtained data through surveys addressed to companies operating in the second-hand sectors as well as other organisations that develop initiatives related to reuse. Thus, the robustness of the approaches is not clear yet, since the first reporting cycle provides new challenges in collecting and calculating reuse amounts, and it is expected that the data will improve in the future (EEA, 2024c).

[3] NACE Code G47.7.9 covers “Retail sale of second-hand goods in stores”.

Figure 2.13 Reported amounts of reuse per Member State by category, tonnes in 2021[4]



Note: Germany is an outliner, for which there is no clear explanation at this point. It could be due to difference is measurement method.

Source: data EEA

Survey-based data from Copenhagen show that more than 60% of citizens have bought second-hand items within the last year, in particular clothing and shoes (50.6%), home accessories (39.8 %) and furniture (32.4%). More than half of those who bought second-hand items did this via online marketplaces (58.2 %) and in physical stores (56.5%), such as charity shops and vintage stores (Copenhagen Municipality, 2024). Fashion goods were also the most popular items across reuse channels in Flanders, and they seem to be one of the largest revenue streams in the reuse sector (Van Opstal et al., 2025). More than 60% of those who bought second-hand fashion did so in professional reuse shops and more than 40% acquired items from private persons via online platforms (ibid.). In Copenhagen and Flanders, the findings indicate that informal channels such as acquiring used goods through personal contacts, local swap shops, recycling stations and social media also play an important role.

The environmental and climate benefits of reuse largely depend on whether reusable goods prevent the acquisition of new goods, thus whether they succeed in replacing conventional consumption (Delanoeije & Bachus, 2022). Recent studies indicate that the replacement is often surprisingly low. For example, in Flanders, only 28% of reused goods were found to replace new goods (Delanoeije & Bachus, 2022). Another study from Copenhagen found that the replacement rates vary largely between product categories. For large products with high functional value, the replacement rate is significantly higher than for small products with aesthetic value. The highest overall replacement rate is found among personal electronics (81%) and white goods and household appliances (76%), and is significantly lower for textiles, shoes, and accessories (33%) (Behave Green, 2025). Furthermore, in the US, research finds that buying

[4] For Sweden confidential data was excluded. For other countries, reported zero amounts may either represent that no reuse activity occurred, or otherwise that data was unavailable for reporting.

second-hand is positively correlated with buying new clothing, particularly among younger people and frequent shoppers (Mizrachi & Sharon, 2025). This indicates that second-hand purchasing may contribute to overconsumption and that the environmental benefits from reuse might be lower than anticipated.

At the same time, other studies point to higher levels of displacement. A recent study by WRAP, for instance, found a replacement rate of 64% for peer-to-peer resale in the UK, and that over three in five second-hand clothing purchases displace a new purchase (WRAP, 2025). Overall, different studies find a wide range of displacement rates, reflecting both differences in methodology and the fact that some studies are conducted for specific locations, companies or platforms. In addition, differences will persist based on the markets that organisations serve, the products and services they offer, and the countries they operate in. Typically, these studies rely on displacement-rate surveys, where respondents are asked whether the purchase of a second-hand item prevented the purchase of a new item (WRAP, 2025).

Development of the remanufacturing sector

Business models in remanufacturing seek to retain the product value by preserving the product's functionality and extending its lifespan. Thereby, the remanufactured product is expected to live up to the same quality standards as a new product, and usually also comes with a warranty. Remanufacturing services typically include the dismantling of products, restoring and replacing components if necessary, and product testing to ensure that it meets the quality standards (European Environment Agency, 2024a). It should be noted that there are varying definitions of this activity, without always offering a clear distinction from other value-retention processes, such as refurbishment (ibid.)

There is very limited data available on remanufacturing since it is often a B2B activity, and companies do not necessarily consider themselves remanufacturers even if they engage in such activities (European Environment Agency, 2024a). In some cases, however, company-level data is published, for example:

> *Swappie* is a Finnish company specialising in refurbished smartphones, with more than 2 million customers, over 800 employees, and operations in 11 EU countries (Swappie, 2024).
>
> *AfB* is a German non-profit company that refurbishes electronics. In 2024, the company refurbished ca. 674.000 IT and mobile devices while creating 20 new jobs for people with disabilities (AfB, 2025).
>
> *Borg Automotive* is a Danish company remanufacturing automotive parts, extending the life of automotive components by supplying them to the European aftermarket and Original Equipment Manufacturers (OEMs). It has over 2000 employees and earnings before tax amounting to EUR 20 million for 2023 (Borg Automotive, 2024).

A study by the ETC CE (2021) estimates that remanufacturing markets have not significantly grown between 2014 and 2021, which might be related to slow changes in capital-intensive industries and rather slow development of standards and regulations for remanufactured products (ETC, 2021) (Figure 2.14). However, for certain sectors, such as the aerospace sector, there has been steady growth in remanufacturing. Furthermore, there is high growth potential for electrical and electronic equipment (EEE) and medical equipment. Often, this requires new business models and reverse logistics. For example, remanufacturing can be integrated into product-as-a-service business models to ensure the return of products (ETC, 2021).

Figure 2.14 Estimates of remanufacturing market sizes by sector

Sector	Estimated remanufacturing market size (EUR bn)		
	2014	2021 (low end)	2021 (high end)
Aerospace	12.4	15.2	16.3
Automotive	7.4	9.1	11.9
Heavy-duty and off-road equipment	4.1	4.2	-
Electric and electronic equipment	3.1	4.4	-
Medical equipment	1	1.32	1.4
Machinery	1	1.04	1.4
Rail	0.35	0.43	0.56
Furniture	0.3	0.42	-
Marine	0.08	0.08	0.16

Source: ETC (2021)

Summary of developments for reuse and remanufacture business models

Reuse markets are growing, supported by both traditional second-hand channels and the rapid expansion of online platforms. Survey evidence from cities such as Copenhagen and Flanders shows that second-hand purchasing is widespread, particularly for clothing and fashion goods, though informal exchanges also play an important role. Projections suggest the resale apparel market in Europe could grow from EUR 15.9 billion in 2024 to EUR 26 billion in 2030 (KPMG, 2025). At the same time, replacement rates seem to vary considerably: while reuse of high-value items such as electronics and appliances often displaces the purchase of new goods, this effect is far weaker for categories with lower functional value. This limits the extent to which reuse translates directly into reduced consumption.

Remanufacturing remains less well-documented, with limited statistical data available and only modest signs of market growth in aggregate estimates. According to a Horizon 2020 research project, remanufacturing is projected to reach a market size of EUR 100 billion by 2030 (ERN, 2020). The same study suggests remanufacturing in the EU employs around 192,000 people across more than 7,200 companies. Activity is concentrated in specific sectors such as aerospace, while new opportunities are emerging in electronics and medical equipment. Company-level examples, such as refurbished smartphone providers, illustrate the commercial potential in the B2C sector. However, a broader uptake of refurbishment remains constrained by high capital requirements, the absence of widely recognised standards, and product designs that do not allow for effective repair or refurbishment (Parchomenko et al., 2023).

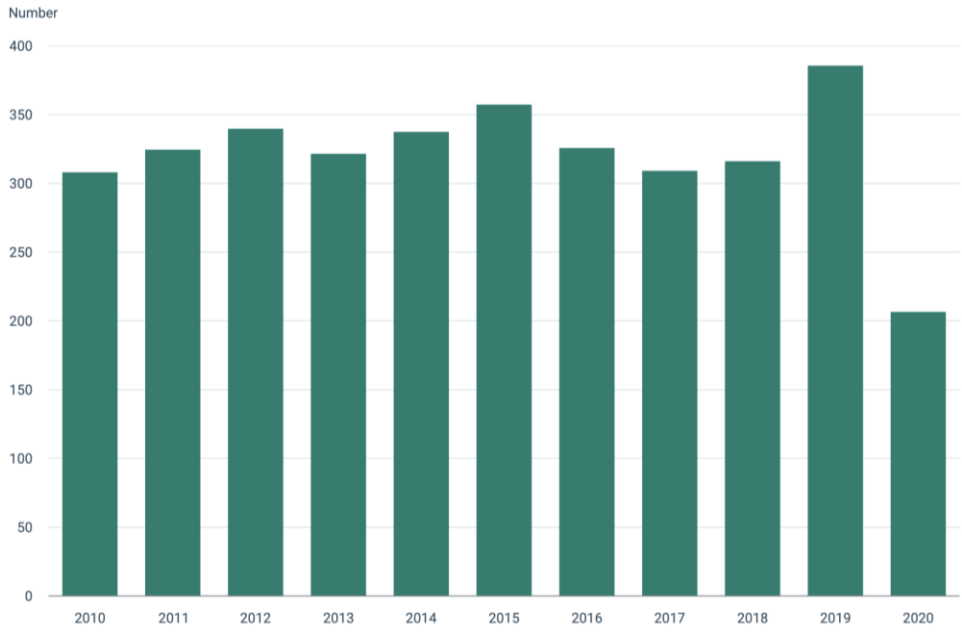
Overall, reuse and remanufacture contribute to extending product lifespans but face persistent challenges related to market maturity, consumer perceptions, and regulatory frameworks. Chapters 3 and 4 will further analyse how different scaling strategies, particularly scaling out through marketplace development and scaling up via policy support, can foster the growth of reuse and remanufacture practices.

2.6 Recycling and material reuse models – what developments do we see?

End-of-life actions are considered the most mature aspect of circular economy, since most policy focus and efforts by industry have been on improving waste management practices (European Environment Agency, 2024b). Patent data can be used as a proxy for the innovation undertaken in an economy (Crosby,

2000). However, it is important to note that patents are more easily acquired for new technologies, such as recycling processes, than for service-oriented concepts, such as product-as-a-service models. Consequently, Eurostat's patent data on recycling and secondary raw materials indicates innovation in circular waste management technologies by EU companies. The number of patents has been relatively stable between 2010 - 2020 [with a drop in 2020 due to Covid-19], despite the strong focus on this part of the circular economy (Figure 2.15). While more recent data is not available, this suggests the need for further intervention to support the development of new technologies and processes that ensure the production of high-quality secondary raw materials that can compete against virgin feedstocks (European Environment Agency, 2024b).

Figure 2.15 Number of patents related to recycling and secondary raw materials, 2010-2020



Source: European Environment Agency (2024b) based on data published by Eurostat.

To effectively close the loop, companies need to replace virgin materials with reused or recycled materials. Overall, it is evident that this is not yet happening on a large scale. Only 11.8% of EU material used comes from recycled waste in 2023 and has only increased by 1% since 2010. The share of recycled waste in total material consumption varies between material groups, and is higher for those materials that are technically easier and economically more attractive to recycle and feed back into the economy, such as metals (European Environment Agency, 2025c).

Developments of recycling and material reuse in different sectors

For the construction sector, data from the Circular Gap report for the Netherlands show that 8% of the sector's total resource consumption comes from secondary materials, and that 88% of construction waste is reused or recycled (Circle Economy, 2022). However, most of the construction waste is recycled or reused for low-grade applications such as road foundation materials, and hence not used at the highest value possible (Circle Economy, 2022). A central reason is the set of economic incentives that continue to favour primary materials. Virgin aggregates and raw materials remain significantly cheaper due to low extraction costs, economies of scale in existing supply chains, and the absence of pricing mechanisms that reflect the environmental externalities of primary production. By contrast, secondary materials often carry higher costs linked to collection, sorting, contamination risks, quality assurance and compliance with technical standards (Circle Economy, 2022).

Concular, a German start-up, has developed the first standard for pre-deconstruction audits (DIN SPEC 91484). This standard supports the recovery of building materials according to the waste hierarchy, and hence increased circularity in construction. They are currently in the process of establishing an international standard which can be implemented into national regulations (Concular, n.d.)

For textiles, Circular Gap report data shows that this share is significantly lower at a global level. Here, only 0.3% of all the materials used in global textile production come from recycled resources (Circle Economy, 2024). Besides fibres, this includes other material inputs such as energy inputs, chemicals and other materials used for example for accessories, zips, coatings or packaging. For recycled fibres specifically, Textile Exchange estimates that they accounted for around 7.6% of global fibre production in 2024, with the vast majority being recycled polyester made from plastic bottles (6.9% of total fibre production) and less than 1% originating from pre- and post-consumer textile waste (Textile Exchange, 2025). For polyester specifically, recent analysis finds that brands continue to favour cheaper virgin polyester or recycled polyester from PET beverage bottles, as recycled polyester produced from European post-consumer textile waste is currently around 2.6 times more expensive than the average cost of virgin polyester in Asia. This provides little economic incentive to incorporate textile-to-textile recycled polyester at scale, despite significant advances in textile recycling technologies (Systemiq, 2025). In terms of environmental impact, European polyester recycling is considered more beneficial than virgin polyester production in Asia for air pollution and greenhouse gas emissions, while environmental impacts related to microplastic release and water use persist (Systemiq, 2025).

While there are no specific data available for the uptake of recycled materials by European textile brands, a recent analysis from May 2024 of the most popular clothing items sold in five different Zalando web shops throughout Europe show that, on average, 8% of these items contained recycled content. However, the share of recycled fibres for the items is unknown (European Environment Agency, 2025b).

Findings from a recent JRC study confirm the challenges in the textile sector: more than 8 million tonnes of textile waste are incinerated or landfilled each year across the EU, while only a small fraction of collected textiles is reused or recycled locally. Mechanical recycling predominates, typically transforming waste into low-value outputs such as cleaning rags or insulation, while closed-loop recycling (producing apparel-grade fibres) remains limited in capacity (Huygens et al., 2023). Furthermore, the European textile sorting and recycling sector is currently facing a severe crisis, driven by an excess supply of used textiles, shrinking demand in its traditional export markets for exporting second-hand textiles, and persistently weak demand for recycled materials. According to industry actors and municipal waste management providers, this increases the risk of textile waste that is now collected separately to end up being incinerated, as well as widespread bankruptcies in the textile recycling and sorting industry (Municipal Waste Europe & EuRIC, 2024).

Similarly, the European plastics recycling sector is facing a deepening crisis. The share of recycled plastics in total plastics use in the EU has increased slightly, reaching around 8.1% in 2020, but it remains low in absolute terms (EEA, 2024d). Recyclers are struggling due to low prices for virgin plastics, cheap imports, high energy costs and weak demand for recyclates, leading to closures and risking that investments into recycling infrastructure are lost. Recent industry assessments indicate that, between 2023 and the end of 2025, Europe is likely to lose recycling facilities corresponding to almost one million tonnes of installed plastics recycling capacity, undermining progress towards EU circular economy (EuRIC, 2025).

Summary of developments for recycling and material reuse models

Recycling and material reuse remain the most established part of the circular economy, supported by longstanding policy attention and a well-established recycling infrastructure. Patent data confirms ongoing

innovation in recycling technologies, though the overall level has remained stable in recent years. At the same time, the share of secondary materials in the EU economy is still modest, with recycled waste accounting for 12.2 % of material consumption in 2024 and showing only marginal growth since 2010 (Eurostat, n.d.). This points towards a lack of demand in secondary raw materials, with the continued availability of cheap primary resources as a key barrier.

Sectoral data illustrates both the advances and limitations of recycling in practice. In construction, high recovery rates are achieved, but materials are often downcycled into lower-value applications. Emerging standards, such as pre-deconstruction audits, signal efforts to raise the quality and value of reuse and recycling. In textiles, progress is much more limited: only a very small share of inputs globally comes from recycled fibres, and among leading retailers in Europe, recycled content remains a minor component of clothing.

Overall, recycling and material reuse are not yet delivering large-scale substitution of virgin materials. High collection rates have not translated into widespread uptake of secondary raw materials, largely due to economic and technological barriers, particularly the lower cost of virgin inputs. Unlocking further progress will require more than technological innovation: stable supply chains, supportive market structures, and policy measures that stimulate demand for high-quality recycled content are equally essential. Chapters 3 and 4 examine the systemic conditions for scaling up recycling efforts and how this can be achieved without reinforcing low-value material loops.

3 A framework on scaling circular business models

3.1 Introduction: different perspectives to scaling

Scaling circular business models is essential for accelerating the transition to a circular economy, yet it remains one of the key challenges faced by businesses seeking to embed circularity into their operations. In order to contribute to a sustainable development, circular business models are challenged to balance economic, environmental, and social value creation in a scalable manner (Bocken et al., 2022). Therefore, a holistic approach to scalability – one that extends beyond organisational and financial growth – is needed to ensure that circular business models contribute meaningfully to a sustainable economic transition, supported by a resilient innovation ecosystem and aligned policy frameworks.

Limited scalability has been identified as a major barrier to a slow implementation of circular business models, even when demand for such circular models can be expected to be high (Coscieme et al., 2022; EEA, 2021; Hultberg & Pal, 2021). While pilot initiatives and start-ups contribute to innovation and technological advancements, their impact depends on the ability to scale beyond niche markets (Rok & Kulik, 2020).

In 2021, the EEA developed an analytical framework for circular business innovation, starting from circular goals throughout the value chain, integrating different types of innovation and relying on different enablers (EEA, 2021; ETC/WMGE, 2021b). The elements of the EEA framework, i.e., business model innovation, technological and social innovation, supportive policies, and behavioural and educational enablers, provide the foundational conditions for enabling circular business models. They establish the necessary groundwork by fostering experimentation, market entry, and early adoption of circular practices. However, while these enablers are critical for getting circular business models off the ground, they are not by themselves sufficient to ensure large-scale systemic impact. Many circular initiatives remain confined to pilot projects, niche markets, or early adopters, unable to break through into the mainstream economy. Moving from isolated successes to system-level transformation requires a deliberate focus on scaling strategies.

Scaling circular business models involves more than simply growing the size or financial revenues of individual businesses. It demands structural changes, cultural shifts, and the creation of supportive ecosystems that allow circular value creation to expand, replicate and deepen across industries and societies. At the same time, circular business models remain embedded in a wider economic system that still rewards linear production and consumption, through price structures, regulatory frameworks, infrastructures and financial norms that favour short-term throughput. A realistic account of scaling therefore needs to acknowledge these systemic barriers and consider how policy, finance and collective action can realign the broader system with circular value creation.

In the following sections, we explore different perspectives on scaling circular business models. We look into several approaches to scaling (scaling out, scaling up, and scaling deep), the strategies and conditions needed for successful scaling, and the critical thresholds that circular businesses must overcome. Throughout, we highlight how successful scaling efforts often depend on deepening or reinforcing the enablers described earlier. Through this lens, we aim to better understand how circular business models can move beyond pilots and prototypes to become the new normal in a sustainable economy.

3.2 Scaling strategies

The term 'scaling' is often used to refer to business ‘growth’: increasing production, generating greater volume and sales and increasing revenues. However, scaling circular business models requires a nuanced understanding of growth that extends beyond conventional economic expansion.

Scaling out, scaling up, and scaling deep

Studies identify three distinct but complementary scaling strategies that need particular consideration beyond just increasing sales or production levels: scaling out, scaling up, and scaling deep (Bauwens, Huybrechts, et al., 2020; Moore et al., 2015; Sandberg & Hultberg, 2021) (Figure 3.1). Instead of focusing on the exact threshold of what defines a 'scale-up' compared to a 'start-up', it is more relevant to investigate how circular businesses can scale (Cavallo et al., 2024). Ways to achieve scaling include franchises, forming formal or informal partnerships with other organisations, directly expanding the business model by opening new offices or service points in different areas, and developing a system to certify or officially recognise organisations that can successfully implement the circular solution (Moore et al., 2015).

Figure 3.1 Circular business models: scaling out, scaling up and scaling deep

Source: illustration by EEA, based on Bauwens et al., 2020; Moore et al., 2015; Sandberg and Hultberg, 2021.

Scaling out involves expanding the number of customers by increasing geographical reach or replicating and diffusing circular business practices. This approach, often largely within a company's control, aligns with conventional business growth strategies but can also foster broader adoption of circular practices as more firms engage in similar models. It often builds on successful business model innovation and technological readiness as critical enablers. Scaling out means applying a proven circular business model in new locations or markets, or encouraging similar firms to adopt comparable practices. In this sense, Lam et al. (2020) distinguish between *growing* (doing the same initiative in a similar context), *replicating* (the same initiative in a dissimilar context), *transferring* (a similar initiative in a similar context) and *spreading* (a similar initiative in a dissimilar context, that is, spreading underlying principles).

By scaling out, companies not only expand their customer base but also contribute to the mainstreaming of circularity across sectors and systems. However, an important challenge for circular business models is the existence of foreign market entry criteria, which are often not readily available or transparent (Yurdaanik Eskiyerli & Ewertz, 2024). These may include national registration requirements for extended producer responsibility (EPR) schemes, diverging definitions of waste and by-products that affect cross-border material flows, or restrictions on the resale of certain categories of goods (e.g., used electronics, medical equipment, or construction materials). Such criteria can hinder cross-border diffusion, even when the business model itself is viable and mature.

> *Too Good To Go* (Denmark/Pan-European) is an app that provides a platform to reduce food waste. The platform connects consumers with restaurants and stores that have unsold food at the end of the day, allowing them to purchase it at a discounted price. Since their launch in 2016, they have reached 100 million registered users and expanded to 19 countries. They claim to have saved over 135 million meals in 2024, avoiding 2,7 kg of CO2 emissions, 810 litres of water and 2,8 m² of land use per saved meal (Too Good to Go, 2024).

Vinted (Lithuania/Pan-European) is a C2C online marketplace for second-hand clothing and other product categories beyond fashion. They operate in 23 markets across Europe, and had over 105 million registered users in 2023 (Business of Apps, 2025). When entering new markets, Vinted ensures that there is a good amount of supply by connecting them with existing markets (e.g. when entering the Dutch market, customers could buy products from France). They have also acquired local platforms as they've expanded, such as Danish platform Trendsales. According to Vinted, this is important for successfully scaling out their business, since consumers want to have choice and expect a similar experience with second-hand shopping than with buying new. However, systematic barriers remain, such as the lack of harmonised legislation, which results in fragmented EPR systems for textiles and makes regulatory compliance across EU Member States challenging[5].

Vytal (Germany) is a German start-up founded in 2019 that offers a digital, deposit-free reusable packaging system for to-go food and drink. According to the company, the core proposition is that customers can borrow high-quality reusable containers from participating restaurants or food service partners via an app, and return them to any partner location, without the barrier of paying a deposit upfront (Vytal, 2025). Beyond ordinary restaurants, Vytal is targeting large-scale events (e.g. Olympics 2024), sports venues, etc. The company has scaled from Germany into 23 other countries, having a partner-network of over 7000 locations. In December 2024 Vytal also entered the U.S. market (GCC Webmag, 2024). Rolling out to new regions demands appropriate wash-cycle capacity, container cleaning, return-station networks, and partner onboarding.

Scaling up involves influencing structural conditions, such as market structures, regulatory frameworks, and policy landscapes, to support broader adoption of circular business models. This requires a systemic change to create an enabling environment for circular practices. In other words, rather than focusing on expanding a single business or model, scaling up aims to transform the broader system in which businesses operate. This might include reforming regulations or procurement rules, introducing supportive standards or adjusting financial incentives. The goal is to remove barriers and create conditions where circular models can thrive across the economy. Here, the role of policy enablers is paramount, as scaling up requires systemic changes beyond the scope of individual or single business models.

Fairphone (Netherlands) designs and produces smartphones with a focus on repairability, modularity and ethical resource use. To succeed in scaling up, Fairphone needed to establish transparent value chains, provide incentives for suppliers to engage in enhanced due diligence processes, and find mission-aligned investors to sustain their growth. By getting involved with the Fair Cobalt Institute and engaging significant industry players such as Google and LG, Fairphone has contributed to "creating new 'rules of the game' in the industry" for cobalt supply chains (Han et al., 2023).

Concular (Germany) helps real estate projects adapt to the growing requirements of EU taxonomy and the circular economy. It led the development of the first standard for pre-deconstruction audits (DIN SPEC 91484), involving a wide range of stakeholders. This standard defines a standard procedure for recording building materials and products before demolition or renovation, to assess their potential for high-quality reuse and recovery. This feeds into recent legislative changes in EU Member States to introduce mandatory pre-deconstruction audits. Concular is currently in the process of establishing an international standard which can be implemented into national regulations (Concular, n.d.)

Reath (UK) offers reusable packaging solutions for businesses and developed an Open Data Standard for reusable packaging, called ‘reuse.id’, enabling companies to create digital passports to track physical items throughout their lifecycle. Their technology and advocacy have contributed

[5] Interview with Vinted on 10.06.2025.

to policy discussions on standardisation and compliance for reusable packaging, driving legislative change that supports circularity (Pun, 2022).

Scaling deep addresses cultural and behavioural shifts, aiming to embed circular principles in societal norms, citizen and consumer mindsets. A shift in citizen values and beliefs, translated into consumer preferences, trust and collaboration, is essential for long-term circular transformation. Indeed, for circular business models to have lasting impact, they must resonate with how people think, consume, and interact - not just with how markets function or policies are defined. While scaling out and scaling up contribute to business expansion and structural change, scaling deep ensures that circular business models become deeply rooted in citizen and consumer culture and in industry practices, fostering acceptance, legitimacy, and everyday relevance. Therefore, scaling deep heavily relies on social innovation and behavioural enablers, such as education, community engagement, and new narratives around ownership and sustainability.

In a growing number of industrialised countries, separate waste collection and sorting habits have become engrained in the everyday behaviour of consumers, enabling the development of a performant recycling sector.

Carsharing services have become more common in urban contexts, where an increasing number of young people no longer own a car but instead have a subscription to a carsharing. The number of shared cars per 1,000 people in Germany increased with as much as 624% between 2010 and 2023 (EEA, 2025).

In practice, circular business models are pursuing all three modes of scaling simultaneously to some extent, so boundaries blur and different modes of scaling may overlap. For example, car-sharing companies combine scaling out (more cities), up (the provision of public parking spots accommodating the model) and deep (ownership-to-access becomes more mainstream).

Towards an optimal scale

Regardless the scaling strategy involved, the **'optimal' scale** of a circular business model requires consideration about its desirability, feasibility, and viability (Bocken et al., 2022)**.** This means that the value proposition aligns with customer needs, as well as helps to reduce environmental impact (desirability), that value creation and delivery are operationally feasible, and that value capture mechanisms ensure financial viability. Beyond economic considerations, the motivations of circular entrepreneurs play a critical role in shaping their scaling ambitions.

Research on motivations of grassroots circular entrepreneurs, for instance, showed that they are primarily driven by non-economic motives, including environmental and social impact (Henry et al., 2023). Their initial focus is often on localised, small-scale impact rather than rapid expansion. However, exposure to peers, mentoring programmes, and incubator initiatives can shift their ambitions over time, leading to a greater emphasis on scaling to amplify environmental and climate benefits beyond small-scale; or to improve economic viability.

Design with Sense (Belgium) is a cooperative dedicated to creating custom-built interior designs from reclaimed materials, adding unique value that reflects clients' aesthetic preferences. Their business model is based on a strong commitment to resource efficiency and circularity, collaboration and local impact. Rather than seeking significant growth in size, they focus on increasing efficiency in their work processes while remaining true to their core mission. To advance knowledge on circular furniture, they actively engage with educational institutions to tell their story and share their expertise (Norion Consult et al., forthcoming).

This illustrates that circular initiatives can also amplify within, either by *stabilising* an initiative so that it continues to deliver impact over a longer period, or by *speeding up* activities within the same scope (Lam et al., 2020). These strategies focus on deepening reliability, continuity and operational maturity rather than geographic expansion or diversification.

Regardless ambitions and aims, to successfully grow circular business models in the short term and achieve an optimal scale, companies need to balance marginal costs and benefits. They can do this by increasing revenues, e.g., by boosting market demand, or by reducing costs through efficient processes and economies of scale. However, as pointed out by Siderius & Zink (2023), such a short-term cost-benefit analysis can lead to short product lifecycles and value assessments based on market prices, which are often misaligned with circular principles.

Therefore, it is important to consider negative and positive externalities. Negative externalities, such as increased transport emissions from scaling, or rebound effects leading to higher overall consumption, can offset environmental and climate gains (Ackermann & Tunn, 2024; Zink & Geyer, 2017). For example, the French company CircularPlace collaborated with the national environmental agency ADEME to develop a carbon impact calculator. The tool is designed to discourage transactions involving reused items where transporting a low-value product over a long distance would cause more environmental harm than benefit[6]. Conversely, positive externalities, such as knowledge spillovers from circular innovations (e.g., on circular design), also occur and may not be included in traditional cost-benefit calculations (Grafström & Aasma, 2021; Jaffe et al., 2005).

Furthermore, cognitive biases also affect how entrepreneurs perceive the optimal scale for their businesses. They might stick to the status quo, underestimating the benefits of scaling due to perceived risks, or overestimate the ease of scaling without fully considering market and regulatory challenges. (Kahneman, 2011). Finally, market systems traditionally prioritise growth and profitability, which may overlook the potential of sufficiency-oriented business models (Bocken & Short, 2016; Niessen & Bocken, 2021).

3.3 Economies of scale

The ideas of scaling out, scaling up, and scaling deep are relatively new compared to the more established concept of economies of scale. Understanding how different forms of economies of scale operate provides useful insight into why many circular business models find it difficult to grow. Economies of scale refer to the advantages that businesses gain when they grow larger, such as producing goods at lower cost, working more efficiently, or reaching more customers. These benefits often depend on new technologies and supportive policies.

Circular business models often face constraints in achieving economies of scale. Activities such as repair, refurbishment, remanufacturing, reverse logistics, and quality assessment tend to be labour intensive and difficult to automate or fully standardise. As a result, unit costs decline more slowly as output increases, which limits competitiveness relative to linear models that are optimised for high volume and throughput (Ellen MacArthur Foundation, 2025). In what follows, three types of economies of scale are explained – those related to production (*supply-side*), to customer behaviour (*demand-side*), and to learning and improvement over time (*dynamic*).

Supply-side economies of scale occur when producing more goods or services lowers average costs. This can happen in two ways. First, internal economies of scale take place within a single business: as a company grows, it can buy materials in bulk, invest in better equipment, or streamline its operations which leads to cost savings (Beccarello & Foggia, 2023). For example, Swappie, a Finnish company specialising in

[6] Interview with CircularPlace on 30.06.2025

refurbished electronics, focuses on a limited range of iPhones and only recently introduced iPads to achieve economies of scale, rather than diversifying into a broader product assortment[7]. However, circular businesses may face more challenges in reaching this stage, especially when trying to grow within a system that still favours linear models. Second, a group of businesses operating in the same sector or region may benefit from external economies of scale: they may experience advantages from shared infrastructure, material flows, knowledge, or supportive policies. Yet, these shared benefits are generally harder to realise for circular businesses. For example, companies that rely on recycled materials need access to large volumes of consistent waste streams. First-movers therefore often struggle because key partners and infrastructure are not in place yet, which is a chicken-and-egg problem. Still, bigger is not always better.

Diseconomies of scale can occur when expansion leads to higher costs or unintended inefficiencies. In circular business models, these might stem from complex reverse logistics or long transport distances, undermining environmental and climate benefits and leading to increased costs. For example, Nudie Jeans, a Swedish denim brand offers free repairs on all its jeans, regardless of where they were purchased. Additionally, as firms grow, decision-making can become slower, and operational flexibility may decrease, making it harder to stay innovative and aligned with circular goals.

Demand-side economies of scale occur when a product or service becomes more valuable as more users adopt it (Varian, 2018). This is especially relevant for circular business models based on sharing, such as car-sharing and tool libraries, or for second-hand platforms, where larger networks improve availability, reduce wait times, and allow a better match of supply with demand. For example, Vinted, a European C2C platform for second-hand clothing dropped the seller fee to increase the number of sellers, which then translates into increased demand - creating a flywheel of supply and demand[8]. Digital platforms for repair or reuse also benefit from such network effects: as more users join, they attract additional buyers, sellers, and services, further enhancing the value of the platform. However, building such networks takes time, especially when trust and behavioural change are needed (Van Opstal & Manshoven, 2024). Reaching a critical mass of users is key. The downside of this is that once established, dominant platforms can become difficult to displace, creating a lock-in effect because switching may be inconvenient or costly (Boukhatmi & Van Opstal, 2025).

Dynamic economies of scale come from learning and improving over time. As circular businesses gain experience, they become more efficient. Mentoring, peer networks, and public support can speed up this process. Early-stage circular entrepreneurs often face challenges like limited experience and uncertainty (Henry et al., 2023; Van Opstal & Borms, 2023), but support from incubators, accelerators or networks can help them to refine their models (Klofsten et al., 2024). Over time, they learn to sense, seize, and reconfigure resources, enabling them to develop and capture additional market segments (scaling out), influence systemic conditions (scaling up), and shift mindsets (scaling deep) (Sandberg & Hultberg, 2021). This is particularly relevant for circular business models as they often need to compete to an already optimised ecology of linear business models (Bocken et al., 2019).

3.4 Supply-chain collaboration

Scaling circular business models requires strong supply chain collaboration. Circular supply chains demand a high degree of integration among value-chain partners to enable product take-back, reuse, remanufacturing, and recycling (De Angelis et al., 2018), heavily relying on collaboration, trust, information sharing and collective action, all of which require social innovation.

Collaboration extends beyond direct suppliers to include policymakers, financial institutions, and even consumers, who play a crucial role in returning materials and extending product lifecycles (Hultberg & Pal,

[7] Written response to questionnaire by Swappie received on 01.08.2025.
[8] Interview with Vinted on 10.06.2025.

2021). Technological enablers, such as digital platforms for product tracking or secondary material marketplaces, are also crucial for enabling transparency and coordination across supply chain partners. At the same time, policy enablers can incentivise or mandate collaborative practices, particularly through extended producer responsibility (EPR) schemes or eco-design regulations.

Internal collaboration within a single industry facilitates the development of closed-loop systems, take-back schemes, reverse logistics, and the creation of secondary markets for reused components (Ayati et al., 2022). An example is the sector of glass packaging, that have developed a closed loop for the recycling of single-use glass containers, as well as a take-back and reuse system for reusable beverage bottles, including some standardisation for beer bottles. This may also require horizontal cooperation between firms that might traditionally see each other as competitors (De Angelis et al., 2018). For example, companies that collaborate on warehousing, transportation, and distribution can reduce costs, improve efficiency and enhance their overall competitiveness.

Cross-industry collaboration, on the other hand, generates opportunities for industrial symbiosis, where by-products from one sector serve as inputs for another (Ciulli et al., 2022).

> *Kalundborg Symbiosis* (Denmark) is a partnership between 17 public and private companies in Kalundborg, where resources such as energy, water, and materials are shared (Kalundborg Symbiosis, 2025). For instance, the Asnæs Power Station provides steam to Novo Nordisk and other companies, while Novo Nordisk supplies surplus yeast slurry to local farmers.
>
> The *Prato textile district* in Italy is an industrial symbiosis centred on the recovery of materials from used clothing, consisting of about 7000 fashion enterprises that span clothing, furnishing textiles, and yarn production. The district has crafted a highly interconnected system for recycling textile production waste, garment offcuts, and used clothing, processing over 100,000 tonnes of pre- and post-consumer textile waste per year, resulting in about 28,000 tonnes of regenerated fibre yarns annually (Corertex, 2022; PrismaPrato, 2025).

Several challenges hinder the development of circular supply chains. However, these barriers - technological, informational, economic, organisational, regulatory, and societal – also represent important opportunities (Ayati et al., 2022).

- **Economic and financial barriers:** This remains one of the most critical barriers to scaling circular business models, particularly for start-ups and smaller firms that lack the capital to invest in infrastructure (Stempfle et al., 2022). For example, many product-as-a-service providers (PaaS) face challenges in aligning high upfront investments with long-term revenue generation, which does not necessarily match investors' expectations on returns on investments. Addressing this challenge by developing tailored financial instruments could de-risk innovation and support long-term scaling.

- **Technological barriers:** Challenges include difficulties in tracking and collecting end-of-life (EoL) products, assessing material quality, and ensuring compatibility with circular design principles. Many firms, particularly small and medium-sized enterprises (SMEs), lack the digital infrastructure required to support reverse logistics and integrate monitoring systems. Emerging AI-enabled tools, from automated disassembly and quality assessment to predictive return flows, are increasingly reshaping circular supply chains, offering both significant efficiency gains and new challenges related to data governance and technological capacity. However, investing in traceability tools, sensor-based sorting, and affordable reverse logistics infrastructure can significantly improve the feasibility of circular business models.

- **Information barriers**: Firms often lack the expertise needed to transition to circular models and fail to coordinate with supply chain partners. The absence of reliable data-sharing mechanisms

limits the exchange of materials and hinders trust between businesses. Yet this also creates space for capacity-building efforts, knowledge-sharing platforms, and digital data-sharing tools that foster trust and enable collaboration. Strengthening information flows can enable and stimulate new business models.

- **Market-related barriers:** These include the limited availability of high-quality secondary materials, fluctuating virgin resource prices, and weak consumer demand for recovered products (Jain et al., 2021). While interest in circular products may be increasing, adoption remains constrained by price sensitivity, convenience concerns and trust in product quality (Hultberg & Pal, 2021). At the same time, these gaps reveal opportunities to strengthen secondary material markets, develop quality standards, and promote customer trust and awareness. Stimulating consumer demand through transparency, labelling, or public procurement can play a pivotal role to scale circular business models.

- **Organisational barriers:** These encompass leadership resistance, rigid operational structures and misaligned incentives both within organisations as along circular value chains (Stempfle et al., 2022; Van Opstal et al., 2024). Such barriers often hinder the coordination needed for circular practices. For instance, successful implementation may require a long-term collaboration with suppliers to ensure access to spare parts, components or refurbishment services. These challenges point to the need for change management strategies, experimentation with cross-functional teams, and the redesign of incentive structures to reward collaboration and long-term thinking (Strupeit et al., 2024; WBCSD, 2025).

- **Regulatory barriers**: Gaps and inconsistencies in policy frameworks – for example a lack of harmonised end-of-waste criteria between Member States – hinder investment and market adoption, while competition and public procurement law may discourage collaboration between firms. Yet this also highlights a major policy opportunity: to align legislation with circular goals, promote pre-competitive partnerships and provide legal clarity that encourages innovation and resource-sharing.

- **Societal barriers:** Low environmental awareness, resistance to access-based models over ownership, and reluctance to bear behavioural switch costs all contribute to a slow implementation of circular supply chains. However, these challenges offer rich ground for social innovation, education and community engagement. Campaigns that reshape cultural norms around ownership, repair, and reuse can strengthen citizen buy-in and support scaling deep.

3.5 Developing circular supply chains and ecosystems

Circular business models and supply chains do not operate in isolation, rendering systemic collaboration and ecosystem development necessary for achieving true circularity at scale. Transformation dependencies are essential in designing, implementing and scaling circular business models. Companies must consider existing infrastructures, value chains and complementary businesses (Asgari & Asgari, 2021). Additionally, due to the complexity of interactions among multiple stakeholders, companies must regularly evaluate their position within larger value networks. Therefore, scaling circular business models requires an ecosystem perspective, where circularity is seen not as a property of individual firms but as a collective system-level outcome (Konietzko et al., 2020). A circular ecosystem is a system of interdependent and heterogeneous actors that transcends industrial boundaries, collective directing efforts towards circular value propositions while fostering economic resilience and limiting adverse environmental impact (Trevisan et al., 2022).

The difference between a business model and an ecosystem perspective is that the latter views the business models of other relevant actors to be as important as the one of a focal firm (Adner, 2017). Circular ecosystems consist of multiple interdependent actors - such as producers, suppliers, service providers, regulators, investors and end users - who collaborate to enable circular flows of materials, products and services. Unlike traditional business models, which focus on firm-level optimisation, circular ecosystems necessitate alignment across industries, infrastructures and governance structures to ensure that circular strategies can scale effectively (Konietzko et al., 2024). In other words, effective scaling strategies require co-development with ecosystem actors, since their implementation hinges on the reciprocal alignment and adaptation of business models across the ecosystem (Derks et al., 2022). Likewise, community engagement and government collaboration are deemed important to build circular ecosystems (Palomares-Aguirre et al., 2018).

3.6 Leverage points for scaling circular business models

Applying a supply chain and ecosystem perspective to scaling circular business models, three critical leverage points can be identified and defined in this report: a minimal viable scale, a niche scale and a transformation point. The use of the term leverage point connects to a broader systems thinking tradition that has discussed places to intervene in complex systems (Meadows, 1999). Moving across these thresholds depends not only on strategic business decisions but also on the maturity of the enabling environment.

When circular business models operate beneath the **minimal viable scale**, their adoption remains so limited that they struggle to achieve economic viability. Below this threshold, firms cannot generate sufficient demand to sustain their operations, as the costs of value creation and delivery does not outweigh the revenue of a small customer base. Remaining below this threshold means the firm will continue to operate at a loss, eventually forcing it to cease operations. However, once this scale is exceeded, revenues exceed costs, making the model viable for a stepwise adoption by a niche market segment. Accordingly, policy interventions should aim to support firm growth past this threshold to avoid sustained losses.

At the **niche scale**, businesses can create, deliver and capture value by targeting specific customer segments with tailored circular value propositions. Within these niche markets, firms are often able to identify strategic ‘sweet spots’ for market entry, where particular customer needs align strongly with circular offerings (Noëth et al., 2024). These include early adopters or ‘converted crowds’ who are already receptive to sustainability-oriented solutions and for whom the circular value proposition holds clear appeal. This requires viable technologies, iterative business model refinement and growing consumer acceptance.

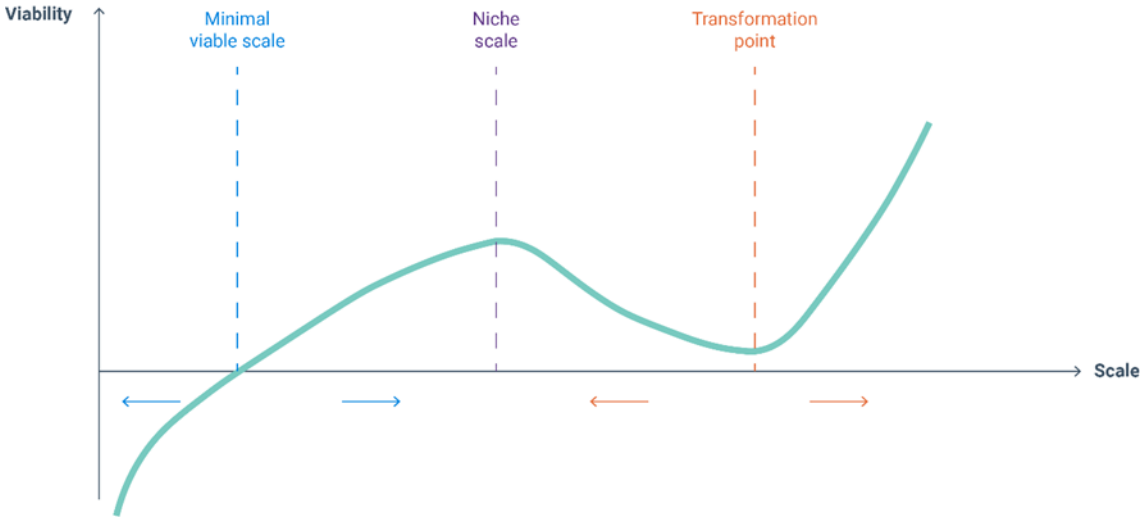
However, beyond this niche scale, businesses increasingly face hurdles to convince a broader set of customers. While their model may be functional for a dedicated group, mainstream citizens and consumers remain unconvinced, as linear competitors continue to dominate on cost, convenience, and familiarity. Growth beyond this stage is constrained by path dependencies, as key ecosystem partners, such as suppliers, financial institutions and policymakers, remain locked into linear systems. This lock-in makes circular models less attractive to the broader market, as infrastructure, regulations, and financial instruments are optimised for traditional business models rather than circular alternatives.

Nevertheless, at a certain point, the scale of a business model may become large enough to reach a new threshold - one at which the surrounding ecosystem and customer behaviour have sufficiently adapted to the circular alternative, embedding it as part of the ‘new normal’.

At this **transformation point**, a sufficiently large group of citizens and consumers transitioned towards circular models, causing a system shift towards a new default, making circularity a stable option that can fully compete with alternatives. This demands systemic policy support, widespread behavioural change and the normalisation of circular business practices.

Figure 3.2 illustrates the key leverage points, the relative viability of business models at different stages between these point, and the dynamics that either foster or hinder growth along the way. While the niche scale represents a relatively stable position, the minimal viable scale and the transformation point are critical thresholds that must be surpassed to enable further scaling of circular business models.

Figure 3.2 Leverage points for scaling circular business models

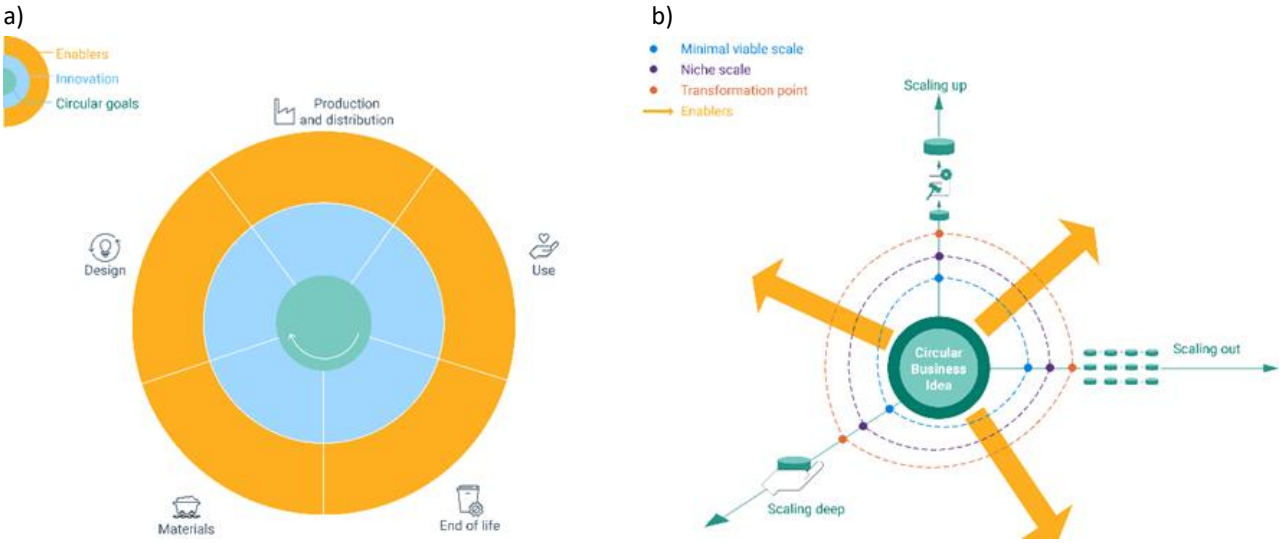


Source: illustration by EEA

3.7 Conceptual framework on scaling circular business models

To situate our analytical perspective in relation to the 2021 EEA report, Figure 3.3 contrasts the original framework with an extended version developed here, which places particular emphasis on scaling circular business models.

Figure 3.3 Conceptual framework on scaling circular business models; (a) analytical framework on circular business models (EEA, 2021); (b) framework on scaling



Source: illustration by EEA

The left-hand side (a) of Figure 3.3 shows the framework conceptualised in the 2021 EEA report, which provided a first analytical structure for enabling circular business models (EEA, 2021; ETC/WMGE, 2021b). This framework starts from circular goals pursued across the value chain and integrates different types of enabling factors such as innovation, policy and behavioural change. Its primary focus was on how firms can innovate their value proposition, value creation, and value capture processes in order to implement circular strategies such as reuse, repair, and recycling, and on the conditions that allow such business models to achieve their circular goals (see Section 2.1 and Box 1).

On the right-hand side (b) of Figure 3.3, an enriched framework is proposed that builds on this foundation while shifting the focus towards the dynamics of *scaling* circular business models. While again starting from the circular goals at the core of business models, this framework highlights three distinct but interrelated scaling perspectives – scaling out, scaling up, and scaling deep – each of which can be supported by enabling factors that will be further examined in Chapter 4. In addition, it makes explicit how scaling trajectories depend on reaching successive leverage points. Enabling conditions aligned with scaling out, scaling up and scaling deep can help circular business models move beyond a minimal viable scale (M). When sustained and reinforced, these same enabling conditions support growth of the niche scale (N) until, ideally, this progression reaches the critical leverage point at which circular business models no longer remain exceptions but start to become the new 'normal' within markets and societies.

The enabling conditions that support scaling will be further discussed in Chapter 4.

4 Scaling circular business models: enablers and boundary conditions

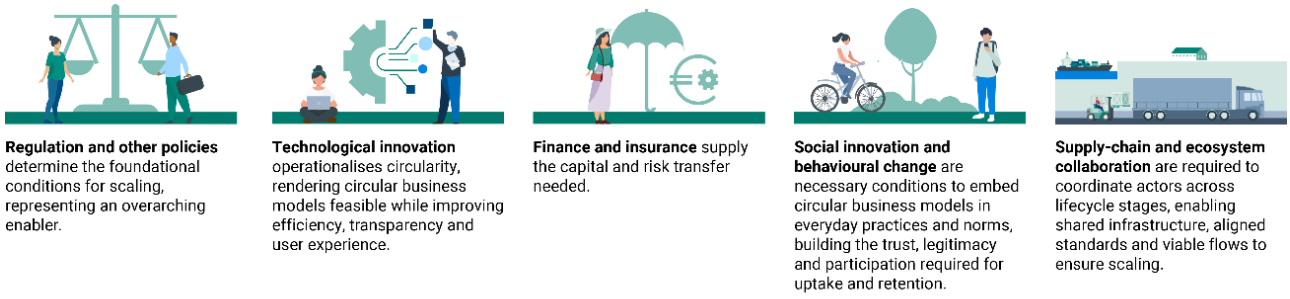
The previous chapter outlined the conceptual framework for understanding scaling in circular business models, distinguishing between different scaling strategies (scaling out, scaling up, scaling deep) and highlighting the importance of economies of scale, supply-chain collaboration, circular supply chain and ecosystem development, and leverage points to achieve a circular systems shift.

In this chapter, five enablers for scaling circular business models will be identified and examined[9] (Figure 4.1):

1. **Policy and regulatory support** affect the rules of the game, determining the foundational conditions for scaling, representing an overarching enabler.
2. **Technological innovation** operationalises circularity, rendering new business models feasible while improving efficiency, transparency and user experience.
3. **Finance and insurance** supply the capital and risk transfer needed for growth.
4. **Social innovation and behavioural change** are necessary conditions to embed circular business models in everyday practices and norms, building the trust, legitimacy and participation required for uptake and retention.
5. **Supply-chain and ecosystem collaboration** are required to coordinate actors across lifecycle stages, enabling shared infrastructure, aligned standards and viable reverse flows to ensure scaling. Together, these form a coherent and comprehensive set of levers that determine whether circular business models progress from isolated pilots to system-level impact.

For each of the enablers, this chapter examines how it influences the core elements of circular business models; how they contribute to different scaling strategies; and how they support the achievement of different leverage points along the scaling journey. Concrete examples are given throughout this chapter to illustrate. Each section is concluded with practical lessons for key stakeholders.

Figure 4.1 Key enablers for scaling circular business models



Source: illustration by EEA

4.1 Policy and regulatory support: creating foundational conditions for scaling

Public policy and regulations play a generic and foundational role in enabling the scaling of circular business models. Unlike conventional business models, circular business models often face relative disadvantages due to a market structure that fails to internalise environmental and social externalities. This limits their competitiveness in the absence of enabling policy frameworks that actively support circularity. Regulatory support, through instruments such as extended producer responsibility (EPR), eco-

[9] For an overview of barriers to implementing circular bussiness models, we refer to Vermunt et al. (2019), Geissdoerfer et al. (2023), and Brändström et al. (2024).

design requirements, tax incentives and circular public procurement, are crucial to redefine the institutional context in which circular business models can emerge, operate and scale.

Impact on the core of the business model

Supportive policy frameworks strengthen the credibility and visibility of circular value propositions by shifting consumer and business expectations toward environmental sustainability and social wellbeing, not only financial viability. For example, legislation such as the European Right to Repair Directive or mandatory take-back schemes signal societal and institutional support for longevity and reuse. This enhances the attractiveness of repair- or leasing-based models, making propositions around durability and serviceability more convincing to both consumers and investors (EC, 2020).

Policy instruments such as reduced VAT on repair services, eco-modulation in extended producer responsibility (EPR), or mandatory eco-design requirements directly influence how circular businesses create and deliver value. These measures reduce operational barriers and contribute to a level playing field for circular models, which otherwise face high coordination or compliance costs. For example, in leasing-based Product-as-a-Service (PaaS) models, regulations that mandate product take-back or clarify ownership versus user responsibilities can reduce uncertainties and improve the feasibility of service delivery.

Regarding value capturing, fiscal incentives, procurement policies, and grant funding for pilot circular initiatives can stabilise revenue flows and reduce risk for early-stage circular ventures (Van Opstal & Borms, 2023). Public procurement mandates for reusable or repairable products, for instance, expand accessible markets for refurbishment companies or resale platforms. Moreover, tax relief on labour-intensive activities such as repair shifts the cost balance in favour of more circular value-capture mechanisms, enabling profitability in these business models (Bocken et al., 2022).

Scaling out, scaling up, and scaling deep

Policy and regulatory support can facilitate **scaling out** (i.e., expanding the number of customers by increasing geographical reach or replicating and diffusing circular business practices) by lowering entry barriers and harmonising conditions across regions and Member States. The European Commission (2020) advocates for such harmonisation, particularly in areas like waste legislation and product design, to foster cross-border growth of circular initiatives. Moreover, public procurement rules that mandate circular criteria can spur demand across multiple localities and allow local pilots to scale geographically via framework contracts (EEA, 2021).

> For instance, the adoption of EU-wide standards for product labelling, reuse targets, or extended producer responsibility helps circular businesses replicate their operations in new jurisdictions without reconfiguring their business models extensively.

Policies also play a decisive role in creating structural change required for **scaling up** (i.e. transform the broader system in which businesses operate by structural conditions, such as market structures, regulatory frameworks and policy landscapes to support broader adoption of circular business models). Regulatory frameworks can transform market conditions by integrating eco-design requirements, mandating repairability indices, or adjusting tax regimes to favour labour-intensive, service-based business models. These measures shift the "rules of the game," making circular models viable not just as niche alternatives but as system-wide norms (Sandberg & Hultberg, 2021).

> For example, minimum requirements for product longevity and reparability under the *Ecodesign for Sustainable Products Regulation (ESPR)* can disincentivise planned obsolescence and nudge entire industries toward circularity (Regulation – EU-2024/1781).

The *EU Single-Use Plastics (SUP) Directive* bans or restricts several single-use plastic products, including cutlery, straws, stirrers and plates (Directive (EU)2019/904). These bans eliminate the business case for linear single-use models and may encourage shifts towards reuse-as-a-service businesses and compostable alternatives.

Policy also enables **scaling deep** (i.e. cultural and behavioural shifts, aiming to embed circular principles in societal norms, citizen and consumer mindsets) by reinforcing norms and behaviours through institutional signals. When governments fund public awareness campaigns, support citizen science, or integrate circularity into educational curricula, they strengthen shared values around sufficiency, repair and reuse. Regulatory reforms such as the Right to Repair Directive are not only legal instruments but also normative signals that promote cultural legitimacy for alternative consumption models. Additionally, subsidies for community-based repair and reuse activities encourage deeper societal engagement with circular practices, fostering mindset shifts over time (Van Opstal & Borms, 2025).

*Mandatory Repairability Index in France***:** Since January 2021, France requires certain electronics (e.g. smartphones, laptops, TVs, washing machines) to carry a repairability score (1–10) on product labels. The goal is to create consumer awareness, drive competition on repairability and promote design-for-repair (Ministères Aménagement du territoire Transition écologique, 2024). It also strengthens the business case for third-party repair services and 'right to repair' platforms. Building on the success of this, France also introduced a durability index in 2025 for certain products that goes beyond repairability and includes criteria on reliability, of robustness and ease of maintenance.

Public bike-sharing in European cities such as Copenhagen, Berlin and Brussels are promoted by procurement policies that support or promote access-based solutions (Beroud et al., 2024).

Leverage points

Policy support is crucial in helping circular businesses move beyond the **minimal viable scale** by reducing structural disadvantages compared to linear incumbents. Early-stage circular firms often face high per-unit costs due to limited volumes and a lack of infrastructure, which makes achieving supply-side economies of scale difficult. Regulatory tools such as subsidies for repair and remanufacturing infrastructure reduces these early cost barriers. In doing so, policies help businesses move beyond breakeven thresholds. Likewise, tax reforms that help to shift taxes from labour to resource use and pollution increase the competitiveness of circular business models (EEA, 2022). Often, circular business models are more labour-intensive as they require additional manual work for maintenance, repair, refurbishment and end-of-life processes like reverse logistics and sorting (ECESP, 2021). Policies such as reduced VAT or tax deductions for repair may therefore help to spur demand beyond minimal viable scale levels.

Promoting repair services through policy (Ganapini, 2023)**:** In 2016, Sweden reduced VAT on repair services (e.g. for bicycles, shoes, clothes) from 25% to 12%[10]. In France, a repair fund was launched in 2022 to reduce repair costs for electric and electronic devices by about 20%. Also in 2022, Austria introduced the 'Reparaturbonus', subsidising 50% of the repair cost. By making repair more affordable for citizens and consumers, demand for small-scale repair businesses is increased, helping them to stabilise their operations and increase their volume by making their services competitive with new products in terms of price.

Circular furniture in Dutch government procurement: In their 'Green Deal Circular Procurement', the Dutch government introduced criteria favouring reuse, recyclability and service-based models in its tenders (PIANOo, n.d.). Circular procurement of furniture was one of the first product groups

[10] In 2022 this VAT rate was further reduced to 6 %, but subsequently reversed back to 12 % in 2023.

included (Rijkswaterstaat, 2017). This enabled startups in the furniture sector (like Ahrend and Gispen) to offer circular furnishing services (e.g. leasing, refurbishing) thanks to predictable long-term contracts from government tenders (REBus, 2017; Ahrend, 2025). As a result, guaranteed volumes were created over several years, allowing firms to invest in logistics, refurbishment centres and digital platforms, all of which are key to achieving supply-side economies of scale.

At the **niche scale**, policy acts as an accelerator when it strengthens emerging circular practices and stabilises the conditions under which they can experiment and grow. The niche itself may be highly local – for instance, repair cafés, community-based reuse initiatives or early circular pilots – yet the support structures that nurture these initiatives do not need to be local. National programmes, procurement standards that favour reused or refurbished goods, or legally mandated take-back systems, can generate predictable volumes, reduce uncertainty, and enable replication across contexts. These conditions allow firms to refine their value propositions and align with early adopter preferences. Dynamic economies of scale are also supported when policy programmes offer learning platforms, such as incubators or sectoral working groups, which enable shared learning among niche actors (EEA, 2021).

Extended producer responsibility (EPR) for textiles: In 2008, France made EPR mandatory for textile producers, requiring them to finance the collection, sorting, reuse and recycling of end-of-life garments via the producer responsibility organisation Refashion, through financial contributions by producers (Refashion, n.d.). This made that businesses such as Le Relais benefited from predictable material flows, as well as financial support for sorting centres, enabling them to process higher volumes and to innovate (e.g. making insulation materials from used garments).

Flemish innovation grants and business support: The Flemish government offers several subsidies to support companies in circular innovation. For example, the 'Blue Deal' call supports companies to prototype and scale innovations focused on water-saving and reuse. The grants enable investments and help in de-risking, allowing front-running companies to validate early-stage demand (VLAIO, 2022). Also the grants by Flanders Circular support companies to experiment with new circular business models (Circular Flanders, n.d.-a).

To reach the **transformation point** where circular business models become the new default option, policy needs to shift from enabling experimentation to reshaping the institutional environment. This requires regulation to align market signals (prices, obligations, risk assessments) with circular goals. The aim is to make circular business models become mainstream through regulation, standardisation and enforcement. Examples include mandatory repairability indices and penalties for unsustainable products. Such interventions can institutionalise circular business models across sectors (Bocken et al., 2019; Sandberg & Hultberg, 2021).

Mandatory reusable cups at events (Flanders, France, and Germany): Since 2020, the Flemish government has made the use of reusable drinking cups mandatory at events and festivals with more than 300 attendees (OVAM, n.d.). As a result, many local events now work with logistics partners offering washing and cup-as-a-service business models. Since 2021, France has also introduced a national ban on disposable cups and plates at public events under the Anti-Waste Law for a Circular Economy (AGEC) (Ministère de la Transition Ecologique, 2021). While such policies restrict disposable alternatives, thereby triggering rapid scaling of companies providing reusable cup services (BillieCup, 2024), its uptake varies by context. In Germany, for example, a 2023 law ("mandatory reusable packaging obligation") requires restaurants, caterers and delivery services to offer a reusable option. However, a recent study reports that the reuse share increased from 0.7% in 2022 to 1.6% in 2023, indicating a very slow progress (WWF, 2024).

Minimum recycled content mandates: The EU Packaging and Packaging Waste Regulation 2025/40 (PPWR) sets mandatory minimum recycled content from post-consumer plastic waste to be incorporated into plastic packaging (e.g. 30% for single-use PET bottles by 2030, increasing to 65%

in 2024). This forces producers to create demand for recyclates, which supports scaling of high-quality recycling infrastructure and business models. Additionally, companies providing software to manage product data and EPR and compliance reporting related to packaging thrive because of increasing regulations. An example is the German startup Recyda (Recyda, 2025).

Options for policymakers, business, civil society and academia

Effective policy frameworks are essential to remove barriers, create incentives and provide legal certainty for circular business models to scale. Various actors play complementary roles in shaping, testing and supporting the regulations and incentives that enable circular business models to scale. The following lessons highlight how different actors can contribute to this.

For policymakers:

- Shift taxes from labour to resource consumption and pollution to help overcome the high barrier of labour costs and to increase economic incentives for circular business models.
- Design adaptive policies that evolve with the business model maturity, e.g., seed grants for pilots, procurement incentives for niche actors and mandatory regulations for transformation.
- Establish harmonised EU-wide rules on durability, repairability and take-back obligations to facilitate cross-border scaling.
- Integrate circular principles into mainstream economic and industrial policies (e.g., innovation, skills and competition frameworks).
- Provide legal clarity and regulatory certainty for circular business models, as inconsistent policies may deter customer trust (Van Opstal & Manshoven, 2024).
- Use green public procurement with circular criteria (e.g. durability, repairability, take-back) to create stable demand and enable circular solutions to scale across multiple sites and sectors.
- Provide R&D grants for circular practices, e.g. modular product design.

For businesses:

- Engage in co-regulation and consultation to co-design policies that enable scaling.
- Engage in circular public procurement to unlock early-stage demand and demonstrate impact at scale.

For civil society and academia:

- Monitor and evaluate policy effectiveness from economic, environmental and social justice perspectives.
- Amplify citizen support for ambitious policies through advocacy and public engagement.
- Provide data and knowledge on scaling of circular business models.

4.2 Technological innovation: the flywheel for scaling circular business models

Technological innovation enables core features of circular business models, from modular design and traceability to digital service delivery and predictive maintenance. It supports efficiency, transparency and behavioural change across product lifecycles.

Impact on the core of the business model

Technological advances enhance circular value propositions by improving traceability, modularity and performance of products, as well as the quality and convenience of services.

Digital product passports make it possible to verify the origin, repairability and circular credentials of products, thus strengthening consumer trust in reused or refurbished goods (Boukhatmi et al., 2023; Konietzko et al., 2020).

Modular product design: Innovations such as modular office furniture (Bene, 2025) or modular electronics (Fairphone, 2025) illustrate how modular design approaches can support longer lifetimes (Proske et al., 2020). Modularity not only simplifies repair and upgrading but also enables customisation, making products more adaptable to changing user needs. This flexibility strengthens the value proposition of circular business models by creating recurring service and upgrade opportunities, while also increasing their potential to scale across diverse customer segments or regional standards.

IoT-enabled monitoring enhances carpooling and bike sharing fleet management by tracking location, availability and condition in real time. This enables predictive maintenance, usage tracking and optimisation of distribution, improving service efficiency and reliability. By lowering operational costs and increasing user trust, Internet of Things (IoT) technologies create the conditions for these services to scale to larger fleets and wider geographic coverage.

Regarding value creation and delivery, new technologies enable more efficient collection, sorting, remanufacturing and redistribution of products. For instance, sensor-based sorting in textile or electronics reuse, or predictive maintenance in service-based models, reduces labour costs and improves delivery reliability. Digital platforms that match supply and demand (e.g., peer-to-peer resale or sharing platforms) lower transaction costs and reduce inefficiencies in circular loops (Han et al., 2022).

Automated diagnostic sorting technologies create value by increasing the efficiency and accuracy of high-quality material recycling. By lowering costs and enabling consistent input streams, they improve the competitiveness and scalability of recycling-based business models. For example, TOMRA Sorting Solutions uses sensor-based systems and AI to separate plastics and other materials with high precision, delivering certified, high-purity fractions for new applications (TOMRA, 2025).

Automated diagnostics, testing and data-wiping tools play a crucial role in scaling the refurbishment of electronic devices while ensuring consistency of repair standards. For example, Swappie employs these technologies to accelerate the refurbishment process of electronic devices without compromising on quality. This enhanced reliability is essential for building consumer trust in refurbished products[11].

Technological innovation impacts value capturing as it unlocks new revenue models. For example, embedded software and digital interfaces allow the shift from one-time sales to subscription or usage-based pricing. This improves lifetime customer value while enabling data-driven cross-selling (e.g., repair and resale packages). Moreover, digitisation enables more granular cost tracking and performance analytics, which attract investors and facilitate insurance models that de-risk leasing or refurbishment businesses (Acquier et al., 2025).

Scaling out, scaling up, and scaling deep

Technological innovation enables circular business models to **scale out** efficiently by standardising and replicating their operations across locations. For instance, the deployment of digital platforms such as resale apps, sharing schemes or refurbishment diagnostics facilitates the rapid geographic expansion of services by automating core functions like customer onboarding, inventory management or logistics (Cavallo et al., 2024). Moreover, the use of modular product design and IoT tracking allows products to be

[11] Written response to questionnaire by Swappie received on 01.08.2025.

serviced or reused more easily in different contexts, increasing the transferability of circular models (Acquier et al., 2025).

> *Swapfiets* (Netherlands) was founded in 2014 and quickly expanded to other European markets, including Germany, Belgium, Denmark, Italy, France and UK. It uses bike-tracking using IoT and customer service apps for booking, payments and maintenance scheduling, to deliver consistent user experiences across cities (Swapfiets, 2025).
>
> *Vinted* (Lithuania) was founded in 2005 and currently operates in 23 markets across Europe. It integrated payment, shipping and labelling directly into the platform to make it easier for users to sell and buy second-hand items[12].
>
> *CircularPlace* (France) helps organisations recirculate their physical assets internally through a digital platform. To scale its model, it integrated AI tools that automate the creation of detailed listings: users can upload a picture and the system generates descriptions with size, weight and a recommended resale price. This lowers the barrier for companies to list items, improves listing quality and increases the likelihood of successful reuse transactions[13].

One of the major challenges when scaling out access-based models lies in the environmental and operational impact of increased logistics. Unlike one-time product sales, access models often involve frequent transportation of goods between users, warehouses and repair hubs, including multiple packaging cycles. In addition, it may rely upon increasing server capacity. If not addressed carefully, these factors can offset the environmental and climate benefits from reduced product ownership by increasing transport-related emissions, packaging waste and energy use. To mitigate this, access-based models also rely on technological innovations, such as route optimisation algorithms and use of low-emission transport options and eco-efficient packaging, including reusable options. Also, localised service hubs can shorten distances between users and reduce shipping frequency.

Concerning **scaling-up**, technological innovation acts as an enabler of system-wide integration and interoperability. For example, product passports and blockchain-enabled material traceability facilitate transparency and accountability across extended supply chains, allowing circular flows to be institutionalised beyond individual firms (De Angelis et al., 2018). Advances in remanufacturing, automated sorting, or AI-based demand prediction also reduce uncertainty and transaction costs in circular systems, making them competitive at scale. Such innovations contribute to the reconfiguration of market infrastructures necessary for mainstream adoption.

> *Quifactum* enables brands to easily create and manage item-level Digital Product Passports (DPPs), helping companies go beyond regulatory compliance and unlock new value for repair, resale, recycling and authentication (European Circular Economy Stakeholder Platform, 2024). Quifactum is built on a flexible digital system that can handle large and complex amounts of product data, allowing it to grow quickly and cost-effectively as demand increases making it a strong enabler for scaling up circular business models across industries (Quifactum, 2025).

Technology also supports **scaling deep** by changing how users interact with products, services and sustainability information. Apps that promote conscious consumption, enable product reuse, or visualise environmental and climate impacts contribute to behavioural feedback loops that embed circular practices in everyday life (Han et al., 2023). For example, user-friendly repair guides, gamification of environmentally preferred choices or QR-coded traceability build consumer trust and promote reflection on value beyond newness.

[12] Interview with Vinted on 10.06.2025.
[13] Interview with CircularPlace on 30.06.2025.

Life-style apps such as Too Good To Go enable circular lifestyles by connecting consumers with surplus food, reducing waste while fostering new habits around resource use. As a digital innovation, it strengthens circular business models by making reuse convenient and trusted, and by scaling deep through cultural and behavioural shifts that normalise sustainable consumption (RECO Blog, n.d.; Too Good to Go, 2024).

NORNORM offers subscription-based office furniture and lighting, extending product lifespans through repair, refurbishment and redeployment (NORNORM, 2025). By combining *digital inventory management, refurbishment logistics* and partnerships with brands like Kinnarps and IKEA, the company has scaled out across several European countries while also scaling deep by embedding circular thinking into workspace planning and procurement.

Leverage points

At the **earliest stage**, technology can help circular businesses reach a minimal viable scale by enabling more efficient value creation. Modular product design, for example, reduces repair complexity and facilitates cost-effective refurbishment, making it possible to break even at smaller scales. Digital tools that automate diagnostics or logistics reduce fixed costs per transaction, supporting internal economies of scale for firms with limited reach (Beccarello & Foggia, 2023). Technology may thus help overcome the 'chicken-and-egg' problem of needing scale to invest but needing investment to scale.

As firms reach a **niche scale**, technology underpins consistency and replicability. Shared IT infrastructure (e.g., resale platforms, product passports) enables demand-side economies of scale by linking multiple user groups and fostering network effects (Boukhatmi & Van Opstal, 2025). Dynamic economies of scale also emerge as technology facilitates experimentation: product tracking tools enable iterative feedback loops and data analytics allow businesses to optimise user behaviour and supply chain performance (Sandberg & Hultberg, 2021).

Technological innovation in circular business models goes far beyond digital tools and Information and Communication Technology (ICT). It also includes breakthroughs in new materials, advanced recycling methods and CO_2 capture technologies. Initiatives like BlueCity in Rotterdam provide the physical and institutional infrastructure for such innovations to scale (BlueCity, 2025). By offering workspaces, labs and structured programmes such as the Circular Factory, BlueCity supports startups in developing demo-scale factories, accessing funding, and turning technological advances into viable circular businesses.

Technological maturity is essential at the transformation point, where an entire sector adopts interoperable tools and infrastructures. This enables systemic circularity through shared product data standards, AI-driven reuse prediction or traceability. When such technologies become sector-wide norms, they generate external economies of scale and reduce transaction costs across entire ecosystems. Furthermore, a widespread adoption of circular design technologies redefines baseline expectations, such as turning design for disassembly or upgradability into industry standards (Konietzko et al., 2024).

Options for policymakers, investors and public funders, businesses, education and training providers, civil society and academia

Scaling of circular business models requires coordinated action across multiple actors, each playing a distinct but complementary role in supporting the technological innovations needed for circular models to thrive. The following targeted options outline how different stakeholder groups can contribute.

For policymakers:

- Develop and fund standards for digital product passports, open data protocols and traceability systems that ensure interoperability across firms and sectors. These standards lower transaction costs and enable systemic circularity at scale.
- Link regulatory initiatives to enabling technologies, such as mandatory information disclosure on repairability or recyclability via standardised formats.
- Use public procurement to drive demand for technology-enabled circular solutions, setting an example and reducing perceived risk for early adopters.
- Evaluate the necessity and impact of supporting new technologies, ensuring that policy incentives avoid rebound effects and account for the environmental costs of technological innovation itself.

For investors and public funders:

- Finance critical infrastructure technologies such as product tracking, lifecycle analytics and automated sorting that underpin scalable circular value chains.
- Support pilot projects and proofs of concept that address key bottlenecks at the minimal viable scale, including diagnostic apps, logistics tools or modular design systems.
- Invest in scaling interoperable systems across company networks, especially in industries like fashion, electronics or construction, where shared systems can extend reach to niche scale or even sector-wide transformation.
- Prioritise funding for open platforms over proprietary solutions to maximise cross-sector learning and collective impact.

For businesses:

- Adopt interoperable digital tools that enhance repairability, reuse and reverse logistics, e.g., track-and-trace systems, usage-based billing tools, or automated return management.
- Standardise technical processes to enable franchising, replication, or API-based[14] integration into broader platforms to allow for seamless collaboration between different players in a value chain.
- Engage in pre-competitive collaboration to co-develop and share enabling technologies with other actors in the ecosystem.
- Lack of transparency and trust regarding data security/privacy issues must be addressed. There is still a widespread unwillingness among companies to grant shared access to data (partly due to unclear aspects of data ownership).

For education and training providers:

- Invest in future-oriented digital and technological skills relevant to circular strategies, including modular or circular product design, digital traceability, reverse logistics systems and data governance.
- Create interdisciplinary curricula combining sustainability, engineering, and digital innovation to prepare graduates for circular economy roles.
- Enrich user-oriented tools with nudging and gamification strategies to engage the public into circular behaviours, improve convenience and promote circular business model acceptance.

For civil society and academia:

- Co-develop open, user-centred tools with SMEs and ecosystem partners that reduce adoption barriers and generate broad system benefits.
- Bridge applied and academic research by testing enabling technologies in real-world pilots and publishing results on scaling potential.
- Provide data and knowledge on scaling of circular business models.

[14] Application Programming Interfaces (APIs) are standardised sets of rules that allow different software systems to communicate. By integrating technological processes (e.g. data analytics, authentication, payment handling) through APIs these specific technical functions or workflows can be connected into a larger digital ecosystem, marketplace or platform, allowing different partners to access the process or information.

4.3 Finance and insurance: enabling investment and risk management to scale

Finance and insurance play a critical role in enabling any business model to emerge, stabilise and grow. They provide the capital and risk management tools needed to support long-term value creation, infrastructure development and behavioural trust in novel business models. For circular business models, however, accessing financing is particularly challenging because their value propositions often rely on unfamiliar asset structures, extended payback periods, and revenue streams tied to product longevity or service-based offerings rather than one-off sales. These characteristics can make financial returns less predictable and collateral harder to value, increasing perceived risk for investors and insurers (Ma et al., 2025). In addition, limited historical performance data, evolving regulatory contexts, and dependency on collaborative value chains create further uncertainty, which can deter conventional finance and insurance providers (Banico, 2024).

Impact on the core of the business model

Access to targeted finance enables circular businesses to articulate more ambitious value propositions. For example, leasing models in white goods or shared mobility services often require upfront investment in durable assets, which can only be recovered gradually over a longer period. Without financial backing tailored to such timelines, these propositions may never reach market maturity (Palomares-Aguirre et al., 2018). Green finance labels, blended finance schemes[15] and impact investing frameworks can validate circular propositions by highlighting their environmental and societal relevance.

Working capital, leasing capital, and infrastructure financing are vital to scale circular value creation and delivery. In the repair and refurbishment sector, upfront investments in facilities, skilled labour, and logistics must precede returns from resale or service contracts, meaning that operations must be sustained for months or years before income stabilises. Without adequate finance, these activities risk remaining small-scale, unable to achieve the economies of scale that improve efficiency and affordability. Moreover, access to insurance mechanisms de-risks the delivery of usage-based models (e.g., light-as-a-service or leased appliances), especially when products are shared across multiple users or returned after long use cycles (Han et al., 2023). For example, rental platforms must manage product wear and tear, cleaning, and complex return logistics, each of which can generate unpredictable costs. Without insurance to cover damage, loss, or contamination, such operational risks fall entirely on the service provider, which can quickly erode margins.

> Swapfiets, the Dutch company has grown rapidly by offering a subscription model for bikes where users get a replacement bike if theirs break. Over the years, breakdowns have become much less frequent due to the fact they now produce their own bikes (Keuchenius, 2023).
>
> The Octopus Club, a UK-based peer-to-peer marketplace for second-hand maternity and children's items, closed after five years despite strong impact and recognition. Despite over 25,000 registered users and elaborate media coverage, the platform faced the 'scale–funding' paradox: to grow it needed investment, but to secure investment it needed growth. In a funding landscape increasingly focused on AI and profitability, the company struggled to attract the capital required to scale its technology and compete with larger players like Vinted (Estrougo, 2025).
>
> Clothing rental schemes often struggle to secure insurance for issues like damage or hygiene concerns in returned garments. However, UK-based Polaris Insurance offers specialised clothing hiring insurance that covers customer damage, loss, public liability, and business interruption, helping reduce risks that can otherwise limit operations (Polaris Insurance, 2025).

[15] Blended finance schemes are funding arrangements that combine capital from public, private, and sometimes philanthropic sources to support projects that deliver both financial returns and positive social or environmental outcomes.

Finance affects value capture by shaping pricing models and risk tolerance. Without long-term patient capital, circular businesses may be forced to adopt extractive pricing strategies or compromise their circular integrity (Mejía-Vélez et al., 2026). Financing mechanisms that allow value to be captured over time, such as performance-based finance, ESG-linked loans, or customer payback schemes, better align with the lifecycle logic of circular models. Innovative fintech models (e.g., resale-integrated payment solutions that are designed to handle transactions in which ownership of a product changes multiple time, including resale, trade-in or buy-back scenarios) also help unlock new sources of revenue (Klofsten et al., 2024).

> The insolvency of Texaid, Germany's largest textile sorter, shows the difficulty of capturing value in post-consumer recycling. Falling resale prices, rising sorting costs, and low-quality fast fashion eroded its margins despite earlier profits. The case highlights the need for finance and risk-sharing tools, such as investment, guarantees, or insurance, to stabilise thin-margin but essential circular business models (Mathews, 2025).

Scaling out, scaling up, and scaling deep

Innovative financial and insurance mechanisms streamlined at the EU-level allow circular businesses to **scale out** by reducing upfront investment barriers. Access to leasing capital, working capital loans, or pay-per-use insurance schemes enables the expansion of asset-heavy models such as mobility-as-a-service or durable appliance leasing. Bundled service-finance packages, supported by impact investors or green banks, allow start-ups to replicate their models in new markets without sacrificing financial sustainability (Palomares-Aguirre et al., 2018). Access to resources is crucial for the speed at which startups can develop, enhancing their ability to expand into new markets (Mejía-Vélez et al., 2026). An interview with the company Recyda showed that funding has directly supported rapid growth and internationalisation.

> Dutch housing cooperation *Woonstichting Eigen Haard* successfully introduced a PaaS model for energy-friendly washing machines for its residents. When they wanted to scale and external financing was needed, this seemed unfeasible as this would mean the rental price would almost triple. Despite this, the initiative inspired appliance manufacturer BSH (Bosch Siemens Hausgerate) to launch its own rental service, BlueMovement (Keuchenius, 2023)

Scaling up often requires transforming investment logic and risk assessment at the level of financial institutions. Circular business models typically rely on long-term cash flows and non-ownership value strategies, which are poorly understood by traditional financiers (Toxopeus et al., 2021). The integration of circularity into sustainable finance taxonomies, ESG scoring models, and bankability assessments is critical to redirect capital toward systemic circular transitions (Klofsten et al., 2024). Public-private partnerships and blended finance models also help de-risk large-scale infrastructure investments, such as decentralised sorting facilities or regional reverse logistics hubs (Ezeudu & Bristow, 2025). At the same time, funding plays a key role in advancing the Technology Readiness Level (TRL) of circular innovations from lab scale to pilot and eventually commercial plants (Mejía-Vélez et al., 2026).

> *NoPalm Ingredients*, a Dutch biotech startup, produces yeast-based oils as sustainable alternatives to palm oil. With EUR 5 million in seed funding, it is scaling its fermentation technology from pilot to industrial production, enabling supply to food and cosmetics markets while cutting CO_2 emissions and land use (NoPalm Ingredients, 2025).

> *Valused*, a French startup for reconditioned car parts, raised EUR 4 million to expand its team, enhance technology, and accelerate growth across Europe. The funding supports its goal of becoming a leading provider of certified circular automotive parts (Valused, 2025).

> *Circular denim brand MUD Jeans* also offers their jeans for lease to its customers. While the revenue is spread over multiple years, MUD has to pay the full amount of VAT when the leasing contract starts. MUD Jeans has an agreement with its bank ABN Amro that they supply the working capital to cover these upfront costs (Keuchenius, 2023)

While often overlooked, finance also plays a role in **scaling deep** by incentivising cultural shifts in consumption and investment. Consumer finance products, such as credit schemes, deposit systems, or insurance packages, influence household behaviours, including habits around return, reuse, or maintenance. Examples include deposit–refund systems for beverage container which influence return practices, or extended warranties or repair insurance that encourage households to maintain and repair rather than replace products. Yet, consumer finance is mostly available for new products, such as cars and household appliances, while reuse-based models often lack comparable financing and insurance, which limits their wider uptake. At the institutional level, pension funds or asset managers incorporating circularity principles can set normative examples for longer-term, mission-aligned investing. Moreover, grant-based funding for grassroots circular entrepreneurship fosters inclusive experimentation, deepening the societal roots of the circular economy (Henry et al., 2023).

> *CircularPlace* (France) helps organisations recirculate their physical assets through a digital platform. A key barrier for scaling second-hand use between companies is the lack of widely recognised insurance and certification for industrial and technical items, which limits buyer confidence. To address this, CircularPlace collaborates with specialised refurbishers who can certify product functionality in certain domains (e.g. commercial kitchen appliances), though coverage is not yet available across all product categories[16].

Leverage points

Access to finance is often the critical determinant of whether a circular business can pass the **minimal viable scale.** High upfront investments in durable products, logistics infrastructure or refurbishment processes create capital intensity that early revenues cannot cover. Circular start-ups typically lack the track record or collateral to access traditional credit, making them reliant on mission-driven finance, impact investing or public grants (Mejía-Vélez et al., 2026). Tailored insurance schemes further reduce exposure to customer default or product damage, helping to de-risk entry into the market and stabilise early-stage value capture. An example is the Amsterdam Circular programme, which pilots chain financing across whole value ecosystems, allowing start-ups and their partners to co-invest, share risks, and scale collectively (AMS, 2025).

At the **niche scale**, financial instruments evolve to support growth and process optimisation. Leasing capital or revolving credit facilities help businesses expand while maintaining cash flow stability. Demand-side economies of scale become feasible as businesses attract more customers through reduced pricing made possible by better capital efficiency. Finance also supports dynamic economies of scale, as increased cumulative volumes allow better forecasting and investment in organisational learning. Financial intermediaries play a key role in assessing and validating circular business models, increasing credibility with partners and customers (Klofsten et al., 2024).

Reaching the **transformation** point requires alignment between circular business models and financial sector incentives. Mainstream financial institutions should internalise circular performance metrics, enabling large-scale investment in shared infrastructure or ecosystem solutions (Palomares-Aguirre et al., 2018). The Circular Risk Scorecard, developed by the Dutch central bank's Sustainable Finance Platform among others, is a practical example: it assesses finance applications through a 'circular lens', factoring in product circularity, resource scarcity, and management quality to adjust risk perceptions and pricing

[16] Interview with Circular Place on 30.06.2025

accordingly (De Nederlandsche Bank, 2024). This enables credit and insurance models to accommodate durable, shared-use business models, while tools like green bonds, ESG loans and blended finance facilitate system-level deployment of capital rather than isolated project funding (Henry et al., 2023; Mejía-Vélez et al., 2026).

Options for policymakers and public funders, financial institutions and investors, business support organisations and educators, and for businesses

Access to suitable finance and insurance is a critical enabler for the scaling of circular business models. Traditional financial and risk assessment frameworks often fail to capture the value and specific characteristics of circular practices, such as longer product lifetimes, performance-based revenues, or collaborative ownership structures. To bridge this gap, coordinated action across different actors is needed to align financial instruments, provide insurance offerings and build capacity among stakeholders. The following lessons outline how each actor group can contribute.

For policymakers and public funders:

- Develop green financial instruments, including green bonds and loan guarantees, to support the deployment of enabling technologies in circular value chains.
- Create public insurance schemes and risk-pooling models[17] that de-risk reuse, repurposing and the use of recycled content across sectors.
- Fund digital public goods such as product passport standards, open data protocols and interoperable infrastructure that facilitate systemic circularity.
- Use public procurement to stimulate demand for technology-enabled circular solutions and signal market confidence.

For financial institutions and investors:

- Develop tailored finance products aligned with circular revenue models (e.g., pay-per-use, lease-based, performance-based contracts).
- Create insurance instruments that cover product performance risks in reuse and refurbishment, and enable risk-pooling structures for emerging business models.
- Improve access to seed capital, microfinance, and blended finance tools that enable early-stage circular businesses to achieve operational efficiency at small scale.
- Invest in pilot projects and early-stage ventures to help them reach minimum viable scale, including both asset-heavy models (e.g., leasing fleets, renting inventories, refurbishment hubs) and asset-light models (e.g., data-driven models, digital resale platforms, product-tracking services).

For business support organisations and educators:

- Help circular entrepreneurs prepare for investment by building skills in funding strategy and how to present their financial plans effectively.
- Educate banks, venture capital firms and insurance providers on circular business models, their risks and opportunities, and the specific metrics that signal viability.
- Integrate financing and technology themes into circular economy curricula and accelerator programmes.

For businesses:

- Adopt digital tools that improve data transparency and help demonstrate value to financiers and insurers, such as usage analytics or product tracking systems.

[17] Risk-pooling models are arrangements in which multiple participants share the financial burden of potential losses by combining their risks into a single pool, so that the cost of any individual loss is distributed across the whole group.

- Standardise technology use to improve scalability and lower integration costs when working with external platforms or funders.

4.4 Social innovation and behavioural change: shifting norms to scale demand and participation

Social innovation and behavioural change are essential for embedding circular business models in everyday practices, social norms and shared values. They enable trust, legitimacy and participation, which are necessary for uptake and longevity of circular business models.

Impact on the core of the business model

Social innovation enhances the legitimacy and resonance of circular value propositions. Community repair cafés, local tool libraries or platform cooperatives engage citizens as co-creators, increasing the social embeddedness of the value proposition.

> *FairBnB* is an alternative to AirBnB that shares rental income with local community projects and gives hosts and guests a say in governance (FairBnB, 2025).
>
> Campaigns that promote sufficiency, such as '*Second-Hand September*"' (Oxfam, 2025) or '*Right to Repair*' initiatives (Right to Repair Europe, 2025) shift societal values towards longevity, making business models based on reuse or repair more culturally acceptable (Han et al., 2023; Hultberg & Pal, 2021).

Behavioural enablers such as convenience, trust and habit are central to effective value creation and delivery. Additionally, social innovations often entail community building and ways to increase visibility of circular behaviours. For example, peer-to-peer sharing platforms or resale markets depend on review scores and reputation to function efficiently. Also, storytelling can be a useful way to attract and educate customers, while lowering perceived risk or stigma.

> The Swedish denim brand *Nudie Jeans* launched the 'Create Tomorrow's Vintage' campaign, showcasing the lived-in experience of wearing Nudie Jeans, highlighting the brand's commitment to longevity. By collaborating with influencers, they reinforce the message that well-maintained clothing can be both stylish and long-lasting ('Clothes that become more beautiful the more you wear them, the more you repair them') (Nudie Jeans, 2025).
>
> Educational initiatives, such as repair training in vocational schools or television shows promoting product repairs (BBC, 2025), can play a role in reviving lost skills and mainstreaming the narratives needed to support circular behaviour.
>
> The Belgian cooperative *Design with Sense* (Belgium) actively collaborates with educational institutions to raise awareness on the benefits of using reclaimed materials for interior design and the craft behind it. While these educational activities are typically not renumerated, they see it as an important contribution to the wider mission of promoting local value creation and circularity (Norion Consult et al., forthcoming).

Long-term customer engagement, sustained by trust and shared values, improves value capturing through retention and lifetime revenue. Dynamic pricing models that reward sustainable behaviour (e.g., usage-based discounts or repair credits) depend on behavioural change. The sports gear brand Decathlon offers cheaper rental options as well as second-hand options alongside their primary product offer (Decathlon, 2025a, 2025b). Additionally, social legitimacy reduces customer acquisition costs, especially in community-

based or platform-mediated models. For example, repair networks that grow via word-of-mouth and local engagement avoid high marketing costs, thereby enhancing net value capture (Henry et al., 2023).

Scaling out, scaling up, and scaling deep

To **scale up**, social innovation must extend beyond pilot communities and engage with institutional change. For instance, co-creation processes between municipalities and citizen initiatives can lead to new regulatory frameworks or service delivery models that formalise circular behaviours (Konietzko et al., 2020). Civil society organisations often act as intermediaries, translating bottom-up initiatives into policy proposals or industry standards. Embedding repair, reuse and sharing into public services or educational curricula not only legitimises but also embeds circular alternatives across society (Derks et al., 2022).

> Originally emerging in the 1990s as small, community-led reuse shops run by social enterprises, *De Kringwinkel* (Belgium, Flanders) demonstrated the combined environmental benefits of waste prevention and the social benefits of job creation for disadvantaged groups. Recognising this dual value, the Flemish government integrated the network into its official waste management plan, providing structural funding, quality standards and guaranteed material flows from municipal collection points. Today, De Kringwinkel operates over 150 shops across Flanders, processing tens of thousands of tonnes of goods annually, and is embedded as a permanent element of the region's reuse and social employment strategy (Boeck et al., 2022).

> Mobility-as-a-Service (MaaS) platforms integrate bike-sharing, car-pooling and public transport into unified apps, supported by real-time data and dynamic pricing systems (Tunn et al., 2025). Municipalities can also support adoption and further scaling by providing the necessary infrastructure for sharing systems (e.g. designated parking spaces for car/bike sharing). For example, the Dutch platform *umob* offers a pan-European mobility solution that bundles public transport, taxis and shared transport (including shared cars, (electric) bicycles and scooters) into a single app and account (umob, 2024). By integrating route planning, booking and payment across multiple transport providers and modes, umob removes many of the practical and psychological barriers to choosing shared and multimodal mobility over private car ownership. The service exemplifies how user-centred technology, multi-partner provider integration and municipal/urban policy alignment can help embed shared mobility in everyday travel behaviour, making it a viable and attractive alternative to owning a car (Cendon Garcia, 2025).

Social innovation facilitates **scaling out** by mobilising users and communities across geographies as active participants in circular models. Community repair cafés, clothing swaps, and second-hand pop-ups often function as scalable prototypes that can be adopted by other communities or integrated into more formal circular services (Bauwens, Hekkert, et al., 2020). These initiatives also offer test beds for learning about user preferences and design features that can inform the rollout of digital platforms or peer-to-peer services. Word-of-mouth and grassroots visibility contribute to organic growth beyond initial geographies (Lam et al., 2020).

> Originating in Amsterdam in 2009, *Repair Cafés* are volunteer-run events where community members repair broken household items together. The model spread internationally through the Repair Café International Foundation, which provides starter kits, branding and organisational guidance to local groups. This open, replicable structure has enabled the movement to grow to over 3,000 locations in more than 40 countries, often supported by municipalities and waste prevention programmes. Each new café adapts the concept to local contexts while contributing to a global network that exchanges practical repair knowledge and advocates for right-to-repair policies (Repair Café, 2025).

Scaling deep is the domain where social innovation exerts its most profound influence. By challenging norms of ownership, convenience and disposability, social innovation reconfigures the meaning of consumption itself. Such cultural movements are essential to create enduring demand for circular models and to resist backsliding into linear habits. Behavioural change initiatives grounded in community identity, mutual support and shared values help to anchor circularity in everyday life.

> The *#LovedClothesLast* campaign by the global non-profit Fashion Revolution promotes clothing longevity. Rather than framing the message around 'buying less' in a degrowth context, the campaign focuses on celebrating personal style, emotional attachment, and garment care. Through social media challenges, repair tutorials and storytelling about cherished clothing, it reframes mending and re-wearing as creative and aspirational acts. The campaign mobilises influencers, designers and consumers to share their own "loved clothes" stories, creating a sense of community pride in extending product life. This cultural shift supports circular fashion business models, such as clothing rental, resale and repair services, by making them resonate with personal identity and social belonging (Fashion Revolution, 2021).

Leverage points

At **early stages**, circular businesses often depend on project-based socially innovative practices, such as repair cafés, community swaps, or civil society initiatives, to build trust and visibility. These initiatives reduce marketing costs and allow firms to reach early users motivated by shared values rather than price or convenience. By fostering engagement in small-scale settings, social innovation supports early demand-side economies of scale: word-of-mouth networks, community endorsements and peer support build a base of users that justifies further investment.

As circular initiatives mature into **niche scale**, social innovation may help to sustain value alignment and community loyalty. Grassroots actors and civil society organisations act as co-creators and institutional partners, helping to translate circular concepts into culturally resonant practices. Behavioural incentives such as deposit-return schemes, gamified sharing, or storytelling around product origin enhance customer participation and retention. These mechanisms strengthen dynamic economies of scale by embedding circular habits and facilitating incremental behavioural adjustments (Bauwens, Hekkert, et al., 2020).

Achieving transformation requires that behavioural norms and cultural meanings shift at the broader societal level. Here, social innovation functions as a carrier of alternative values, reconfiguring what is considered desirable, convenient, or aspirational. Public education, media narratives, and consumer movements shape the 'cultural infrastructure' in which circular business models can thrive. In some cases, this requires a decoupling between ownership and identity, or a revaluation of care over consumption, to foster circularity to become the dominant logic. This enables a lock-in of circular norms across generations, institutions and sectors (Lam et al., 2020; Van Opstal, 2025).

Options for policymakers and public funders, education and training providers, media and communication professionals, investors and social economy actors, and businesses and business organisations.

The transition to a circular economy is not only a technical or economic challenge but also a social one. Scaling circular business models requires shifts in mindsets, norms and everyday practices, alongside the development of new forms of collective organisation and participation. Social innovation and behavioural change are therefore critical to embedding circularity in communities, workplaces and markets. Multiple actors each have a role in enabling people to adopt, normalise, and sustain circular practices. The following lessons highlight how different stakeholders can foster the social foundations to enable scaling of circular business models.

For policymakers and public funders:

- Provide dedicated funding for social innovation projects that foster new forms of community-based circular activity, including cooperatives, local exchange systems and collective ownership models.
- Support community pilots and living labs that demonstrate the viability of circular initiatives such as repair cafés, sharing schemes, or urban reuse hubs, particularly in diverse social contexts.
- Invest in scaling strategies that go beyond 'converted crowds', by funding outreach and replication of successful circular initiatives into new social groups, neighbourhoods, or regions.
- Integrate social innovation into broader circular economy policy frameworks, recognising it as a driver of the circular transition.

For education and training providers:

- Incorporate repair literacy and hands-on circular skills into both formal and informal education pathways.
- Develop curricula that link behavioural change, systems thinking and practical sustainability competences, preparing learners to become agents of circular transition.
- Facilitate community learning spaces, such as makerspaces or intergenerational workshops, where people can build confidence and collective capacity for reuse, maintenance and creative repair.

For media and communication professionals:

- Invest in circular economy literacy campaigns that go beyond technical content and tell compelling stories of individuals, communities, and entrepreneurs engaging in circular practices.
- Showcase role models and narratives that reflect cultural diversity and promote circular values such as care, sufficiency and shared responsibility.
- Counter prevailing linear consumption norms by highlighting the value, creativity and dignity embedded in repairing, repurposing and reusing products.

For investors and social economy actors:

- Fund grassroots and community-led initiatives that demonstrate scalable behavioural change through peer influence, local leadership and participatory governance.
- Support replication of local initiatives, such as repair cafés, community reuse centres, or tool libraries, by investing in infrastructure, coordination and knowledge sharing.

For businesses and business organisations:

- Engage in co-design processes with users, communities, and local stakeholders to align circular business models with social preferences.
- Measure and communicate social impacts as part of your circular value proposition to attract broader support.

4.5 Supply chain and ecosystem collaboration: building collective capacity to scale

Circular business models cannot operate in isolation. They rely on value chains and ecosystems where actors coordinate across design, production, use and recovery phases. Collaboration enables shared infrastructure, mutual trust, and aligned standards that are vital for efficiency and legitimacy.

Impact on the core of the business model

Collaboration enables value propositions that no single actor could deliver alone. For instance, the promise of closed-loop production requires reverse logistics, sorting partners, remanufacturers and retailers to coordinate activities. Shared product standards or sector-wide take-back agreements enhance consumer confidence in circular promises (De Angelis et al., 2018).

In the Dutch construction sector, the *New Horizon Urban Mining Collective* shows how value chain collaboration can unlock circular opportunities. By partnering with demolition firms, waste collectors, processors, and builders, it systematically dismantles buildings to recover materials like bricks, timber and steel. These are processed to quality standards and reintroduced into new projects, creating reliable supply, reducing environmental and climate impact, and helping normalise reclaimed components in a traditionally risk-averse industry (New Horizon, 2024).

Joint innovation, co-investment and logistics partnerships are essential to manage complexity in value creation and delivery. In second-hand retail, for example, pre-sorting agreements and product grading protocols across collection centres reduce duplication, assure harmonisation and enable scaling. For Product-service systems (PSS) models, alignment with after-sales service partners is critical to guarantee maintenance and returns. Horizontal collaboration between competitors, such as shared reverse logistics for white goods, was key to scale in several European pilots (Han et al., 2022).

The European Recycling Industries' Confederation (EuRIC) has developed an *industry-wide handling and sorting specification* that provides a standardised guideline for industry professionals across textile value chains to ensure high quality second-hand textiles for re-use and/or the appropriate infeed for the subsequent recycling process (EuRIC, 2021).

New forms of collaboration also create opportunities for value capture. Examples include revenue sharing, joint branding, or pooled use of resources. A repair platform, for instance, may earn income both from its own repair services and from commissions on partner products. In addition, agreements at the ecosystem level can open the door to external funding or to participation in certification schemes. However, collaboration also requires shared risk and mutual trust, especially where costs and benefits are unevenly distributed (Van Opstal et al., 2024). The Kalundborg industrial symbiosis model illustrates how shared infrastructure and mutually beneficial resource flows can yield collective economic and environmental returns (Kalundborg Symbiosis, 2025).

Scaling out, scaling up, and scaling deep

Collaboration across supply chains enables businesses to **scale out** by tapping into existing distribution networks, reverse logistics pathways, or shared infrastructure. For example, partnerships with retailers, logistics providers, or IT platforms allow repair or reuse services to expand their access to customers by integrating with established distribution and communication channels (Ciulli et al., 2022). Such collaborations reduce the cost and complexity of entering new markets. Furthermore, joint marketing campaigns also enhance brand legitimacy and make it easier to replicate models in different geographies or sectors (De Angelis et al., 2018).

Patagonia's Worn Wear programme partners with repair centres and iFixit to power a globally distributed reverse-logistics and repair network, enabling customers to trade in, repair, and purchase pre-owned gear (Seeing Green, 2025).

The Swedish denim brand *Nudie Jeans* collaborates with retailers to establish a repair network where customers can get their jeans repaired for free. The idea behind the Nudie Jeans Repair Shops is that they are hubs for jeans to be repaired, resold as second-hand or even donated to the Nudie Jeans recycling programme (Nudie Jeans, n.d.). Repair partners are reimbursed for each repair carried out and receive equipment and training from Nudie Jeans.

To **scale up,** collaboration must evolve into institutionalised ecosystem governance. Sector-wide coalitions, such as cross-industry symbiosis networks, help to reshape supply-demand relationships and influence policy reform. For instance, the Fair Cobalt Alliance initiated by Fairphone brought together mining companies, tech firms and NGOs to co-develop standards for ethical sourcing, thereby influencing practices at scale (Han et al., 2023; The Fair Cobalt Alliance, 2025). Ecosystem collaboration enables shared

R&D, pooled investments, and coordinated lobbying efforts to push circularity beyond individual business interests.

Scaling deep through collaboration involves transforming values and trust structures that govern inter-organisational relations. Collaborative ecosystems based on shared purpose, such as repair communities or local exchange networks, or commons-based production models, redefine value away from competition and toward mutual benefit (Konietzko et al., 2024). Such ecosystems can help to institutionalise trust, transparency and reciprocity, which are essential for long-term collaboration in circular supply chains. Moreover, cross-sectoral collaboration involving municipalities, cooperatives, and citizens enables the embedding of circular practices within local governance and daily life.

> Precious Plastic is a global, open-source initiative that shares free designs, blueprints and business models for small-scale plastic recycling machines, enabling communities to transform plastic waste into new products, thereby reducing plastic waste and supporting local economic opportunities. Operating as a commons-based production model, it treats technical knowledge as a shared resource maintained collectively by a worldwide network of makers, NGOs and local groups (Precious Plastics, 2025).

Leverage points

Early-stage circular businesses often operate in fragmented environments where critical partners, such as collectors, refurbishers, or recyclers, are missing or misaligned. Ecosystem collaboration helps firms to overcome these gaps and reach a *minimal viable scale* by sharing infrastructure, co-developing logistics, or agreeing on minimum quality standards. These cooperative arrangements reduce marginal costs and create access to external supply-side economies of scale (De Angelis et al., 2018). For example, shared warehousing and reverse logistics networks enable cost-effective returns management even for small players.

> As part of the EU-funded SYMBIO project, VCG.AI and Croatian partner *STEEM* developed a circular business model valorising glycerol from biomass sources across food, cosmetics, pharmaceuticals, and bio-based chemicals. AI-based analysis matched over 11 producers, a purification provider, and 9 market companies, creating a coordinated value network. By leveraging existing infrastructure and refining techniques, local by-products became high-value inputs. The model shows scaling out across industries and scaling up by embedding waste valorisation into Croatia's agri-food and chemical economy (Reif-Romero, 2025).

At the **niche scale**, collaboration becomes more strategic and structured. Sectoral partnerships, pre-competitive alliances and shared service models emerge to stabilise circular flows. These arrangements allow firms to specialise while accessing complementary capabilities, supporting dynamic economies of scale (Borms et al., 2023). Demand-side economies of scale may also follow when ecosystem brands build customer recognition and trust across multiple actors. Collaborative marketing and interoperability standards further improve system-level efficiency (Konietzko et al., 2020).

Transformation is not possible without ecosystem alignment. At this level, collaboration evolves into governance coordination among regulators, producers, service providers and end-users. Whole value chains adopt a circular logic and supporting infrastructures, such as logistics, tailored ICT, or repair hubs, are embedded across sectors (Derks et al., 2022; Trevisan et al., 2022).

> Under the *Amsterdam Circular Strategy 2020–2025*, the city aligns regulators, businesses and the public across key value chains, such as construction, food, and consumer good, to embed circular logic throughout. The city will map material flows from entry to processing to better preserve resources, and has committed that by 2030, half of all building renovations and maintenance operations will follow circular construction principles (City of Amsterdam, 2025).

Options for policymakers and public funders, businesses and industry associations, regional governments and ecosystem coordinators, investors, civil society and academia

The scaling of circular business models depends not only on individual firm strategies but also on the strength of the ecosystems in which they operate. Circularity requires coordinated action across supply chains and sectors, where different actors contribute complementary capabilities and resources. Collaboration within and across value chains is essential to mobilise investment in shared infrastructure, reduce transaction costs and enable efficient use of secondary materials and services. The following lessons outline how policymakers, businesses, regional governments, investors, and academia can foster ecosystem collaboration and build the collective foundations for circular business models to thrive.

For policymakers and public funders:

- Map circular value chains and actively support the development of regional and cross-sectoral ecosystems where collaboration enables efficient use of secondary materials, shared services and coordinated investment.
- Provide targeted funding for industrial symbiosis and cross-industry collaboration initiatives that promote the exchange of residual flows, by-products and reusable components.
- Fund shared reverse logistics and take-back infrastructure, including collection points, repair centres, and redistribution hubs that can serve multiple actors in a local or regional ecosystem.
- Invest in match-making platforms and circular hubs that connect producers, users, recyclers and service providers, especially SMEs and start-ups in need of ecosystem integration.
- Define and enforce interoperability, quality and safety standards for secondary materials and reused components to lower transaction costs, ensure trust, and facilitate scaling across firms and regions.

For businesses and industry associations:

- Pursue pre-competitive collaboration with peers and suppliers to co-develop enabling infrastructure (e.g., shared logistics, modular component systems, common return channels) that no single firm could justify alone.
- Invest in shared platforms and standards that allow different actors in the value chain to exchange data, verify circular performance and align product designs or reuse protocols.
- Engage in ecosystem coordination by identifying missing actors or capabilities needed to make circular loops operational and seeking partnerships to fill these gaps.
- Leverage industry associations or clusters to initiate collaborative pilots and accelerate trust-building between complementary actors.

For regional governments and ecosystem coordinators:

- Act as neutral brokers for circular collaboration, bringing together public, private and civil society actors to align strategies and jointly solve system bottlenecks.
- Support physical infrastructure and digital tools for cross-sector circularity, such as regional material exchanges, product tracking systems and collaborative logistics platforms.
- Fund and host circular hubs or ecosystem labs that facilitate innovation, match-making and experimentation across the value chain.
- Encourage governance models that ensure shared benefits, risk distribution and co-ownership of circular infrastructure.

For investors:

- Prioritise funding for infrastructure projects with multi-firm benefits, such as shared remanufacturing facilities or decentralised sorting centres.
- Recognise the systemic value of ecosystem-oriented investment, where outcomes depend on coordination and mutual reinforcement across stakeholders.

- Provide incentives or blended finance schemes that reward collaborative risk-taking and enable scaling strategies built on shared assets or capabilities.

For civil society and academia:

- Support applied research on ecosystem governance, platform interoperability and collaborative business models in circular settings.
- Develop decision-support tools and data analytics that help ecosystem actors identify synergies, gaps and optimal intervention points for value chain collaboration.
- Partner with regions and industries to pilot real-world ecosystem solutions, documenting lessons for broader replication and upscaling.

5 Lessons learned and future perspectives

Scaling circular business models is crucial to achieving Europe's environmental, climate and social ambitions. Despite a growing number of promising pilots and niche initiatives, their impact often remains limited by systemic barriers. This concluding chapter revisits the guiding questions of this report and distils key pathways for enabling circular business models to move from isolated experiments to mainstream economic and cultural practices.

What do we mean by scaling?

Scaling in the context of circular business models encompasses more than simply increasing revenue or market share. It includes three complementary strategies:

- Scaling out, i.e. replicating or geographically expanding a model, or diffusing circular practices across markets and actors.
- Scaling up, i.e. influencing systemic conditions, including policy, market structures and institutional norms.
- Scaling deep, i.e. embedding circularity in cultural values, behaviours and everyday practices.

Crucially, scaling does not imply unlimited economic growth. For many circular business models, scaling is also about reaching sufficiency, wellbeing and system stability, rather than maximising volume. This means that replication, cultural embedding and ecosystem alignment can be as important as financial expansion.

Why do some circular business models scale and others not?

The ability of a circular business model to scale depends on a mix of drivers, enablers and barriers, all of which vary across sectors, geographies and business model types.

- Enablers include supportive policies, enabling technologies, access to tailored finance and insurance, social innovation and ecosystem collaboration.
- Barriers include misaligned market incentives, lack of harmonised regulation, insufficient infrastructure, limited access to finance, cultural resistance and information gaps.
- Lock-ins in linear systems, such as entrenched supply chains, sunk investments and cultural norms around ownership, can inhibit scaling, even for technically viable and market-ready circular business models.

Some circular business models scale because they can leverage network effects, align with policy priorities, or tap into consumer trends. Others stall because they cannot overcome critical thresholds such as the minimum viable scale, where costs remain higher than revenues, or because they cannot break through to mainstream acceptance beyond early adopters.

What is optimal scaling?

Optimal scaling balances desirability (alignment with user needs and social values), feasibility (technical and operational capacity) and viability (economic sustainability). It involves:

- Reaching the minimum viable scale to sustain operations.
- Expanding to niche scale, where the model is competitive within targeted early adopter segments.
- Crossing the transformation point, where policy, infrastructure, finance and cultural norms align so that circular business models can compete on equal terms with linear incumbents.

Optimal scaling also accounts for limits and side effects: avoiding diseconomies of scale, rebound effects and environmental trade-offs that undermine circularity. For example, scaling a reuse model may reduce waste but increase transport emissions if logistics are inefficient. Furthermore, potential efficiency gains

and resource savings might be offset by increased consumption and production, requiring increased focus on how to avoid rebound effects.

Monitoring the scaling of circular business models

Robust monitoring is essential for evaluating the success and scaling of circular business models. Yet, official statistics reported by EU Member States remain very limited, and this gap is reflected in existing monitoring frameworks, where indicators on circular business models are largely absent. Few exceptions exist, such as the CE Monitor developed in Flanders or France's monitoring of the repair sector. Closing these monitoring gaps will require:

- Integration of metrics related to circular business models developments into official EU and Member State statistics.
- Expansion of monitoring frameworks to also capture novel circular business models such as peer-to-peer reuse platforms, as well as indicators related to behavioural shifts.
- Closer collaboration between statistical agencies, research organisations and practitioners to co-develop methodologies for data collection.

Improved monitoring would also enable policymakers to assess the impact of regulatory support for circular business models.

Pathways to enable scaling in Europe

Moving from pilots to true system transformation requires progress along several interconnected pathways:

- Policy and regulatory alignment emerge as a key enablers, with harmonised product standards, coherent EPR frameworks and fiscal systems that no longer disadvantage repair, reuse, or leasing.
- Technological innovation plays an equally central role, particularly interoperable digital tools (e.g. product passports and reverse logistics systems) and modular design solutions that make efficiency, transparency and replication possible.
- The financial architecture for circular business models also needs to evolve, with blended finance, performance-based lending, and risk-pooling insurance better suited to their long payback horizons.
- On the social side, behavioural and cultural shifts gain traction when grassroots initiatives are supported, repair and reuse skills are embedded in education, and campaigns reframe consumption around access and longevity.
- Finally, collaboration across supply chains and ecosystems bringing together different industries, shared infrastructures, and coordinated governance, can align the actions of all actors involved, ensuring that materials circulate efficiently and reliably at scale.

With the European Green Deal, the Circular Economy Action Plan, and sectoral initiatives such as the Ecodesign for Sustainable Products Regulation, Europe has the policy architecture to make circularity a mainstream economic logic. Scaling circular business models will require sustained cooperation among policymakers, businesses, investors, civil society and citizens, anchored in a systemic vision that integrates scaling out, scaling up, and scaling deep.

By aligning policy frameworks, financial systems, technological infrastructure, social norms and ecosystem governance, Europe can move circular business models beyond minimal viable scale, strengthen niche positions and trigger the transformation point where circularity becomes the default. This is not simply about growing new business models. It is about reshaping the whole economy to deliver resilience, competitiveness, wellbeing and sustainability for the long term.

6 References

Ackermann, L., & Tunn, V. S. C. (2024). Careless product use in access-based services: A rebound effect and how to address it. *Journal of Business Research*, *177*, 114643. https://doi.org/10.1016/j.jbusres.2024.114643

Acquier, A., Carbone, V., & Ezvan, C. (2025). Scaling circular economy business models: A capability perspective. *Business Ethics, the Environment & Responsibility*, *34*(2), 377–389. https://doi.org/10.1111/beer.12658

Adner, R. (2017). Ecosystem as Structure: An Actionable Construct for Strategy. *Journal of Management*, *43*(1), 39–58. https://doi.org/10.1177/0149206316678451

AfB. (2025). *Nachhaltig, sozial und wirtschaftlich erfolgreich: Afb social & green IT stellt neuen Wirkungsbericht vor*. https://www.afb-group.de/nachhaltig-sozial-und-wirtschaftlich-erfolgreich-afb-social-green-it-stellt-neuen-wirkungsbericht-vor/?utm_source=chatgpt.com

Ahrend. (2025). *Commitment to circular business operations and international expansion in 2024*. https://www.ahrend.com:80/en/about-ahrend/press-and-publications/Royal-Ahrend-continues-to-focus-on-circular-operations-and-international-expansion-in-2024/

AMS. (2025, July 31). *Pioneering Circular Chain Financing*. AMS. https://www.ams-institute.org/news/pioneering-circular-chain-financing/

Asgari, A., & Asgari, R. (2021). How circular economy transforms business models in a transition towards circular ecosystem: The barriers and incentives. *Sustainable Production and Consumption*, *28*, 566–579. https://doi.org/10.1016/j.spc.2021.06.020

Ayati, S. M., Shekarian, E., Majava, J., & Wæhrens, B. V. (2022). Toward a circular supply chain: Understanding barriers from the perspective of recovery approaches. *Journal of Cleaner Production*, *359*, 131775. https://doi.org/10.1016/j.jclepro.2022.131775

Banico, V. (2024, September 10). Circular Economy Insurance: Unlocking Sustainable Growth Through Innovative Coverage. *Evolveable Consulting*. https://evolveable.com/circular-economy-insurance-sustainable-growth/

Barkemeyer, R., Young, C. W., Chintakayala, P. K., & Owen, A. (2023). Eco-labels, conspicuous conservation and moral licensing: An indirect behavioural rebound effect. *Ecological Economics*, *204*, 107649. https://doi.org/10.1016/j.ecolecon.2022.107649

Bauwens, T., Hekkert, M., & Kirchherr, J. (2020). Circular futures: What Will They Look Like? *Ecological Economics*, *175*, 106703. https://doi.org/10.1016/j.ecolecon.2020.106703

Bauwens, T., Huybrechts, B., & Dufays, F. (2020). Understanding the Diverse Scaling Strategies of Social Enterprises as Hybrid Organizations: The Case of Renewable Energy Cooperatives. *Organization & Environment*, *33*(2), 195–219. https://doi.org/10.1177/1086026619837126

BBC. (2025). *BBC One—The Repair Shop*. BBC. https://www.bbc.co.uk/programmes/b08l581p

Beccarello, M., & Foggia, G. D. (2023). Efficient scale and scope of business models used in municipal solid waste management. *European Journal of Management and Business Economics*, *32*(4), 492–508. (world). https://doi.org/10.1108/EJMBE-09-2022-0271

Behave Green. (2025). *Hvornår erstatter genbrug nyt?* https://circular.kk.dk/sites/default/files/2025-09/Hovedrapport_%20Hvorn%C3%A5r%20erstatter%20genbrug%20nyt.pdf

Bene. (2025). *Bene Sustainability Report 2025*. https://bene.com/en/concepts-knowledge/sustainability-report

Beroud, B., Van Zeebroeck, B., & Peduzzi, E. (2024). *Which future for the Brussels' ublic bicycles service? Synthesis*. https://old-bm.irisnet.be/sites/default/files/2024-06/Future%20of%20Brussels%20public%20bicycles%20service%20-%20Synthesis.pdf

Bike Europe. (2023, September 22). *Pon-owned Swapfiets reports multi-million euro losses*. https://www.bike-eu.com/46063/pon-owned-swapfiets-reports-multi-million-euro-losses

BillieCup. (2024, August 16). Different regulations on disposable cups. *BillieCup*. https://billiecup.com/regulations-on-single-use-cups-in-different-countries/

BlueCity. (2025). *Home*. https://bluecity.nl/en

Bocken, N., Boons, F., & Baldassarre, B. (2019). Sustainable business model experimentation by understanding ecologies of business models. *Journal of Cleaner Production*, *208*, 1498–1512. https://doi.org/10.1016/j.jclepro.2018.10.159

Bocken, N., de Pauw, I., Bakker, C., & van der Grinten, B. (2016). Product design and business model strategies for a circular economy. *Journal of Industrial and Production Engineering*, *33*(5), 308–320. https://doi.org/10.1080/21681015.2016.1172124

Bocken, N., Harsch, A., & Weissbrod, I. (2022). Circular business models for the fastmoving consumer goods industry: Desirability, feasibility, and viability. *Sustainable Production and Consumption*, *30*, 799–814. https://doi.org/10.1016/j.spc.2022.01.012

Bocken, N., & Short, S. W. (2016). Towards a sufficiency-driven business model: Experiences and opportunities. *Environmental Innovation and Societal Transitions*, *18*, 41–61. https://doi.org/10.1016/j.eist.2015.07.010

Boeck, A. D., Lemahieu, V., & Wille, E. (2022, December 7). *Waste Management and Re-use centers in the region of Flanders*. Online Webinar “Strengthening the re-use of products in Croatia". https://thedocs.worldbank.org/en/doc/ad9eb02944f7b042a17c74d1a68ea7b3-0080012022/original/03-OVAM-and-re-use-in-Flanders-long-version-Wille.pdf

Borg Automotive. (2024). *Financial figures and ESG reporting: BORG Automotive grows and invests in sustainability*. https://borgautomotive-reman.com/news-and-articles/financial-figures-and-esg-reporting-borg-automotive-grows-and-invests-in-sustainability/

Borms, L., Van Opstal, W., Brusselaers, J., & Van Passel, S. (2023). The working future: An analysis of skills needed by circular startups. *Journal of Cleaner Production*, *409*, 137261. https://doi.org/10.1016/j.jclepro.2023.137261

Boukhatmi, Ä., Nyffenegger, R., & Grösser, S. N. (2023). Designing a digital platform to foster data-enhanced circular practices in the European solar industry. *Journal of Cleaner Production*, *418*, 137992. https://doi.org/10.1016/j.jclepro.2023.137992

Boukhatmi, Ä., & Van Opstal, W. (2025). How can digital platforms resolve market failures to foster a circular economy? *Business Strategy and the Environment*. https://doi.org/https://doi.org/10.1002/bse.70190

Brändström, J., Jazairy, A., & Roos Lindgreen, E. (2024). Barriers to adopting circular business models: A cross-sectoral analysis. *Business Strategy and the Environment*, *33*(5), 4331–4350. https://doi.org/10.1002/bse.3653

Business of Apps. (2025). *Vinted Revenue and Usage Statistics (2025)*. https://www.businessofapps.com/data/vinted-statistics/

Cavallo, A., Cosenz ,Federico, & and Noto, G. (2024). Business model scaling and growth hacking in digital entrepreneurship. *Journal of Small Business Management*, *62*(4), 2058–2085. https://doi.org/10.1080/00472778.2023.2195463

Cendon Garcia, D. (2025, June 17). Dutch MaaS startup umob raises €3.5 million for unified mobility booking platform—All in one app. *EU-Startups*. https://www.eu-startups.com/2025/06/dutch-maas-startup-umob-raises-e3-5-million-for-mobility-booking-platform-all-in-one-app/

Circle Economy. (2022). *The Circularity Gap Report—Built Environment, the Netherlands*. https://cdn.prod.website-files.com/5e185aa4d27bcf348400ed82/652e9d75befbcffd62c1affb_CGR%20BEN%20-%20Report.pdf

Circle Economy. (2024). *The Circularity Gap Report—Textiles*. https://www.circularity-gap.world/textiles

Circular Flanders. (n.d.-a). *Circular Flanders—Hub of the Flemish Circular Economy*. Retrieved 1 September 2025, from https://vlaanderen-circulair.be/en

Circular Flanders. (n.d.b). *Car sharing – CE monitor*. https://cemonitor.be/en/indicator/mobility/market/car-sharing/

Circular Flanders. (n.d.c). *Repair indicator – CE monitor*. https://cemonitor.be/en/indicator/circularity/r-strategies/repair-indicator/

Circularise. (2023, September 11). *R-Strategies for a Circular Economy*. https://www.circularise.com/blogs/r-strategies-for-a-circular-economy#practical-advice-for-businesses-looking-to-adopt-r-strategies-2

CircularPlace. (2024, June 13). CircularPlace announces a €1.4M fund-raising round. *La plateforme de réemploi qu'il vous faut !* https://circularplace.fr/circularplace-announces-a-e1-4m-fund-raising-round/

City of Amsterdam. (2025). *Policy: Circular economy* [Webpagina]. Gemeente Amsterdam. Policy: Circular Economy. https://www.amsterdam.nl/en/policy/sustainability/circular-economy/

Ciulli, F., Kolk, A., Bidmon, C. M., Sprong, N., & Hekkert, M. P. (2022). Sustainable business model innovation and scaling through collaboration. *Environmental Innovation and Societal Transitions*, *45*, 289–301. https://doi.org/10.1016/j.eist.2022.11.003

Coalition Circular Accounting. (2023). *Making Cycling Circular: The Case of Swapfiets*. https://cdn.prod.website-files.com/5d26d80e8836af2d12ed1269/63dbc3f642b96760b6b7fed8_Making%20cycling%20circular%20-%20The%20case%20of%20Swapfiets%20-%20White%20paper.pdf

Concular. (n.d.). *Pre-Deconstruction Audit nach DIN SPEC 91484 – Concular – Zirkuläres Bauen*. Retrieved 3 September 2025, from https://concular.de/din-spec-91484-pre-demolition-audit/

Copenhagen Municipality. (2024). *Undersøgelse af københavnernes holdninger og vaner i forhold til genbrug og reparation (unpublished)*.

Corertex. (2022). *Prato recycling district: Recycle wool, cashmere and other fabrics*. https://corertex.it/en/recycling/

Coscieme, L., Manshoven, S., Gillabel, J., Grossi, F., & Mortensen, L. F. (2022). A framework of circular business models for fashion and textiles: The role of business-model, technical, and social innovation. *Sustainability: Science, Practice and Policy*, *18*(1), 451–462. https://doi.org/10.1080/15487733.2022.2083792

Crosby, M. (2000). Patents, Innovation and Growth. *Economic Record*, *76*(234), 255–262. https://doi.org/10.1111/j.1475-4932.2000.tb00021.x

DBA. (2024). *Genbrugsindekset 2024*. https://www.dba.dk/guide/publikationer/genbrugsindekset/2024/

De Angelis, R., Howard, M., & Miemczyk, J. (2018). Supply chain management and the circular economy: Towards the circular supply chain. *Production Planning & Control*, *29*(6), 425–437. https://doi.org/10.1080/09537287.2018.1449244

De Nederlandsche Bank. (2024). *Circular Finance through the Circular Risk Scorecard*. https://www.dnb.nl/en/green-economy/sustainable-finance-platform/circular-finance-through-the-circular-risk-scorecard/

Decathlon. (2025a). *Second Life | Decathlon*. https://www.decathlon.co.uk/c/lp/second-life-decathlon_19e3a173-d511-4277-8ffd-abf475fe3dd0

Decathlon. (2025b). *Verhuur van sportartikelen*. https://rental.decathlon.com/be/nl

Delanoeije, J., & Bachus, K. (2022). Measuring circular reuse magnitude and replacement rate: A new method. *Resources, Conservation and Recycling*, *184*, 106414. https://doi.org/10.1016/j.resconrec.2022.106414

Derks, M., Oukes, T., & Romijn, H. (2022). Scaling inclusive business impacts at the Base of the Pyramid: A framework inspired by business model ecosystems research. *Journal of Cleaner Production*, *366*, 132875. https://doi.org/10.1016/j.jclepro.2022.132875

DG Environment. (2024, September). *Ecolabel facts and figures*. https://environment.ec.europa.eu/topics/circular-economy/eu-ecolabel/businesses/ecolabel-facts-and-figures_en

EC. (2020, November 3). *A new Circular Economy Action Plan For a cleaner and more competitive Europe. COM(2020) 98 final*. https://eur-lex.europa.eu/resource.html?uri=cellar:9903b325-6388-11ea-b735-01aa75ed71a1.0017.02/DOC_1&format=PDF

EC. (2023). *Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on common rules promoting the repair of goods and amending Regulation (EU) 2017/2394, Directives (EU) 2019/771 and (EU) 2020/1828*. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023PC0155&qid=1766824076547

EC. (2024). *EU eco-innovation index 2024*. https://data.europa.eu/doi/10.2777/4878812

ECA. (2023). *Circular Economy. Slow transition by member states despite EU action* (Special Report No. 17/2023). European Court of Auditors. https://www.eca.europa.eu/ECAPublications/SR-2023-17/SR-2023-17_EN.pdf

ECESP. (2021). *Circular Taxation Reflection Paper*. European Circular Economy Stakeholder Platform.

EEA. (2021). *A framework for enabling circular business models in Europe*. https://www.eea.europa.eu/publications/a-framework-for-enabling-circular/a-framework-for-enabling-circular

EEA. (2022). *The role of (environmental) taxation in supporting sustainability transitions*. https://www.eea.europa.eu/en/analysis/publications/the-role-of-environmental-taxation-in-supporting-sustainability-transitions

EEA. (2024a). *Accelerating the circular economy in Europe: State and outlook 2024*. Publications Office of the European Union. https://data.europa.eu/doi/10.2800/055236

EEA. (2024b). *Product lifespans—Monitoring trends in Europe* [EEA Briefing]. https://www.eea.europa.eu/en/analysis/publications/product-lifespans-monitoring-trends

EEA. (2024c). *Reuse flows according to the implementing decision (EU) 2021/19: Information on the database structure and use Database version*. https://sdi.eea.europa.eu/catalogue/srv/api/records/99101ccf-00a6-40fc-9129-122e836d0db5/attachments/Reuse%20metadata%20annex%20Version%201.pdf

EEA. (2024d, June 18). *The role of plastics in Europe's circular economy*. https://www.eea.europa.eu/en/analysis/publications/the-role-of-plastics-in-europes

EEA. (2025). *Number cars in car sharing schemes | Circularity Metrics Lab*. https://www.eea.europa.eu/en/circularity/thematic-metrics/consumer/number-cars-in-car-sharing-schemes-1

EEA. (n.d.). *Jobs in B2C repair sector—Circularity Metrics Lab*. https://www.eea.europa.eu/en/circularity/sectoral-modules/product-lifespans/jobs-in-b2c-repair-sector?activeTab=658e2886-cfbf-4c2f-a603-061e1627a515

Egebæk, K., Børglum Ploug Olsen, A., Kress, L., Johansen, M., Mailund Rebsdorf, J., Bekkevold Lingås, D., Transberg Mortensen, Kaae Adams, Y., Borgman, E., Jørgensen, D., Andersen, S. N., Møller, S. S., Christensen, M., & Hall, M. J. (2024). *Product-Service Systems in the Nordics: Paving the Way for Circular Business & Sustainable Consumption*. Nordic Council of Ministers. https://pub.norden.org/temanord2024-552/2-pss-in-the-nordics.html

EIB. (2025). *Circular economy*. https://www.eib.org/en/projects/topics/energy-natural-resources/circular-economy/index

Ellen MacArthur Foundation. (2025). *How not to fail: Avoiding 10 common pitfalls when scaling circular business models*.

ERN. (2020). *An EU-Horizon funded research project reporting on the scale and value of remanufacturing in Europe*. European Remanufacturing Network. https://www.remanufacturing.eu/

Estrougo, A. R. (2025). *Post | LinkedIn* [Online post]. https://www.linkedin.com/posts/anarachelestrougo_femalefounder-entrepreneurship-founderjourney-activity-7310314961489055744-lUx2/?utm_source=share&utm_medium=member_desktop&rcm=ACoAAAsRzZIBB3PcssV7lP8NJ-yp3Dh1dO0VTEQ

ETC. (2021). *Contribution of remanufacturing to Circular Economy* (ETC/WMGE Report 10/2021). European Topic Centre Waste and Materials in a Green Economy. https://www.eionet.europa.eu/etcs/etc-wmge/products/etc-wmge-reports/contribution-of-remanufacturing-to-circular-economy)

ETC CE. (2022). *An overview of Europe's repair sector*. https://www.eionet.europa.eu/etcs/etc-ce/products/etc-ce-products/etc-ce-report-6-2022-an-overview-of-europes-repair-sector

ETC CE. (2025). *Potential environmental gains from service models* (EEA ETC Report No. 2025/1). https://www.eionet.europa.eu/etcs/etc-ce/products/etc-ce-report-2025-1-potential-environmental-gains-from-service-models

ETC/WMGE. (2021a). *2.1.2.4. ETC Eionet Report Circular Business Models_final_edited for website-6* (No. 2021/2; Business Models in a Circular Economy).

ETC/WMGE. (2021b). *Business Models in a Circular Economy* (Eionet Report No. 2021/2). ETC/WMGE. https://www.eionet.europa.eu/etcs/etc-wmge/products/etc-wmge-reports/business-models-in-a-circular-economy

EuRIC. (2021). *Position papaer: Handling & Sorting Specifications for re-use and recycling of used textiles*. https://euric.org/images/Position-papers/EuRIC_Handling__Sorting_Specs_July2021.pdf

EuRIC. (2025, April 9). *Plastics Value Chain Demands Immediate Action to Save EU Industry* [Letter]. https://euric.org/images/Letters/final_250904_Plastic_Value_Chain_Strategic_Recommendations_Press_release.pdf

Eurobarometer. (2020). *Special Eurobarometer 503: Attitudes towards the impact of digitalisation on daily lives* [Data set]. https://data.europa.eu/data/datasets/s2228_92_4_503_eng?locale=en

European Circular Economy Stakeholder Platform. (2024). *Digital Product Passport as Enabler for the Circular Economy*. https://circulareconomy.europa.eu/platform/en/knowledge/digital-product-passport-enabler-circular-economy

European Environment Agency. (n.d.). *SMEs offering green products or services | Circularity Metrics Lab*. Retrieved 31 March 2025, from https://www.eea.europa.eu/en/circularity/thematic-metrics/business/smes-offering-green-products-or-services?activeTab=77c4828a-e6b9-40c3-811f-d4ad3e7e4dc3

European Environment Agency. (2024a). *Accelerating the circular economy in Europe: State and outlook 2024.* Publications Office. https://data.europa.eu/doi/10.2800/055236

European Environment Agency. (2024b). *Europe's circular economy in facts and figures*. European Environment Agency. https://www.eea.europa.eu/en/analysis/publications/europes-circular-economy-in-facts

European Environment Agency. (2024c, October 28). *Environmental, Social, and Governance Performance of EU Companies | Circularity Metrics Lab*. https://www.eea.europa.eu/en/circularity/thematic-metrics/business/environmental-social-and-governance-esg-performance-of-eu-companies?activeTab=658e2886-cfbf-4c2f-a603-061e1627a515

European Environment Agency. (2024d, November 28). *Washing machines' intensity of use | Circularity Metrics Lab*. https://www.eea.europa.eu/en/circularity/sectoral-modules/product-lifespans/evolution-in-the-average-number-of-washing-cycles-per-washing-machine-in-eu-intensity-of-use?activeTab=658e2886-cfbf-4c2f-a603-061e1627a515

European Environment Agency. (2024e, December 11). *Eco-innovation index in Europe*. https://www.eea.europa.eu/en/analysis/indicators/eco-innovation-index-8th-eap

European Environment Agency. (2025a). *Bike sharing systems in European cities | Circularity Metrics Lab*. https://www.eea.europa.eu/en/circularity/sectoral-modules/product-lifespans/availability-of-bike-sharing-systems-in-european-cities-intensity-of-use

European Environment Agency. (2025b). *Share of the most popular clothing sold online that contains recycled content*. https://www.eea.europa.eu/en/circularity/sectoral-modules/textiles/share-of-the-most-popular-clothing-sold-online-that-contains-recycled-content

European Environment Agency. (2025c, June 1). *Circular material use rate in Europe | European Environment Agency's home page*. https://www.eea.europa.eu/en/analysis/indicators/circular-material-use-rate-in-europe

European Investment Bank. (2024). *Circular Economy Overview 2024*.

European Investment Bank. (2025). *Circular economy*. Circular Economy. https://www.eib.org/en/projects/topics/energy-natural-resources/circular-economy/index

Eurostat. (n.d.). *Monitoring framework—Circular economy*. https://ec.europa.eu/eurostat/web/circular-economy/monitoring-framework

Ezeudu, O. B., & Bristow, D. (2025). Financing methods for solid waste management: A review of typology, classifications, and circular economy implications. *Sustainable Development*, *33*(2), 3062–3085. https://doi.org/10.1002/sd.3256

FairBnB. (2025). *Fairbnb.coop—Sustainable flats, B&B, rooms, bnb and vacation rentals*. Fairbnb.Coop - Community Powered Tourism. https://fairbnb.coop/

Fairphone. (2025). *Our Impact*. https://www.fairphone.com/en/impact/

Fashion Revolution. (2021). *#LovedClothesLast: Tales from our Wardrobes*. https://www.fashionrevolution.org/lovedclotheslast-tales-from-our-wardrobes/

Ganapini, C. (2023, March 9). There is life on Mars! Success stories of financial incentives to make repair affordable. *Right to Repair Europe*. https://repair.eu/news/there-is-life-on-mars-financial-incentives-to-make-repair-affordable/

GCC Webmag. (2024, December 5). VYTAL Global enters the U.S. market with the launch of VYTAL US Inc. *Gccwebmag.Com*. https://gccwebmag.com/vytal-global-enters-the-u-s-market-with-the-launch-of-vytal-us-inc/

Geissdoerfer, M., Santa-Maria, T., Kirchherr, J., & Pelzeter, C. (2023). Drivers and barriers for circular business model innovation. *Business Strategy and the Environment*, *32*(6), 3814–3832. https://doi.org/10.1002/bse.3339

Grafström, J., & Aasma, S. (2021). Breaking circular economy barriers. *Journal of Cleaner Production*, *292*, 126002. https://doi.org/10.1016/j.jclepro.2021.126002

Halte à l'Obsolescence Programmée. (2024). *Bonus réparation. Retour d'expérience de consommateurs et réparateurs sur le fonds réparation des équipements électriques et électroniques (EEE)*. https://www.halteobsolescence.org/wp-content/uploads/2024/01/Rapport-HOP-Bonus-reparation.pdf

Han, D., Konietzko, J., Dijk, M., & Bocken, N. (2022). How do companies launch circular service business models in different countries? *Sustainable Production and Consumption*, *31*, 591–602. https://doi.org/10.1016/j.spc.2022.03.011

Han, D., Konietzko, J., Dijk, M., & Bocken, N. (2023). How do circular start-ups achieve scale? *Sustainable Production and Consumption*, *40*, 363–375. https://doi.org/10.1016/j.spc.2023.06.007

Henry, M., Hoogenstrijd, T., & Kirchherr, J. (2023). Motivations and identities of "grassroots" circular entrepreneurs: An initial exploration. *Business Strategy and the Environment*, *32*(3), 1122–1141. https://doi.org/10.1002/bse.3097

HOP. (n.d.). *HOP – Stop Planned Obsolescence*. https://www.stopobsolescence.org/#faq

Hultberg, E., & Pal, R. (2021). Lessons on business model scalability for circular economy in the fashion retail value chain: Towards a conceptual model. *Sustainable Production and Consumption*, *28*, 686–698. https://doi.org/10.1016/j.spc.2021.06.033

Human Environment and Transport Inspectorate. (2025). *Fast fashion undermines the circular textiles value chain*.

Huygens, D., Foschi, J., Caro, D., Patinha, C. C., Faraca, G., Foster, G., Solis, M., Marschinski, R., Napolano, L., Fruergaard, A. T., & Tonini, D. (2023). *Techno-scientific assessment of the management options for used and waste textiles in the European Union*. https://doi.org/10.2760/6292

Inedit. (2024, May 22). The repair of goods, a pillar of the circular economy and a business opportunity. *Inèdit*. https://ineditinnova.com/en/la-reparacio-de-bens-un-pilar-de-leconomia-circular-i-una-oportunitat-de-negoci/

Ingvardson, J. B., Weisshaar, M., & Rich, J. (2023). Will good public transport substitute free-floating car sharing? A case study from Copenhagen. *Case Studies on Transport Policy*, *12*, 100975. https://doi.org/10.1016/j.cstp.2023.100975

Izsak, K., & Moreno, C. (2024). *Monitoring the twin transition of industrial ecosystems—Textiles - analytical report* [Website]. Publications Office of the European Union. https://op.europa.eu/en/publication-detail/-/publication/06780edf-0911-11ef-a251-01aa75ed71a1/language-en

Jaffe, A. B., Newell, R. G., & Stavins, R. N. (2005). A tale of two market failures: Technology and environmental policy. *Ecological Economics, Technological Change and the Environment*, *54*(2), 164–174. https://doi.org/10.1016/j.ecolecon.2004.12.027

Jain, V., O'Brien, W., & Gloria, T. P. (2021). Improved solutions for shared value creation and maximization from used clothes: Streamlined structure of clothing consumption system and a framework of closed loop hybrid business model. *Cleaner and Responsible Consumption*, *3*, 100039. https://doi.org/10.1016/j.clrc.2021.100039

Kahneman, D. (2011). *Thinking, Fast and Slow* (1st edn). Penguin.

Kalundborg Symbiosis. (2025). *Home*. https://www.symbiosis.dk/en/

Kassatly, V. B., & Townsend, T. (2024). *European Union Ecodesign for Sustainable Products Regulation: Summary of inconsistencies and potential deficiencies in the Preliminary Study on New Product Priorities—With specific reference to Textiles and Footwear*. Cotton Research and Development Corporation.

Keuchenius, K. (2023, August 15). Circulair ondernemen draait niet om verkopen, en juist dat maakt het ingewikkeld. *Trouw*. https://www.trouw.nl/duurzaamheid-economie/circulair-ondernemen-draait-niet-om-verkopen-en-juist-dat-maakt-het-ingewikkeld~bd8548ee/

Klofsten, M., Kanda, W., Bienkowska, D., Bocken, N., Mian, S., & Lamine, W. (2024). Start-ups within entrepreneurial ecosystems: Transition towards a circular economy. *International Small Business Journal*, *42*(4), 383–395. https://doi.org/10.1177/02662426241227520

Konietzko, J., Baldassarre, B., Bocken, N., & Ritala, P. (2024). Initiating a Minimum Viable Ecosystem for Circularity. In A. R. Ometto, J. Sarkis, & S. Evans (Eds), *A Systemic Transition to Circular Economy: Business and Technology Perspectives* (pp. 65–83). Springer International Publishing. https://doi.org/10.1007/978-3-031-55036-2_4

Konietzko, J., Bocken, N., & Hultink, E. J. (2020). Circular ecosystem innovation: An initial set of principles. *Journal of Cleaner Production*, *253*, 119942. https://doi.org/10.1016/j.jclepro.2019.119942

KPMG. (2025). Europe's secondhand fashion market projected to reach €26 billion by 2030. *FashionNetwork.Com*. https://ww.fashionnetwork.com/news/Europe-s-secondhand-fashion-market-projected-to-reach-26-billion-by-2030,1722442.html

Kromand, J. B., Tilsted, J. P., & Bjørn, A. (2025). Developing sufficiency-based sharing principles for absolute environmental sustainability assessment using decent living standards and planetary boundaries. *Sustainable Production and Consumption*, *54*, 516–529. https://doi.org/10.1016/j.spc.2025.01.008

Laitala, K., & Grimstad Klepp, I. (2022, October 19). *Review of clothing disposal reasons*. Consumption Research Norway (SIFO). https://clothingresearch.oslomet.no/2022/10/19/review-of-clothing-disposal-reasons/

Lam, D. P. M., Martín-López, B., Wiek, A., Bennett, E. M., Frantzeskaki, N., Horcea-Milcu, A. I., & Lang, D. J. (2020). Scaling the impact of sustainability initiatives: A typology of amplification processes. *Urban Transformations*, *2*(1), 3. https://doi.org/10.1186/s42854-020-00007-9

Ma, Q., Xu, B., & Bititci, U. (2025). Unpacking financial aspects of circular economy: A systematic literature review. *Journal of Environmental Management*, *384*, 125507. https://doi.org/10.1016/j.jenvman.2025.125507

Mathews, B. (2025, June 25). Texaid files for insolvency as textile recycling crisis deepens. *Apparel Insider*. https://apparelinsider.com/texaid-files-for-insolvency-as-textile-recycling-crisis-deepens/

Meadows, D. H. (1999). *Leverage points: Places to intervene in a system*. http://donellameadows.org/archives/leverage-points-places-to-intervene-in-a-system/

Mejía-Vélez, P., Van Opstal, W., Bidmon, C., Manshoven, S., & Kirchherr, J. (2026). The Fast, the Steady, and the Tenacious: Funding Pathways for Circular Start-ups. *Business Strategy and the Environment*. https://doi.org/https://doi.org/10.1002/bse.70820

Ministère de la Transition Ecologique. (2021). *La Loi Anti-gaspillage dans le quotidien des Français: Concrètement ça donne quoi?* https://www.ecologie.gouv.fr/sites/default/files/publications/Document_LoiAntiGaspillage%20_2020.pdf

Ministères Aménagement du territoire Transition écologique. (2024, December 16). *Indice de réparabilité*. https://www.ecologie.gouv.fr/politiques-publiques/indice-reparabilite

Mizrachi, M. P., & Sharon, O. (2025). Secondhand fashion consumers exhibit fast fashion behaviors despite sustainability narratives. *Scientific Reports*, *15*(1), 34968. https://doi.org/10.1038/s41598-025-19089-1

Moore, M.-L., Riddell, D., & Vocisano, D. (2015). Scaling out, scaling up, scaling deep: Strategies of non-profits in advancing systemic social innovation. *Journal of Corporate Citizenship*, (58), 67–85.

Municipal Waste Europe & EuRIC. (2024). *Crisis in Europe's textiles sorting and recycling sector could trigger a domino effect*. https://www.municipalwasteeurope.eu/publications/crisis-in-europes-textiles-sorting-and-recycling-sector-could-trigger-a-domino-effect

New Horizon. (2024). *New Horizon*. https://newhorizon.nl/

Niessen, L., & Bocken, N. (2021). How can businesses drive sufficiency? The business for sufficiency framework. *Sustainable Production and Consumption*, *28*, 1090–1103. https://doi.org/10.1016/j.spc.2021.07.030

Noëth, E., Van Opstal, W., & Du Bois, E. (2024). Introducing reusable food packaging: Customer preferences and design implications for successful market entry. *Business Strategy and the Environment*, bse.3820. https://doi.org/10.1002/bse.3820

NoPalm Ingredients. (2025, September 2). *NoPalm Ingredients*. NoPalm Ingredients. https://www.nopalm-ingredients.com

Norion Consult et al. (forthcoming). *Understanding the transition to Circular Value Chains. Governance and Power Insights across eight Sectors*. DG RTD, European Commission.

NORNORM. (2025). *Office Furniture Subscription Service*. https://nornorm.com

Nudie Jeans. (2025). *Create tomorrow's vintage*. https://www.nudiejeans.com/en-BE/blog/create-tomorrows-vintage

Nudie Jeans. (n.d.). *Free Repairs Forever*. https://www.nudiejeans.com/en-DK/blog/free-repairs-forever

OVAM. (n.d.). *Wetgeving cateringmateriaal*. Website NL. Retrieved 1 September 2025, from https://ovam.vlaanderen.be

Oxfam. (2025). *Shop de Oxfam Infinity Collection tijdens Second Hand September*. https://oxfambelgie.be/infinity-collection

Palomares-Aguirre, I., Barnett, M., Layrisse, F., & Husted, B. W. (2018). Built to scale? How sustainable business models can better serve the base of the pyramid. *Journal of Cleaner Production*, *172*, 4506–4513. https://doi.org/10.1016/j.jclepro.2017.11.084

Parchomenko, A., De Smet, S., Pals, E., Vanderreydt, I., & Van Opstal, W. (2023). The circular economy potential of reversible bonding in smartphones. *Sustainable Production and Consumption*, *41*, 362–378. https://doi.org/10.1016/j.spc.2023.08.017

PIANOo. (n.d.). *Getting started with circular procurement*. Retrieved 1 September 2025, from https://www.pianoo.nl/en/sustainable-public-procurement/spp-themes/circular-procurement/getting-started-circular-procurement

Polaris Insurance. (2025). *Clothing Hiring Insurance*. Polaris Insurance. https://www.hellopolaris.co.uk/product/clothing-hiring-insurance/

Poppe, E., Aigner, T. M., Meyer, K., & Molnár, M. (2024). *Erweiterte ökologische Wirkungsabschätzung zum Reparaturbonus Thüringen.* Frauenhofer IZM.

Potting, J., Hekkert, M., Worrell, E., & Hanemaaijer, A. (2017). *Circular Economy: Measuring Innovation in the Product Chain*. BL Netherlands Environmental Assessment Agency. https://www.pbl.nl/uploads/default/downloads/pbl-2016-circular-economy-measuring-innovation-in-product-chains-2544.pdf

Precious Plastics. (2025). *Make it precious*. https://preciousplastic.com/

PrismaPrato. (2025). *Sustainability and Innovation—PRato Industrial SMart Accelerator*. https://www.prismaprato.it/en/Sustainability-Innovation/pagina8144.html

Proske, M., Sánchez, D., Clemm, C., & al, et. (2020). *Life Cycle Assessment of the Fairphone 3*. Fraunhofer IZM.

PSF. (2025). *Financing a Clean and Competitive Transition. Monitoring Capital Flows to Sustainable Investments- Methodology*. https://finance.ec.europa.eu/document/download/e362fda8-cef4-41a2-97c5-22c1a9adbd66_en?filename=250311-sustainable-finance-platform-report-capital-flows-methodology_en.pdf

Pun, A. (2022, June 20). 10 European startups fueling the transition to a circular economy. *EU-Startups*. https://www.eu-startups.com/2022/06/10-europeans-startups-fueling-the-transition-to-a-circular-economy/

Quifactum. (2025). *Create digital product passports in minutes*. https://quifactum.com/en

REBus. (2017). *Utilities and circular furniture*. https://www.rebus.eu.com/wp-content/uploads/2017/05/REBus-Case-study-Alliander-Furniture.pdf

RECO Blog. (n.d.). *24 Green Apps for an Eco-Friendly Lifestyle*. Retrieved 3 September 2025, from https://www.reco.shop/blogs/reco-blog/green-apps-for-an-eco-friendly-lifestyle?srsltid=AfmBOopqQbxXvi5uVAzAroPjc1l9a2ovEgMGd0vT4NDqWamKo3Ol9niU#too_good_to_go

Recyda. (2025). *Packaging Sustainability Management.* https://www.recyda.com/

Refashion. (n.d.). *L'éco-organisme textile pour une mode durable*. Refashion. Retrieved 1 September 2025, from https://refashion.fr/

Re_fashion. (2025). *Trouver un réparateur labellisé près de chez moi | Refashion*. https://refashion.fr/trouver-un-reparateur

Reif-Romero, S. (2025, April 8). *Turning Croatian Agricultural and Industrial Residuals Into Glycerol—VCG*. https://vcg.ai/portfolio/turning-croatian-agricultural-and-residuals-waste-into-glycerol/

Repair Café. (2025). About Repair Café—Repairing for a Sustainable Future. *Repaircafe*. https://www.repaircafe.org/en/about/

Right to Repair Europe. (2025). *Home*. Right to Repair Europe. https://repair.eu/

Right to Repair & IFIXIT. (2024). *Current State of EU Right to Repair*. https://repair.eu/wp-content/uploads/2024/10/Current-State-of-EU-Right-to-Repair-Right-to-Repair-Europe.pdf?utm_source=chatgpt.com

Rijkswaterstaat. (2017). *REBus Furniture Sector report*. Rijkswaterstaat. https://www.pianoo.nl/sites/default/files/documents/documents/rebussectorreportfurnitureslessonsoktober2017.pdf

Rok, B., & Kulik, M. (2020). Circular start-up development: The case of positive impact entrepreneurship in Poland. *Corporate Governance: The International Journal of Business in Society*, *21*(2), 339–358. https://doi.org/10.1108/CG-01-2020-0043

Sandberg, E., & Hultberg, E. (2021). Dynamic capabilities for the scaling of circular business model initiatives in the fashion industry. *Journal of Cleaner Production*, *320*, 128831. https://doi.org/10.1016/j.jclepro.2021.128831

Sarasini, S., Bocken, N., Diener, D., Velter, M., & Whalen, K. (2024). Reviewing the climatic impacts of product service systems: Implications for research and practice. *Journal of Cleaner Production*, *452*, 142119. https://doi.org/10.1016/j.jclepro.2024.142119

Seeing Green. (2025). Spotlight: Worn Wear by Patagonia. *Seeing Green*. https://www.seeinggreen.eco/solutions/spotlight-worn-wear-by-patagonia

Service d'Information du Gouvernement. (2025, July 6). *Dans l'actu: Une proposition de loi pour freiner la « fast fashion »*. https://www.info.gouv.fr/actualite/dans-lactu-une-proposition-de-loi-pour-freiner-la-fast-fashion

Siderius, T., & Zink, T. (2023). Markets and the Future of the Circular Economy. *Circular Economy and Sustainability*, *3*(3), 1569–1595. https://doi.org/10.1007/s43615-022-00196-4

Stempfle, S., Roselli, L., Carlucci, D., Leone, A., de Gennaro, B. C., & Giannoccaro, G. (2022). Toward the circular economy into the olive oil supply chain: A case study analysis of a vertically integrated firm. *Frontiers in Sustainable Food Systems*, *6*, 1005604. https://doi.org/10.3389/fsufs.2022.1005604

Strupeit, L., Bocken, N., & Van Opstal, W. (2024). Towards a Circular Solar Power Sector: Experience with a Support Framework for Business Model Innovation. *Circular Economy and Sustainability*. https://doi.org/10.1007/s43615-024-00377-3

Swapfiets. (2025). *About Swapfiets*. https://newsroom.swapfiets.com/en-be/About-us

Swappie. (2024). *Let's make refubished mainstream—Our vision for Europe's Secondhand Smartphone Market*. https://assets.swappie.com/Swappie_Vision_Report_2024.pdf

Systemiq. (2025). *The Textile Recycling Breakthrough: Why policy must lead the scale-up of polyester recycling in Europe* (Sy). https://www.systemiq.earth/downloads/Systemiq-The_Textile_Recycling_Breakthrough-Why_policy_must_lead_the_scale-up_of_polyester_recycling_in_Europe-EN.pdf

Textile Exchange. (2025). *Materials Market Report 2025*. Textile Exchange. https://2d73cea0.delivery.rocketcdn.me/app/uploads/2025/09/Materials-Market-Report-2025.pdf

The Fair Cobalt Alliance. (2025). *Home*. The Fair Cobalt Alliance. https://www.faircobaltalliance.org/

TOMRA. (2025). *Transforming how we obtain, use and reuse our planet's resources*. https://www.tomra.com/

Too Good to Go. (2024). *2024 Impact Report*. https://cdn.sanity.io/files/nqimd3nr/production/29eae5a1b44b8bd12471757a9d81ed7b512512e1.pdf?cookie_consent=true&locale=en-gb&referring_domain=https://www.toogoodtogo.com

Toxopeus, H., Achterberg, E., & Polzin, F. (2021). How can firms access bank finance for circular business model innovation? *Business Strategy and the Environment*, *30*(6), 2773–2795. https://doi.org/10.1002/bse.2893

Trevisan, A. H., Castro, C. G., Gomes, L. A. V., & Mascarenhas, J. (2022). Unlocking the circular ecosystem concept: Evolution, current research, and future directions. *Sustainable Production and Consumption*, *29*, 286–298. https://doi.org/10.1016/j.spc.2021.10.020

Türkeli, S., Huang, B., Stasik, A., & Kemp, R. (2019). Circular Economy as a Glocal Business Activity: Mobile Phone Repair in the Netherlands, Poland and China. *Energies*, *12*(3), 498. https://doi.org/10.3390/en12030498

umob. (2024, October 15). *Home—Umob*. https://umob.app/

Valused. (2025). *Valused*. https://www.valused.fr/fr/

Van Opstal, W. (2025). Too old for a circular solar economy? Age dynamics in the acceptance of solar and circular value propositions. *Technological Forecasting and Social Change*, *212*, 124001. https://doi.org/10.1016/j.techfore.2025.124001

Van Opstal, W., & Borms, L. (2023). Startups and circular economy strategies: Profile differences, barriers and enablers. *Journal of Cleaner Production*, *396*, 136510. https://doi.org/10.1016/j.jclepro.2023.136510

Van Opstal, W., & Borms, L. (2025). Subsidizing repair: Implications for the formal and informal circular economy. *Journal of Cleaner Production*, *518*, 145898. https://doi.org/10.1016/j.jclepro.2025.145898

Van Opstal, W., & Manshoven, S. (2024). From trust to transition: Residential customer acceptance of circular solar business models. *Energy Research & Social Science*, *115*, 103647. https://doi.org/10.1016/j.erss.2024.103647

Van Opstal, W., Pals, E., & Sangers, D. (2025). Mapping the prevalence and size of the informal circular economy in an industrialised region. *Resources, Conservation and Recycling*, *218*, 108268. https://doi.org/10.1016/j.resconrec.2025.108268

Van Opstal, W., Smeets, A., & Pals, E. (2024). Aligning incentives for implementing reversible bonding as a circular economy innovation. *Business Strategy and the Environment.* https://doi.org/https://doi.org/10.1002/bse.3904

Varian, H. (2018). Use and Abuse of Network Effects. In *Toward a Just Society* (pp. 227–239). Columbia University Press. https://doi.org/10.7312/guzm18672-013

Verbraucherzentrale Thüringen. (n.d.). *Reparaturbonus Thüringen*. Retrieved 26 November 2025, from https://www.vzth.de/reparaturbonus

Vermunt, D. A., Negro, S. O., Verweij, P. A., Kuppens, D. V., & Hekkert, M. P. (2019). Exploring barriers to implementing different circular business models. *Journal of Cleaner Production*, *222*, 891–902. https://doi.org/10.1016/j.jclepro.2019.03.052

VLAIO. (2022, August 17). *Blue deal waterbesparende investeringen | VLAIO*. https://www.vlaio.be/nl/subsidies-financiering/blue-deal-waterbesparende-investeringen

Vytal. (2025). *About Vytal*. https://vytal.org/about/about

WBCSD. (2025). *Global Circularity Protocol for Business*. World Business Council for Sustainable Development.

WRAP. (2025). *Displacement Rates Untangled: A Standardised Methodology*.

WWF. (2024). *Mehrweg in der Deutschen Gastronomie. Ein Realitätscheck ein Jahr nach Einführung der Mehrwegangebotspflicht*. Umweltstiftung WWF - Deutschland.

Yurdaanik Eskiyerli, D., & Ewertz, S. (2024). Foreign market entry with circular business models: A customer-centric approach. *Frontiers in Sustainability*, *5*, 1344801. https://doi.org/10.3389/frsus.2024.1344801

Zink, T., & Geyer, R. (2017). Circular Economy Rebound. *Journal of Industrial Ecology*, *21*(3), 593–602. https://doi.org/10.1111/jiec.12545

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