THE CIRCULAR ECONOMY

When benefits to business and political goals go hand in hand

Technology Industries of Sweden

Table of contents

Politics and business go hand in hand

When the business sector and society strive in the same direction, tremendous momentum arises. With common goals, legislation and business models can form the foundation for profound change. Such is the case with the circular economy.

The goal of society and politics in promoting a circular economy is to enhance sustainability by conserving finite resources and reducing the human footprint on both the climate and the local physical environment.

The technology industry's stated goal is to contribute to increased sustainability. A more circular economy strongly contributes to this, while offering significant profitability from circular business models. As this report shows, companies can reduce their needs for new raw materials, other materials, and energy. This makes cost savings possible, not only for energy and raw materials but also for storage and processing. Companies can also build their brand with a circular business model and strengthen their relationship with both current and potential customers. Perhaps equally important is that companies can reduce their risk exposure. Through circular models, there are opportunities to make their supply chains more stable by becoming less dependent on certain raw materials and transportation.

Politics and business go hand in hand. With the circular economy, a powerful alliance for positive change is created.

Pia Sandvik, CEO Technology Industries of Sweden (Teknikföretagen)
April 2024

Summary

The circular economy is on the rise and is generating new types of products, services, and business models. The circular transition has the potential to strengthen Sweden's economy by promoting growth, creating jobs, and increasing innovation. At the same time, it plays a crucial role in preserving the environment and the planet's resources.

Technology Industries of Sweden has approximately 4,500 members who produce products, technical solutions, and services that facilitate the sustainable transition and contribute to a circular economy in various ways across different phases of the value chains. The technology industry has specific conditions due to the fact that high-tech products often have a long lifespan, meet high safety and quality requirements, and consist of advanced and composite materials distributed among a multitude of different components. Therefore, it is not evident that general policy proposals align with the conditions that the Swedish technology industry needs for an effective circular transition.
This report examines the technology industry's opportunities and challenges in the circular transition. Many companies have already developed processes and business models that contribute to the circular economy. However, several obstacles and challenges remain before they can fully realize the potential of the circular economy.

The corporate interviews forming the basis of this report reveal that the members of Technology Industries of Sweden view circularity as an essential component of a long-term and sustainable business strategy. Some companies have already started to develop circular strategies and set specific goals and key performance indicators (KPIs) to evaluate their progress. Other companies are in an initial phase, focusing on defining and concretizing the concept of a circular economy within the framework of their operations. The member companies are advocating for uniform legislation that promotes high quality, reuse, and the upgrading of materials and products, as well as regulations that facilitate modular design. A central challenge is adapting technical specifications, product requirements, and material handling to circular principles. This involves developing improved solutions for material recycling, traceability, compatibility, and standardization. The circular economy also demands changes in logistics systems and increased presence at the regional level. To maximize the value of materials, companies need to operate closer to the end customer, representing a shift from current global logistics and coordination processes. The member companies also underscore the importance of cooperation and partnerships both within industries and across sectors. Creating sustainable logistics systems, establishing new technical standards, and developing practical knowledge about circular material flows are complex tasks that require effective collaboration and joint competence development.

In order to implement a circular economy, industry-adapted circular policies are required, based on principles of international competitiveness, technology neutrality, cost-effectiveness, and proportionality. This report presents six areas with 18 policy suggestions rooted in the specific reality and prioritized challenges of the technology industry. These suggestions include:

Economic Instruments to Stimulate the Transition to a Circular Economy

- New instruments should be preceded by thorough impact analyses to ensure balanced legislation that considers the competitiveness of companies and,
- Strive for European harmonization of legislation and taxes to create equal conditions and eliminate asymmetries between Swedish and foreign companies and,
- Economic instruments should be reviewed to address the economic imbalance between primary and recycled materials.

Harmonized and suitable regulations and product requirements for implementing a circular economy

- Develop the use of appropriate regulatory sandboxes to analyze new regulations, update old regulations, and allow for the testing of innovative solutions.
- Analyze existing regulatory obstacles with the help of policy labs.
- Product-specific sustainability requirements must be designed in close dialogue with the manufacturing industry.

The central role of chemical legislation in a sustainable circular economy

- Better coordination between different regulations to avoid goal conflicts, double regulation, and double reporting regarding chemicals and waste. Harmonization between chemical legislation and waste legislation is a fundamental prerequisite for integrating circular principles and objectives.
- Clear criteria and requirements for recycled raw materials to enable a circular cycle.
- Greater harmonization in national and EU-wide processes for decisions on risk management, updating substance restrictions, and granting exemptions.

Market forces and appropriate regulation stimulate the use of recycled materials

- The conditions and transparency for recycled materials need to be strengthened.
- Blunt tools such as quota obligations or minimum requirements for recycled materials risk leading to unintended consequences and distorting the market.
- Active dialogue with companies is key to creating well-balanced and sustainable solutions to the challenges in circular material use.

Research and development build essential knowledge

- A robust research and innovation system is needed to create the right conditions for the development of new technologies, innovations, and business models.
- Research and innovation-promoting initiatives such as testbeds, regulatory sandboxes, and partnerships are crucial parts of product and technology development, as well as for market introduction.
- A strong infrastructure for research and knowledge development includes enhanced opportunities for testing, validation, and data sharing.

The important role of authorities in guidance, permitting, and supervision regarding the circular economy

- Companies need clarity, long-term commitment, and guidance from responsible supervisory authorities. To ensure the competitiveness of small and medium-sized enterprises, targeted support and informational initiatives are needed.
- Ensure that authorities are allocated sufficient resources to exercise effective market control.
- More efficient and predictable permitting processes create opportunities for increased circularity within the technology industry.

Overall, significant efforts are needed from both political and business sectors to realize the circular economy.

Introduction to the circular economy

1. Introduction to the circular economy

1.1 The circular economy enhances sustainability through efficient resource management

The concept of the circular economy aims to minimize resource use and environmental impact in the production and consumption of products. Unlike the traditional linear economy, where products are manufactured, used, and then discarded as waste, circularity ensures that products and materials remain in use for as long as possible due to high quality, increased reuse, and repair rates. When a product is no longer useful, the material is recycled to the greatest possible extent.

The circular economy not only affects the manufacturing and use of products, but also has implications for the early stages of the value chain, where companies develop business models and design their goods and services. Products are designed with principles for longer use, easy repair, and the possibility of recycling or reuse, which reduces the need for new raw materials. Business solutions like shared usage and renting instead of ownership are central to the circular economy.

The circular economy is often associated with recycling, but the term's meaning is broader and more complex, encompassing several different dimensions. One way to illustrate this is shown in Figure 1. The image describes how the circular economy ensures reuse from previous phases, a high degree of utilization, and the preservation of value. When products can no longer be used, they can, for example, be remanufactured or recycled, and the materials can be recirculated for maximum reuse and minimization of waste.

Through increased resource efficiency in production, smart design, and long product lifespans, the circular economy is a cornerstone in achieving climate goals and preserving biological diversity.

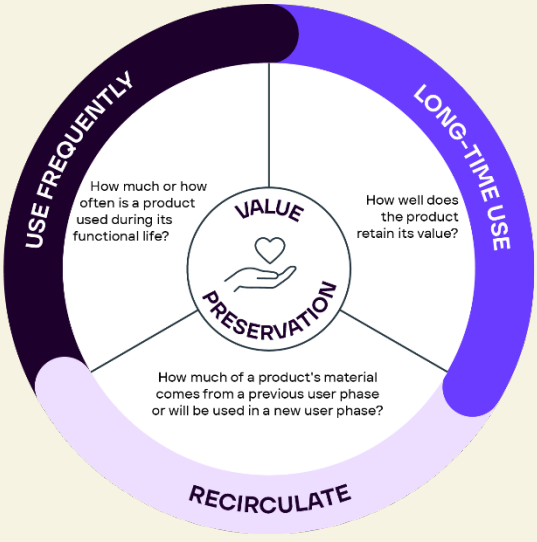


Figure 1: Value preservation in the circular economy occurs through frequent use, long-term use, and recirculation of products to new users or for new purposes. By designing products robustly and ensuring they can be upgraded over time, it is ensured that the product can be used for a long time and that the materials can be recirculated.

1.2 The potential of the business sector in the circular economy

The circular transition can be of great importance for Sweden's continued competitiveness. This can, in turn, create growth and jobs. The circular economy simultaneously strengthens the power of innovation.

As it contributes to preserving the environment and the planet's resources, the positive environmental effects are many. These include, among other things, reduced emissions of greenhouse gases and environmentally hazardous substances, decreased loss of biodiversity, and reduced waste volumes. Furthermore, a circular economy and increased resource efficiency mean reduced dependence on imported raw materials and energy, thereby increasing independence and offering other geopolitical advantages. All of this is important and needs further highlighting, but in this report, we primarily focus on how the circular transition can drive growth and strengthen Swedish competitiveness, as well as how policies should be designed to achieve this.

1.2.1 Resource efficiency aligns with business benefits

By shifting focus from linear value chains and business models to circular alternatives, Swedish companies can realize a range of economic benefits. More specifically, circular solutions contribute to:

Increased resource efficiency: The circular economy involves optimizing processes and products to maximize resource use, increase production and operational efficiency, and enhance energy efficiency in production.[1] Through remanufacturing, reuse, and recycling of resources, companies can reduce their demand for new raw materials, other materials, and energy. This can lead to cost savings not only for energy and raw materials but also for storage and processing. According to an analysis by Boston Consulting Group, increased circularity can result in approximately 15 percent lower material costs.[2]

In the long run, increased resource efficiency leads to reduced strain on nature and climate. A circular economy is therefore crucial for reducing the loss of biodiversity and combating climate change. A report from Sitra and Vivid Economics indicates that a rapid transition to a circular economy can halt the loss of biodiversity and restore it to the year 2000 levels by 2035.[3]

Sustainable brand image and improved stakeholder relations: Companies that actively engage in the circular economy can build a strong brand focused on sustainability and environmental responsibility. This is important not only for attracting customers and employees but also for strengthening relationships with investors and authorities.

Improved risk management and more robust value chains: By reducing dependence on volatile commodity markets and globalized value chains, companies can decrease their business risks in the long term. Companies not only lower financial risk but also mitigate risks such as production stoppages and other operational challenges. According to studies, the impact of such risk minimization can equate to a value equivalent to 10 percent of the company's net sales.[4]

In summary, a circular economy has the potential to help companies reduce costs through improved efficiency, strengthened brands, and effective management of business risks. However, the transition to a circular economy is a complex process that affects all aspects of business operations and the product life cycle. To meet this challenge, a holistic perspective is required, where companies reform their business models, production methods, and logistics and material handling processes. The solutions are rarely simple, instead requiring gradual and coordinated changes throughout the entire business ecosystem. Many companies are ready to take on this challenge as they see it as crucial for their relevance and survival in the changing business environment. Despite this, several challenges remain, and there is a need for policies that actively support and promote the transition, which this report will elaborate on in the next chapter.

[1] Ramboll, 2023
[2] Boston Consulting Group, 2023
[3] SITRA och Vivid Economics
[4] Ibid

1.3 Circularity as a driver for innovation and growth

The movement towards a circular economy represents a paradigm shift and thus involves rethinking business models, product design, production processes, and technologies. With the right conditions, this presents great potential for innovation and increased competitiveness, among other benefits.

New business models: Circularity requires companies to reformulate their linear business models. Instead of just selling products, companies can offer services that include maintenance, repair, and upgrading of products. A transition towards sharing platforms is also a central part of this development. The sharing economy is relevant within market platforms for B2B.[5] A concrete example is LabShare, which utilizes a self-developed platform tool to connect companies in automotive, railway, aerospace, and electronics manufacturing with test laboratories. In these laboratories, companies can perform environmental and validation tests for production purposes (LabShare, 2022).

Product and material innovation: Innovation is essential to design products that are easy to recycle, reuse, remanufacture, or upgrade. Companies must develop new materials, design methods, and manufacturing processes to achieve this. In the electronics industry, for example, there are significant investments in modular design that simplify the repair, reuse, and recycling of electronic components.[6]

Figure 2A: Linear economic model.

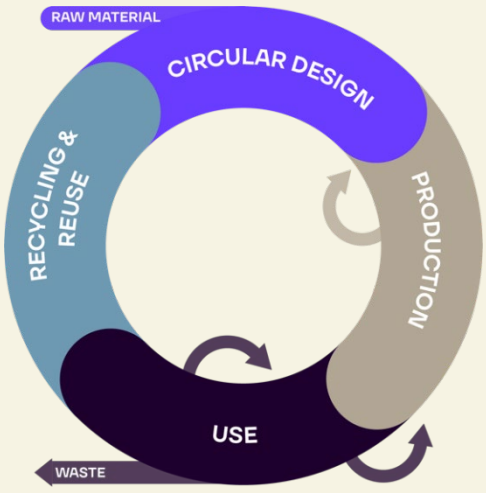


Figure 2B: Circular economic model.

In a linear economy, products follow a straightforward path from raw material extraction and production to use, before finally being discarded as waste when they are no longer considered useful. This has historically been the dominant model for economic activity, but it leads to the overuse of natural resources, accumulation of waste, and increased environmental impact. A circular economic model, on the other hand, involves products being part of a closed and regenerative cycle to the greatest extent possible, where products are designed with circular principles in mind and materials are reused at various stages of their lifecycle.

[5] B2B stands for business-to-business, referring to transactions that occur between companies, rather than between companies and end consumers (B2C).

[6] Ellen MacArthur Foundation, 2020.

1.4 The engineering industry's contribution to the circular transition

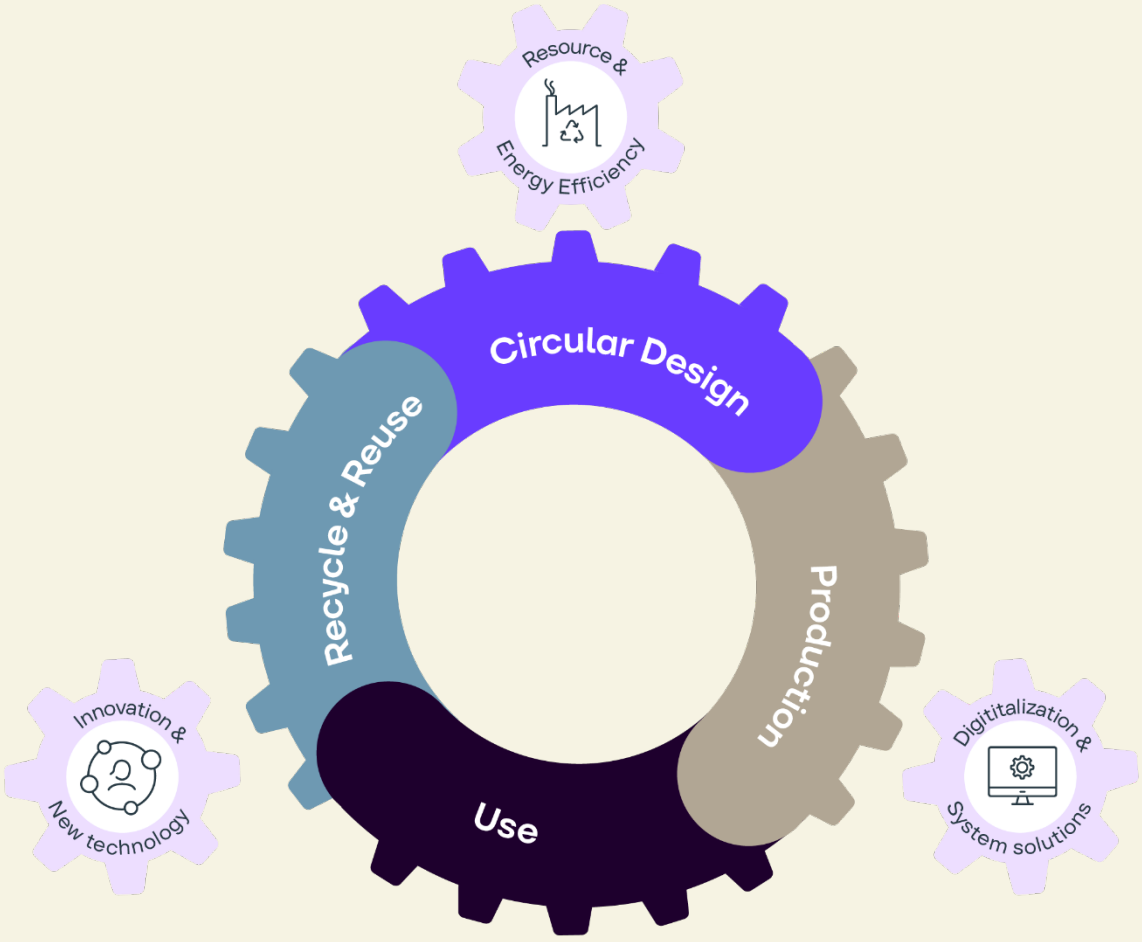
Technology Industries of Sweden has over 4,500 members who produce products, technical solutions, and services that facilitate the sustainable transition and contribute to a circular economy in various ways across the phases of value chains (design, production, use, waste, and recycling stages).

These companies manufacture products and solutions within the energy system that become crucial when society is electrified. These solutions include sustainable batteries, heat pumps, heat exchangers, cables, static compensators, and other power electronics that help maintain balance in power grids. Another group of companies manufactures parts or entire machines and vehicles of various kinds, with a strong focus on being at the forefront of technology and producing sustainably. Many of these companies also offer products that, due to their high quality and long lifespan, extend the usage phase and reduce the need to replace worn-out machines and components. In the foundry industry, the members of Technology Industries of Sweden manufacture most of their products from scrap and other recycled or reused material.

Technology Industries of Sweden includes members who have developed smart digital solutions capable of optimizing the entire production, from raw materials to final products, thereby streamlining the use of various resources such as energy and critical raw materials. These solutions include so-called digital twins, where a digital replica of the entire factory is built in a computer, allowing optimal control of processes with the support of real-time data. Similar systems have been developed for the real estate sector, focusing on optimizing the use of heating, cooling, and ventilation. With the continued development and implementation of digital and AI solutions, more processes will be streamlined and optimized, enabling products to re-enter the circular system. In addition to contributing to energy efficiency and the optimization of production processes, the members of Technology Industries of Sweden contribute broadly to resource efficiency. For example, several members continuously work on enhancing water use efficiency by developing products that require less water and can recover solid and dissolved substances from water.

Many companies have already developed processes and business models to circulate resources and contribute to enabling the circular economy, not only for sustainability reasons but also considering the geopolitical situation. However, the potential for circularity is significantly greater than what we see in society today. To realize this potential, better collaboration between business and politics is needed. An important part of the role of politics is to develop and implement instruments that provide companies with incentives and opportunities to continue developing processes and business models that can make the economy circular.

Figure 3 summarizes the significant contribution of the technology industry to the circular economy through its continuous and well-integrated efforts in innovation, new technology, resource and energy efficiency, as well as digitalization and system solutions.



Innovation & New Technology

Innovation and technological development are prerequisites for the transition and enable the emergence of entirely new companies, industries, and jobs. The technology industry develops and manufactures many of the components needed to enable the green transition of the industry.

Resource & Energy Efficiency

The technology industry develops and manufactures high-quality products with long lifespans. These are increasingly designed based on circularity. Recycled materials are used when possible, considering availability and technical requirements. Modular design allows for longer lifespans and upgrades for more efficient operation. Many of the products have a very long service life (i.e., more than 15 years) with high demands for operational reliability.

Overall, this type of product has good technical possibilities for development to contribute to a more circular economy and to resource efficiency with positive environmental and climate effects.

Digitalization & System Solutions

The technology industry develops new digital tools and other system solutions that enable, among other things, increased traceability of material flows, new innovative business models, and increased efficiency in both their own and customers' processes.

Figure 3: The technology industry contributes to the circular transition by developing innovative new technologies, creating products that use resources and energy efficiently, and providing system solutions and digital processes.

Barriers to the circular economy and circular business models

2. Barriers to the circular economy and circular business models

The potential in the circular transition is significant, but despite this, Sweden's economy is currently estimated to be only 3.4 percent circular.[7] A vast majority of the resources that flow through the Swedish economy therefore come from primary sources.

A large-scale circular transition requires a change in the current dominant systems with linear business models, as well as related laws, regulations, norms, and values deeply rooted in society (see Figure 4). These elements govern not only how we act but also how we perceive and solve problems. By continuing to act as we do today, linear dominance is maintained and reinforced, leading to lock-ins in traditional technologies, behaviors, and mindsets. To break these lock-ins and create space for the development of new resource-efficient solutions, a system shift is necessary. This means that we must challenge the existing resource-depleting norms and ways of acting. This requires technological development, changed regulations, and altered behaviors and patterns of thinking that strongly steer away from resource waste and traditional norms. In summary, several lock-ins and obstacles must be addressed to achieve a circular economy. Below, we outline some of these.

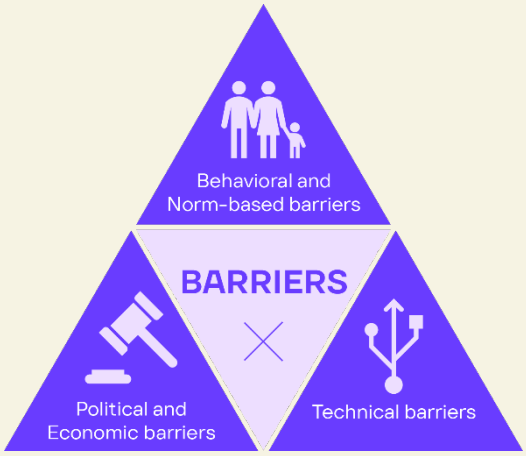


Figure 4: There are several obstacles to achieving a circular economy. These obstacles can be divided into political and economic, technical, and behavioral and norm-based categories. Policies that effectively promote a circular economy must consider all types of obstacles.

2.1 Political and economic barriers

2.1.1 Non-harmonized regulations weaken the competitiveness of the Swedish technology industry

The circular economy aims to reduce waste and maximize resource efficiency by creating a closed loop where products are reused, recycled, and repaired to the greatest extent possible. The goal is to reduce the need for new raw materials and minimize environmental impact. To achieve this, the EU has adopted a series of initiatives to promote the transition to circular systems, including action plans and strategies.

In parallel with this, member states are taking measures to implement the environmental and sustainability goals set by the EU based on their own conditions and interpretation of what it means for

[7] The Circularity Gap Report, 2022

their respective countries. Despite good intentions, companies face challenges due to a lack of harmonization and market fragmentation. Non-harmonization affects not only the EU's long-term competitiveness but also individual companies' opportunities to create circular and sustainable business models for global competition.

A significant portion of the Swedish manufacturing industry consists of export companies operating in a global market.[8] Companies that operate across borders are thus faced with a maze of various national requirements and administrative procedures to make products available in those markets. As a result, companies must change their production processes, material choices, or business models. This change is often associated with high transition costs that are more aimed at national regulatory compliance than a "green transition."

Companies in countries with stricter environmental and sustainability regulations often find themselves in a more difficult competitive position compared to companies in countries with more flexible regulations. This creates an imbalance in the technology industry and weakens the EU's collective strength.

There are examples where countries' national requirements and priorities - such as requirements for national certification, quota obligations for recycled materials, and requirements for labeling, information, and traceability - create imbalances and unequal competitive conditions, contributing to market fragmentation. This lack of harmonization of national initiatives also affects companies' ability for cross-border expansion and transition to circular business models.

To promote the circular economy, it is necessary to ensure equivalent and optimal market conditions among European companies. Therefore, it is important that member states implement EU legislation in a harmonized and purposeful manner. It is also crucial that the legislation does not regulate product characteristics such as design, construction, or the choice of technical solutions. By specifying details in standards instead, the emergence of new solutions is encouraged. In the long run, global frameworks and regulatory systems are desirable to further contribute to the circular economy. This would create a more uniform and predictable environment for companies to operate in, promote sustainable growth, and provide security to invest in circular business models.

FACT

Standardization

Standardization is a process aimed at defining and establishing common solutions for recurring problems in various fields. Essentially, it involves creating consistency and transparency around a product or service. Even processes, such as management, production, and quality assurance processes, can be subject to standardization.

Standards play a crucial role in ensuring consistent and high quality in products and services, thereby promoting health, safety, and the environment. They also serve as a cornerstone for securing and maintaining uniformity between markets. By establishing common standards, efficiency and safety are ensured for all involved parties, which in turn facilitates international trade.

In summary, standards create an environment that fosters innovation and development by providing a common foundation to build upon, while also ensuring quality, safety, and compatibility for all parties involved.

Source: Swedish Instutite for Standards (SIS)

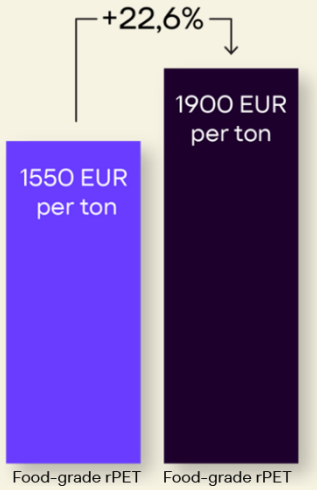
[8] Technology Industries of Sweden 2018

To ensure that Swedish companies are not disadvantaged, it is of utmost importance that the government works toward harmonized regulations and coordinated market controls within the EU, as well as close cooperation with other member states. The business community is involved in the national implementation of EU legislation. To further facilitate the implementation, understanding, and compliance with EU rules in member states, common interpretations and standards for circularity are needed. Progress is being made in this area. For example, there is ongoing cooperation within the EU to develop standards for the circular economy, including guidelines for frameworks, definitions, and business models. This work is led by the Swedish Institute for Standards (SIS)[9]. This development is positive because cooperation on standardization at the EU level and globally would enhance the Swedish industry's opportunities to influence and contribute with experiences and knowledge, which in turn increases competitiveness.

2.1.2 The relative prices between recycled and primary materials are too high

To further strengthen the competitiveness of companies in the circular transition, it is important to establish sound economic rules.

In many cases, the price of primary materials is still lower than that of recycled materials[10] due to various market failures. Recycling, for example, plastic, is an energy-intensive process, and there are additional costs for shipping and logistics management of the recycled material. The demand for recycled PET plastic (rPET) has increased sharply in Europe due to the EU's upcoming legal requirements for mandatory minimum levels of recycled plastic in beverage bottles. At the same time, several other industries are competing for access to the rPET raw material, both to meet legal requirements and companies' own sustainability goals. This asymmetry has caused the price of recycled plastic to skyrocket; in 2022, it was noted that the price for rPET was about 23 percent higher than that of primary PET plastic, see figure 5[11]. This is challenging for companies (especially small and medium-sized enterprises) experiencing difficulties in meeting the higher costs, achieving set minimum levels, and ensuring sufficient quantities of material from suppliers. The example highlights the importance of new legal requirements being preceded by solid impact analyses and a coordinated approach that considers the functioning of the entire market.



Beyond the pricing aspects that complicate a large-scale transition to recycled materials, there are also obstacles regarding quality. It can be very difficult to assess whether a recycled material maintains sufficiently high quality.

Quality that meets production and product requirements is a challenge in many industrial sectors. Examples include high-tech products such as medical technology and products in contact with food, where high requirements today do not allow the use of recycled materials.[12] Another aspect is when there is not enough recycled material available. This can be due to high quality requirements, as in the example above, or because the required quantity is such that there is insufficient availability on the market.

Figure 5. Market prices for food-grade rPET and food-grade PET, 2022. Source: Kahlert and Bening, 2022. Processed by Ramboll.

[9] SIS, 2022
[10] Cradlenet, 2021
[11] Packaging Insights, 2022
[12] IVL and Circular Sweden, 2022

FACT

Market Failure

Market failure occurs when market forces do not lead to an efficient allocation of resources, often due to the inability to manage external effects, for example. External effects refer to indirect consequences of an economic activity that affect third parties and are not reflected in the market price. A relatively low price of primary materials may indicate that external effects are not fully internalized in the price. If this is the case, it is an example of market failure within the circular economy.

The price of new primary materials is often low compared to recycled materials because external effects, such as environmental impact, are not considered in the pricing. This leads to overuse of new resources, which in turn increases environmental impact.

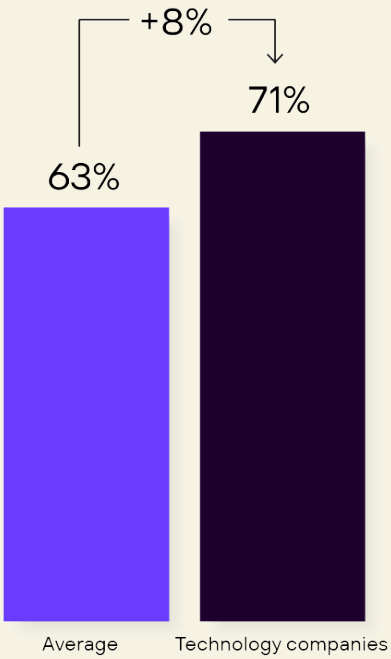
To correct this market failure, various economic instruments such as taxes or subsidies can be used to internalize these external costs, i.e., to make recycled materials more competitive against primary materials. This would create economic incentives for companies to adopt recycled materials and promote the transition to a circular economy.

2.1.3 There are no economic incentives to minimize material usage and waste

For most materials, material costs remain low relative to labor costs, which means there are insufficient economic incentives to reduce material consumption.[13] Moreover, circular business solutions are generally labor-intensive, as they require skilled labor at all stages from product design to maintenance and waste management.[14] For example, the World Bank argues that the circular transition will require relatively more highly educated labor, such as industrial designers, logistics specialists, and process engineers, than before.[15] Given the high relative costs of labor compared to materials, it is therefore rarely economically justifiable to implement such labor-intensive solutions to achieve relatively small savings in material costs.

The engineering industry is generally labor-intensive, as illustrated in Figure 6. On average, 63 percent of the added value of Swedish companies consists of personnel costs. This means that out of the business sector's contribution to the gross domestic product (GDP), almost two-thirds of the value creation comes from the workforce. The remaining portion of the value comes from, for example, raw material processing and production processes. Within the engineering industry[16], personnel costs make up an even larger portion—71 percent—of the total added value. Additional personnel costs can therefore affect companies' ability to invest in other productivity-enhancing factors, such as machinery and facilities, which in turn can hinder the industry's growth and competitiveness.

[13] The Circularity Gap Report, 2022
[14] The World Bank, 2022
[15] The World Bank, 2022
[16] The engineering industry is defined here as companies with SNI codes 25-30, 32, and 33



In addition, the costs of generating waste are too small for it to be economically rational to make large personnel investments solely for the purpose of minimizing waste.[17] Overall, this suggests that circular industrial processes need economic incentives to be implemented. Since June 2023, an investigation with the goal of proposing economic incentives to promote the circular economy has been underway, and the results of the investigation will be presented in September 2024.[18].

The Delegation for Circular Economy has also proposed instruments in the form of a so-called bonus-malus system for waste, where the generation of waste is subject to a malus (i.e., penalty), while full circularity entails a bonus for companies.[19] The World Bank also suggests a tax shift from labor to materials and input goods to further strengthen the market conditions for the circular economy.[20]

Figure 5: Personnel costs as a share of value added, average 2019–2021. Source: SCB, 2023. Processed by Ramboll.

2.2 Technical barriers

2.2.1 Challenges in ensuring the quality of recycled materials

There are challenges in sorting and recycling various waste streams into high-quality recycled materials. One example is the separation of alloy elements from metal waste. Metal waste can contain a variety of alloys and impurities that are difficult to distinguish, making the recycling of high-quality material more complicated and costly. The technology to effectively and economically separate these components is not yet sufficiently developed, leading many companies to face obstacles when trying to achieve high recycling rates for metal waste.

Another challenge is the lack of necessary technology to achieve high recycling rates for plastic. The challenge lies in the efficiency of separating and recycling different types of plastics. Additionally, plastic waste can easily be contaminated by other materials or chemicals during use and collection, making it difficult to produce high-quality recycled material. Pollutants and contamination can also affect both the mechanical and chemical properties of the plastic, which can make it unsuitable for certain applications. The technology for recycling plastic is still under development, and there is a need for more advanced and cost-effective recycling methods to increase the recycling rate and the quality of the recycled material. Developing innovative technologies to streamline the plastic recycling process is therefore crucial to enabling increased circularity within this sector.

Textiles are another significant part of the waste stream and face unique challenges in terms of recycling and quality assurance. Recycling textiles requires advanced technologies to break down the

[17] Cradlenet, 2021
[18] The Governent, 2022
[19] The Delegation for Circular Economy, 2022
[20] The Eorld Bank, 2022

fibers and recover them into new textiles or other products. Currently, there is a lack of cost-effective and scalable recycling processes for different types of textiles and materials.

In addition to the technical difficulties, there is often a lack of necessary capacity and knowledge to assess the quality and origin of recycled materials and products. This poses a major challenge for companies trying to integrate recycled materials into their products. The lack of reliable information can lead companies to choose to use primary materials instead of recycled ones, which counteracts the goal of promoting circularity and reducing resource use.

The design of products plays a crucial role in their recycling potential and life cycle analysis. Without appropriate guidelines, products can be designed in a way that hinders recycling or reduces the quality of recycled materials. This is particularly problematic for complex products or materials with varying properties.

In summary, technical and capacity-based factors constitute significant barriers to achieving increased circularity within the EU.[21] Without adequate resources and incentives to overcome these challenges, companies risk continuing with traditional linear business models that involve significant environmental impact and resource consumption. To address these challenges, a coordinated effort is required from governments, businesses, and research institutions to promote the development of innovative technologies, standards, and guidelines that foster circularity and sustainability in the long term.

2.2.2 Chemical substances in the material cycle require safe and efficient use and handling.

Chemicals play a fundamental role in most operations. They are included in virtually all products to ensure prosperity, protect health and safety, and meet new challenges through innovation. Chemicals are important components in the development of energy-efficient, emission-free, and resource-efficient technologies and products with a long lifespan. At the same time, certain chemical substances have hazardous properties or can complicate material recycling in other ways.

In the pursuit of a circular economy, where materials and products are reused instead of becoming waste, challenges arise regarding the safe and efficient use and management of chemicals. These challenges are present throughout the value chain, from design and production to use and recycling. One of the main difficulties is the risk of environmental and health damage. The use and presence of chemicals with hazardous properties can lead to environmental pollution or cause health problems if not handled correctly. These risks are amplified when chemicals circulate in material flows, posing significant threats to both human health and the environment. Safe management and use of chemicals and waste reduce the risk of environmental and health damage and the need for separation of remaining hazardous substances in waste flows and remediation, which contributes to reduced costs for society and industry.

To ensure that materials and products in a circular economy are safe, it may be necessary to replace certain chemicals with less harmful alternatives (substitution) or replace the technology used with another that maintains the desired function. Finding such alternatives requires research, innovation, and development.

Information about chemical content and safe use is required throughout the value chain to ensure effective and safe material cycles. Methods for information transfer must be efficient and appropriate.

[21] The Circularity Gap Report, 2022

Today, legislation regarding waste, chemicals, and products is not synchronized. This is a major obstacle to the transition to a circular economy. To promote a circular economy without compromising the conditions for a good environment, health, and safety, the applicable legislation must be revised.

In summary, the challenges associated with the safe and effective use and management of chemicals pose a significant barrier to achieving the goals of a circular economy. These challenges can hinder progress toward a sustainable and circular economy by reducing the efficiency and safety of the material cycle, as well as stifling innovation and investment in the field. Overcoming these obstacles requires collaboration and coordination among various stakeholders, including authorities, the business sector, and researchers, to develop and implement effective measures and policies that promote the safe and sustainable use and management of chemicals within the material cycle.

2.3 Behavioral and norm-based barriers

2.3.1 The preference for ownership constitutes a barrier to the sharing economy and new business models

The role of consumers and businesses in the circular economy is of utmost importance and extends far beyond merely choosing materials and products. It encompasses everything from making informed decisions in design, material, and product choice, ownership or renting/leasing, to actively participating in the recycling of used products. In many cases, adequate alternatives to ownership in the form of attractive sharing models are lacking. Consumers and businesses may be deterred by, for example, the time it takes to pick up and drop off rented items or be concerned that shared property will not meet their quality requirements.[22] To promote a more circular economy, it is therefore crucial to have a customer focus and actively include customers in the design of offerings, transforming them from buyers into integrated participants in companies' business models.

Even the cost structures in the business models of the sharing economy affect their commercial potential. According to a study from RISE (Research Institutes of Sweden), different products - such as clothes, bicycles, and electric boats, included as examples in the study - require varying amounts of time to achieve profitability under a sharing model. Depending on the type of product, tailored logistics or IT systems may need to be developed as part of the circular model. Overall, circular companies need to establish entirely new processes for logistics, known as reverse logistics[23]. This, in turn, affects both the price and the scale at which the business model can be implemented[24]. The study also indicates that both financial resilience and changed customer behavior are required for the large-scale development of circular business models.

2.3.2 Circular thinking needs to be implemented right from the design stage, but this requires more knowledge, standards, and good examples

Discussion around circularity and circular business models still largely revolves around recycling and carbon emissions. There is still a lack of knowledge about all dimensions of the circular economy, as well as good examples of how circular models can be implemented on a large scale.

[22] The Circularity Gap Report, 2022

[23] Reverse logistics has emerged as an important component in the overall vision of a circular economy, aiming to encompass the entire lifecycle of products. This means that goods, materials, and products are collected, managed, and returned to the economy after they have served their purpose with the consumer. This process can occur through reuse, repair, remanufacturing, and recycling. In reverse logistics, products and materials are considered part of a closed loop of production and consumption.

[24] RISE, 2020

When it comes to product design, the design of products and expertise in sustainable production are of crucial importance for the transition to a circular economy. It is mainly during the early design phases that the future total environmental impact of a product is determined. This includes decisions such as the choice of product lifespan, the need for consumables, and the possibility of remanufacturing. About 80 percent of a product's environmental impact is determined in the design phase.[25] It is therefore of utmost importance to focus on design to achieve more sustainable and circular societal development.

A crucial aspect of the design phase is to create products that can be used over a longer period without losing their functionality or quality. Products should also be modular, meaning that different components can easily be replaced or upgraded. This creates opportunities to extend the product's lifespan while simultaneously reducing waste. By increasing the lifespan of products, the use of materials and resources can be reduced, resulting in significant environmental and climate benefits. In addition to the substantial environmental advantages, there are also considerable economic values that are lost when many products are used for a shorter time than they could be. Circular design thus involves a focus on change and long-term sustainability as fundamental principles.

According to the Expert Group on Circular Design Principles within the Delegation for Circular Economy, large-scale support efforts are needed to promote circular design solutions. This mainly involves support for building competence within companies, support for collaboration in circular value chains, and support for circular design combined with business development.[26] To promote circular business offerings, collaborations between start-ups and established industries, supported by incubators, colleges, and universities, are also of crucial importance.[27]

Furthermore, the expert group argues that the EU needs to develop new standards and common regulations to promote circular design within both manufacturing and service-producing companies. This is partly underway through the new Ecodesign for Sustainable Products Regulation[28], which aims to provide a framework for establishing ecodesign requirements for a broader set of products than those covered by the current legislation (i.e., the Ecodesign Directive). It is seen as a central building block for promoting more environmentally friendly and circular products.

[25] The EU Commission's Action Plan for Circular Economy
[26] RISE and the Expert Group for Circular Design Principles, 2022
[27] Technology Industries of Sweden, 2018
[28] 28 The proposal can be read in its entirety here: https://environment.ec.europa.eu/publications/proposal-ecodesignsustainable-products-regulation_en

Challenges of the technology industry in the circular transition

3. Challenges of the technology industry in the circular transition

This section of the report presents the results from interviews with selected member companies. The interviews focused on identifying obstacles and drivers that companies experience in their transition to a circular economy. Specifically, we examined internal factors such as strategies, corporate culture, innovation capacity, and investment needs, as well as external factors like trends, collaboration, value chains, and regulations, which can affect circularity.

The complete set of interview questions is attached in Appendix 1.

The companies' views are presented in Figure 7, categorized into six thematic areas: definitions, regulations and control measures, logistics, technical challenges, organization and business model, as well as knowledge exchange and collaboration.

Figure 7: Summary of companies' perspectives on the circular transition.

3.1 Companies feel that a circular economy is important but hard to define

Several companies mention early in the interviews that their work methods and routines are often tied to the circular economy, although it is not specifically referred to as such. For example, values such as high quality and long product lifespan are clearly integrated into several companies' ways of working. Particularly specialized high-tech products must meet high performance requirements and withstand heavy industrial wear, which is why aspects like quality and durability are deeply ingrained in the companies' approaches to developing and maintaining their products. However, companies rarely emphasize the circular aspect of these values, either internally or externally.

There is a commitment among companies to embrace circularity. All interviewed companies describe themselves as engaged in development work related to the circular economy. Some have begun developing circular strategies, establishing concrete goals, and key performance indicators (KPIs) to measure progress. Others are in an initial phase, focusing on defining and concretizing what the circular economy means within the context of their operations. Therefore, companies welcome various types of definitions and standardization that clarify the meaning of the circular economy. They are positively inclined toward regulations and legal requirements, such as the Corporate Sustainability Reporting Directive (CSRD), taxonomy, and the REACH regulation, which create clarity and enable prioritization. However, the companies emphasize the importance of regulations being fit for purpose and creating similar conditions without imposing too much administrative burden.

3.2 Regulations and control measures need to be adapted to the market conditions of the circular economy

Several of the interviewed companies agree that existing regulations and policies pose significant obstacles to a smooth transition to a circular economy. Here is an overview of their common challenges and perspectives:

Need for uniform legislation and clear guidelines:
The industry requires clear regulations to create a consistent interpretation and application of rules. Promptly agreeing on legislation and guidelines at the European level is particularly important, especially when it comes to new waste streams that may arise as the circular economy expands. To ensure efficient, safe, and competitive waste management, uniform codes need to be in place early.

Increased harmonization regarding waste flow management:
Global waste flows create particular challenges for environmental protection, health, and human rights. Additionally, there are administrative barriers that can affect when former waste becomes attractive as a useful resource. One example is the EU's introduction of tariffs on recycled input goods, which creates inequalities in global markets. Depleted lithium-ion cells are currently subject to a 2.6% tariff upon import to the EU, hindering ambitious battery recycling programs within Europe.

Product responsibility and modular design:
An important component of the circular economy is the reuse of products to extend their lifespan and broaden their areas of use. However, uncertainties related to product responsibility may arise when companies assemble newly manufactured and reused components into a new product, or when customers modify products. The desire to incorporate more modular design - ensuring components and modules are repairable, replaceable, and upgradable over time - clashes with uncertainty about responsibility and when a modified product is considered new. A concrete challenge is determining which tests a product comprising a mix of new and recycled components - sometimes from various product versions or model years - needs to undergo to meet requirements related to product

responsibility. For instance, in the case of doors (automatic revolving, swing, or sliding), strict requirements exist regarding personal safety, and it is unclear how these requirements can be adapted to reused parts or components. To address this, there is a need for a clear framework. Revision of requirements and clear guidance on how products, especially those with reused components, should be tested and traced to ensure the highest possible personal safety and compliance with applicable directives.

Effective dismantling and upgrading:
Companies recognize the need to streamline the dismantling process to facilitate the reuse of materials and modules. Current regulations sometimes pose obstacles to upgrading products with new features and software, with car parts and components serving as an example.

Tax shift to promote a circular economy:
Companies propose restructuring the tax system with higher taxes on primary materials and lower taxes on circular labor to encourage a transition to a circular economy. This is because it is economically challenging today to justify the significant labor efforts associated with processing and handling circular products. Additionally, primary materials are still too cheap compared to recycled ones, making it difficult to find direct economic incentives to integrate more recycled materials into products.

Flexible regulations:
Despite the desire for more concrete regulations, companies see a challenge in creating rules that allow for flexibility to manage the complexity of all dimensions of the circular economy. Companies express that the transition to a circular economy must, to some extent, be an exploratory and iterative process, where overly rigid regulations can pose an obstacle to innovative material use and new industrial processes.

In summary, the companies state that the current regulations are insufficient and, in some cases, pose direct obstacles to the transition to a circular economy. Instead, uniform and appropriate regulations are needed to enable the reuse, upgrading, and responsible management of products and materials in line with the principles of a circular economy. The regulations also need to be technology-neutral and future-proof to avoid hindering innovation.

3.3 The circular economy requires new solutions for logistics and both local and regional presence

The interviewed companies emphasize how the circular economy places increased demands on efficient logistics. Even today, there are shortcomings in the logistics system that hinder the efficient transport of goods. The companies see a need to start working with reverse logistics, which focuses on the return and management of used or worn-out products from the customer. For products with a long technical lifespan (10-20 years or more), it becomes practically complicated to retrieve products that may be spread over large areas. Questions of responsibility, such as who is responsible for ensuring that the products are in a condition where retrieval and recycling are feasible, also become relevant. Currently, the companies find it difficult to practically justify the costs of shipping and storing worn-out products, and they particularly emphasize that these costs will need to be effectively passed on to the consumer.

Additionally, the companies emphasize the necessity of increased local presence to effectively manage products and materials in a circular economy. Centers for reuse and recycling must be geographically close to both the production and consumption of the products. This represents a significant shift for many companies' centralized and globally coordinated logistics processes.

Overall, the companies emphasize the importance of creating sustainable and adaptable logistics systems to support the circular economy.

> If we take batteries as an example, we want to be able to give them multiple lives and uses, and ultimately recycle them. Batteries contain extremely expensive and critically important raw materials that need to be managed. If this responsibility is ours, how do we ensure that we have control over that part of the value chain? You must work regionally, for practical reasons.
>
> Our challenge is that we operate on a very global scale, which has always been part of our strategy. Of course, we have regional and local presence with our customers, but we maintain global coordination. To truly close the loop, I believe we need to become much more regionalized, both in logistics solutions and in how we follow up. In a linear economy, it's easier to operate globally — you can just "pass the product along" — but to connect things together, you need to work more regionally, and even locally.
>
> Anders Hedqvist
> Head of Strategic Projects, Epiroc

3.4 The circular economy involves several technical challenges related to material recycling, traceability, and standards

Several companies share common challenges and perspectives regarding the technical aspects of transitioning to a circular economy. They find that current technical standards, recycling processes, and a lack of transparency about the quality of recycled materials are obstacles.

Challenges with material recycling:
Companies highlight difficulties in recycling materials, particularly composite materials, electronic plastics, and various components from products like appliances and home electronics. It is a complex process that requires technological innovations to effectively break down and reuse materials. Additionally, efforts are needed to increase material recycling from other waste streams. The upcoming household collection is expected to boost the volume of collected material. Therefore, there is a need for enhanced technology and capacity for sorting after collection to raise the proportion of high-quality recycled material on the market. Sorting waste is important for contributing to the circular economy by keeping materials in the value chain longer, especially fiber materials. Currently, there is generally no post-sorting of collected paper waste. Sorting paper waste into cleaner fractions after it has been collected would create long-term market potential for investments in sorting and recycling facilities, as well as meet the demand for recycled fiber.

Traceability and transparency:
It is important to have systems and methods for tracing materials and components to facilitate recycling and reuse. This includes knowing where different materials are located, how they can be dismantled, and how they can be best recycled. Many companies today experience uncertainty related to insufficient data about products and materials, such as where they are located when they become obsolete and which parts can be recovered through recycling programs.

Increased traceability has positive implications for phasing out harmful chemicals and substances from the usage cycle. There are several chemicals that have desirable properties in certain contexts but pose

health and safety risks if they spread uncontrollably in material cycles, such as flame retardants.[29] Improved traceability of chemical substances is thus an important component in ensuring the safe and responsible handling of materials containing harmful chemicals and substances.

Challenges with lack of compatibility and strict standards:
Companies are heavily reliant on their products being compatible with other technical products, as well as established product standards and certification requirements. To ensure high quality, the automotive industry, for example, has streamlined its quality management processes by agreeing on a number of global standards. However, within such standardization, any change that occurs upstream will trigger a change in product development and product validation. If a material is not validated in earlier development phases and product tests, the manufacturer cannot add a new material without triggering a revalidation. The phases of product development usually extend over several years, and each revalidation is a costly process. Companies, therefore, describe how the traditional linear optimization of the production process through strict standards directly counteracts the integration of recycled materials.

To implement changes in product design or material selection, it is necessary to review the entire technical environment in which the product will be used. This process is both time-consuming and costly. Companies describe it as a complex challenge to meet quality and safety standards while challenging the status quo and exploring different methods to integrate more circular practices.

Need for effective troubleshooting and repair opportunities:
To promote reuse and reduce unnecessary scrapping, it is crucial to improve troubleshooting capabilities. This involves being able to identify and fix faults with high precision. Currently, many products are scrapped because troubleshooting is either not possible or cannot be done cost-effectively.

Access to recycled material:
Ensuring the availability of high-quality recycled material for use in new products is a challenge. It is important to develop effective systems to guarantee a stable supply of recycled materials at competitive prices. Secondary markets for product components need to become larger and more efficient. Recycled materials must also be sorted in a way that simplifies the assessment of their quality and properties.

In summary, companies emphasize the importance of overcoming multiple technical challenges and ensuring adequate access to materials for a smooth transition to a circular economy. This requires innovation in recycling technology, the establishment of standards that promote reuse and recycling, as well as investments in traceability and troubleshooting methods to achieve sustainability and efficiency in the product lifecycle.

3.5 New business models, such as servitization, challenge the structures in the current organization

Several companies identify significant challenges and the need to adapt to new business models emerging in the circular economy. Circular principles put pressure on existing practices, financial strategies, and understanding of customer needs.

[29] FORMAS, 2023

Adaptation of business models: Companies recognize the need to reassess their business models to align with a circular economy. This involves integrating circular solutions attractively into their business offerings, including transitioning to as-a-service models. At the same time, companies also state that business solutions must remain profitable to be sustainable in the long term.

> The circular economy not only changes norms and culture, it also transforms organizations. It changes the way we collaborate and imposes new demands on various roles within a company and structures within society. We will no longer sell in the same way; instead, we will need to transition more towards as-a-service models. Bonus systems will change, and broader skill sets will be required to sell more integrated products to customers, combining both service and circular thinking. This will likely require new types of leadership and business models, as well as entirely new players.
>
> This new scenario is very much about timing from all parties to make circularity work in society, between companies, and within companies. At its core, the transition to a circular economy is largely about "change management," which is one of the most difficult challenges. For this reason, the shift to a circular economy will take time.
>
> Katarina Colliander
> Senior Business and Trade Navigator Volvo

Understanding the customers' holistic perspective: The transition to a circular economy requires a greater understanding of customers' entire systems and the development of solutions that fit into their complex operations. For example, servitization and leasing of products, such as Batteries as a Service (BaaS), mean that customers purchase products as an operational expense (OpEx) instead of a capital expenditure (CapEx). Companies find that their customers are very positive about this change, as they no longer need to tie up as much capital in machinery and inventory. This trend is particularly evident among small and medium-sized enterprises, which can now access high-quality machinery without having to make costly investments.

Impact on financial markets and customer behavior: In a servitization solution, the selling company ties up more capital in its inventory of products intended for rental rather than sale. This results in a more stable cash flow in the long term but may create a short-term liquidity shortage compared to the traditional linear sales model. This transition requires a new strategy to manage capital needs and the heavier balance sheet. In the short term, the company must allocate more capital to finance the transition to a circular business model. If the company can finance the investments with equity, it means achieving a higher degree of solvency, which in the long run can imply strengthened resilience to rapid market changes and increased flexibility to adapt to a more sustainable and circular business model. If companies instead must borrow to finance the investments, this implies increased financial risk compared to a linear and turnover-focused financial strategy. Against this background, companies express uncertainty about how the financial market may react to the transition from being a company with a light balance sheet and high turnover to tying up a lot of capital in rental and leasing inventory.

In summary, companies emphasize that the transition to new business models in the circular economy requires organizational restructuring, cultural changes, and adjustments to financial strategy. There is an awareness of the need to manage economic and financial effects, as well as handle the risk of being a pioneer in this new business paradigm.

3.6 The circular economy requires knowledge exchange and coordination both within and between industries

All companies emphasize that the circular economy is a complex phenomenon. Several highlight the importance of viewing the circular economy from a systems perspective, where multiple actors interact with each other, both within and across industries.

Customer training and understanding of circularity: Many companies recognize the need to educate customers about the circular economy and assist them in integrating this concept into their strategies and processes. While many customers are seeking circular solutions, they sometimes lack understanding of the subject's complexity and the requirements ultimately placed on them as purchasers. To increase the amount of recycled material in a product, for example, the customer may need to adapt their technical specifications.

Partnership and collaboration: Many recognize the benefits of partnerships and collaborative projects with academic institutions, research entities, and innovative companies. These are perceived as rewarding and promote the development of circular solutions. Vertical collaboration, involving both customers and suppliers, is also highlighted as a valuable opportunity to enhance holistic thinking and to foster an understanding of the entire product life cycle.

Potential in public procurement: Several companies specifically mention how public purchasers can act as pioneers through public procurement, driving the development towards circular practices by embracing new innovative circular solutions from suppliers. An example of this is the City of Stockholm, which chose to use competitive dialogue in the acquisition of a fossil-free construction site on Hallvägen in the Slaughterhouse area. The decision to choose competitive dialogue was made when the city realized that what they desired was difficult to define. Formulating requirements and requesting prices became complex because the city's needs were not clearly specified. Through competitive dialogue, they were able to ask questions to potential suppliers, and as a result, their original expectations were exceeded. The dialogue facilitated, among other things, the use of a battery-electric excavator, planned for market introduction between 2025 and 2027.

Internal competence development: Several companies recognize the need to enhance internal competence development, particularly by supporting designers with relevant documentation and knowledge.

Summary and key observations

Definitions

The interviewed companies perceive the circular economy as an important area with far-reaching implications for future business opportunities. Some have set goals and strategies, while others are working more to understand what the circular economy entails within the context of their operations. They therefore welcome well-designed, clear, and preferably internationally applicable definitions, standards, and legal requirements that facilitate prioritization in the area.

Regulations and policy instruments

Current regulations and policy instruments related to waste, product responsibility, and taxation of raw materials are perceived as obstacles to the transition to a circular economy. Companies are calling for, for example, uniform legislation that enables the reuse and upgrading of materials and products, as well as regulations that facilitate modular design.

Logistics

The circular economy demands changes in logistics systems and increased regional presence. To recover valuable materials, companies need to operate closer to the end customer, which represents a shift from the prevailing global logistics and coordination processes.

Technical challenges

A central challenge for the interviewed companies is adapting technical specifications, product requirements, and material management to circular principles. There is a great need for new solutions in material recycling, traceability, and compatibility. These, in turn, require collaboration and knowledge exchange between manufacturing companies, their suppliers, regulatory authorities, and decision-makers.

Business models

The companies identify significant challenges in adapting to the new business models that the circular economy entails, such as models involving as-a-service offerings. This requires a restructuring of existing business models, adjustment of financial strategies, and a deeper understanding of the customers' complex operations.

Collaboration

Creating sustainable logistics systems, establishing new technical standards, and developing practical knowledge about circular material flows are complex tasks that require effective collaboration and joint competence development. The companies emphasize that a transition to a circular economy demands a holistic and coordinated effort from all stakeholders in both politics and business.

Figure 6: Summary of the perspectives of interviewed companies on the circular economy.

An Industry-Adapted Policy Is Needed To Realize The Circular Economy

4. An Industry-Adapted Policy Is Needed To Realize The Circular Economy

Many stakeholders have formulated policy proposals related to the circular economy. These proposals are often at a general, non-industry-specific level and include, for example, requirements for circular products in public procurement, minimum requirements or quotas for the share of recycled material in new products, and taxes on primary materials. A brief description of the general policy landscape can be found in Appendix 3.

The member companies of Technology Industries of Sweden have a unique perspective on the circular transition and aim to be at the forefront of this movement. The technology industry has specific conditions, as high-tech products often have a long lifespan, meet high safety and quality standards, and consist of advanced and composite materials distributed across a wide range of components. Therefore, it is not obvious that general policy proposals align with the needs of the technology industry to achieve an effective circular transition.

In section 4.1 below, the contributions of the engineering industry to politics are presented. These contributions are based on a socio-economically optimal perspective, given that the members are involved in a variety of different sectors and industries. The engineering industry believes that what is economically beneficial for society is also beneficial for the members at large. The policy recommendations have been developed based on the important principles outlined below:

- International competitiveness: The circular transition must be implemented with a focus on strengthening the position of Swedish companies in both European and global markets. Regulations must be designed with consideration for global competition and the conditions prevailing in other markets.

- Utilize market forces: The transition to a circular economy should, as much as possible, occur on market-based grounds, where consumers and producers are driven towards circular solutions through global competition and demand. This means that legislation and policy instruments must not distort the competitive conditions of companies but instead be designed in a way that aims to stimulate circular business models.

- Polluter pays: A central environmental policy principle which holds that those who cause pollution should bear the costs to reduce or eliminate it. This principle, along with the economic value of contributing to environmental benefits, creates incentives for companies to reduce their environmental impact and promotes the transition to more sustainable and responsible production and consumption patterns.

- Cost-effectiveness: By focusing on cost-effectiveness at every step of the circular processes, decision-makers can ensure that the transition to a circular economy occurs in an economically sustainable way. The goal is to promote solutions that are not only environmentally friendly but also profitable, achieving maximum benefit at minimal societal cost.

- Proportionality: The measures should be proportional to the stated objectives and should not create unreasonable administrative burdens or costs. Regulations and instruments should be applied in areas deemed necessary and should stimulate where needed.

- Technology neutrality: It is important that policy instruments and support are designed in a technology-neutral way. Technology-specific solutions or requirements hinder innovation and new solutions, which can lead to displacement effects that negatively impact other technologies necessary for achieving circularity.

- Long-term perspective: As the goals and effects related to the circular economy extend over a long period, it is important that policy proposals are designed with a long-term perspective and resilience in mind. This means that strategies should be flexible enough to adapt to future conditions, while at the same time promoting long-term sustainability over short-term gains.

4.1 Contributions from Technology Industries of Sweden (Teknikföretagen)

In this section, Teknikföretagen's most important contributions are presented, highlighting the challenges and areas where policy improvements are necessary for a successful circular transition.

Figure 7: The positions of Teknikföretagen within the circular economy. Many of these positions span multiple thematic areas and thus merge into each other. Consequently, there is an interplay between several of the proposed solutions, which to some extent overlap with each other.

Economic instruments should stimulate the transition to a circular economy

Well-designed economic policy instruments are central to succeeding in the circular transition, as they change the incentive structure in favor of circular business models instead of today's linear models. Economic policy instruments need to consist of a balanced mix of carrots and sticks (support and surcharges) and aim to overcome problems in the market that the market itself cannot solve (market failures[30]). Technology companies believe that economic policy instruments should be purposefully designed and based on the principles described at the beginning of this chapter. Moreover, they must not create competitive disadvantages or disrupt the functioning of the market. This is particularly important in the design of new instruments. Economic instruments involve considering the perspectives of companies, which include the complex realities in which they produce their goods and services. New and modified instruments must, during the implementation phase, be well-grounded in the business economic reality.

Since June 2023, a government investigation has been ongoing to propose which economic instruments can promote a circular economy. The investigation stems from the challenge that circular business models, which use recycled materials instead of primary ones or repair products instead of selling new ones, face in competing economically with traditional linear business models. This justifies some intervention in the market's functioning to address underlying market failures. The investigation committee focuses on analyzing which areas, such as material flows, product groups, or services, can be most significantly impacted by economic instruments to promote the transition to a circular economy. The committee is also tasked with proposing which economic instruments, such as taxes and fees, government support, or tax breaks, are most appropriate[31]. Teknikföretagen welcome this investigation.

Special priorities for Teknikföretagen include harmonization and effective economic instruments, as the majority of the Swedish technology industry sells its products in a competitive global market. While full-scale global harmonization is not feasible, Teknikföretagen considers harmonization at the EU level desirable.

To promote the transition to a circular economy, a certain restructuring of the tax system is required. Technology companies argue that the current cost imbalance between primary and recycled materials presents an obstacle for companies looking to invest in recycled materials. The same applies to cost asymmetries between labor and materials in production, where labor is taxed more heavily than materials. This leads to unnecessarily costly labor-intensive processes such as recycling and reuse.

Contribution

- Design economic policy instruments to address the economic imbalance between primary and recycled materials
- New policy instruments should be preceded by thorough impact assessments to ensure balanced legislation that considers the competitiveness of companies.
- Strive for European harmonization of legislation and economic policy instruments to create equal conditions and eliminate asymmetries between Swedish and foreign companies.

[30] Defenitions, from page 12
[31] Regeringen, 2022

Regulations and product requirements must be harmonized and appropriate for the technology industry to successfully implement a circular economy

Regulations, as administrative control measures and product requirements, need to be clear, consistent, appropriate, and proportional. Consistency means they are interpreted and applied uniformly within the EU. Appropriate regulations fulfill their purpose without steering toward individual technical solutions, thereby avoiding innovation hindrance. Standardization is a good example of an appropriate control measure that can contribute to a clear and consistent structure while also promoting innovation and product development.

Current regulations are largely based on linear models, which can lead to significant costs and complexity when implementing circular solutions. In the technology industry, products are often technically complex and consist of hundreds or thousands of different components. Therefore, it becomes particularly important to consider guiding design principles and product requirements in the creation of regulations. A concrete step to facilitate the transition to circular solutions is to update and complement existing regulations in a way that promotes modular design. This can be achieved by ensuring that regulations allow for the reuse of materials, components, and product parts in new products without imposing restrictions that regulate product design and construction, such as requirements for the proportion of recycled material. For example, standards for assessing and indicating the "state of health" for batteries would facilitate companies' ability to reuse batteries and match used batteries with the appropriate application area.

To address product-related challenges in the circular economy, the real obstacles within today's regulations must be identified. Sometimes the regulation itself is an obstacle; other times, it is the interpretation or the national application of the regulation that presents the obstacle[32]. A proven way to analyze obstacles is through policy labs[33] [34]. By bringing together actors from the private and public sectors, regulatory challenges for new technical solutions can be discussed, ensuring that the right type of governance is introduced. This could involve new legislation, a revised interpretation of existing regulations, or the need for new standards.

To transition to a circular economy, regulations and policy development must address long-term goals while maintaining enough flexibility to be effective. Overly rigid regulations can be a barrier to the introduction of innovative solutions in areas such as material usage or new industrial processes. They can also create unwanted costs, technical trade barriers, and market barriers in the global market. Before new legislation is proposed or existing laws are updated, the proposals need to be analyzed and validated as realistically as possible. This can be done through so-called regulatory sandboxes[35]. The complexity of products and production processes makes it particularly important to involve the industry. Both policy labs and regulatory sandboxes become particularly important when product-specific legislation is developed, such as under the Ecodesign for Sustainable Products Regulation (ESPR). It is of utmost importance to test both simpler and more complex products and product groups to ensure that the regulations are adaptable and benefit the transition to a circular economy.

Contribution

- Develop the use of appropriate regulatory sandboxes to analyze proposals for new regulations, update old regulations, and allow the testing of new innovative solutions.
- Analyze existing regulatory obstacles using policy labs.
- Product-specific sustainability requirements must be developed in dialogue with the manufacturing industry.

[32] Section 4 of the EU's action plan for the circular economy: For a cleaner and more competitive Europe (COM/2020/98 final).
[33] Vinnova | Vad är policylabb? | Vinnova
[34] Fullpaper Format (diva-portal.org)
[35] Artificial intelligence act and regulatory sandboxes (europa.eu)

Chemical legislation plays a central role in a sustainable circular economy

A central goal of the circular economy is to reduce the amount of waste and, where waste arises, to use it efficiently through reuse and recycling. These efficient material flows must not cause negative effects on human health or the environment. Therefore, regulations for the use and management of chemical substances in the material flows play an important role in the development of a sustainable circular economy.

The objectives of the circular economy give rise to complex questions about how materials classified as waste (i.e., "end-of-life") and materials recovered from waste (i.e., "end-of-waste") should be reintegrated into various value chains. The current EU legislation was not designed for a circular economy, leading to goal conflicts and challenges that must be addressed. One of the biggest challenges is the sectoral division of legislation in areas such as waste, chemicals, and product legislation. This sectoral division has resulted in each policy area's legislation being changed, updated, adapted, and supplemented with specific legal practices over several decades without significant integration between each policy area.

A telling example is the lack of international consensus and definition regarding the term "substance of concern," which has also been highlighted by the European Commission[36]. The lack of harmonization constitutes an obstacle to achieving the goal of circular loops. Substances of concern can also be present as components or contaminants in recycled materials or products made from recycled materials. Currently, there are no specific regulations to manage the presence of substances of concern in recycled materials and products manufactured from them. The absence of harmonized rules and standards complicates the industry's efforts to achieve closed loops and meet product requirements applicable to newly produced products from primary materials in a transparent, legally secure, and efficient manner. There is thus uncertainty about the optimal handling of chemicals and materials in general, and recycled materials in particular, within the framework of a circular economy. It is not uncommon for goal conflicts and ambiguities to arise regarding when it is preferable to reuse and recycle products containing chemicals or materials whose use is regulated in various ways.

To address these challenges, the harmonization of regulations that govern different parts of the value chain or phases in the life cycle of products, such as chemical legislation and waste legislation, becomes a fundamental prerequisite for integrating circular principles and objectives. This may require changes to both the EU's sector-specific legislation and horizontal regulations to promote a sustainable and seamless return of raw materials.

Contribution

- Better coordination between different regulations to avoid conflicts of interest, double regulation, and double reporting concerning chemicals and waste. Harmonization between chemical legislation and waste legislation is a fundamental requirement for integrating circular principles and objectives.
- Clear criteria and requirements for recycled raw materials to enable a circular loop.
- Greater harmonization in national and EU-wide processes for decision-making on risk management, updates to substance restrictions, and exemptions.

[36] See the communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, and the Committee of the Regions on the implementation of the circular economy package: options to address the interface between chemical, product, and waste legislation (COM/2018/032 final), and the Commission staff working document accompanying the communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, and the Committee of the Regions on the implementation of the circular economy package: options to address the interface between chemical, product, and waste legislation (SWD/2018/020 final).

Utilize market forces and appropriate regulations to stimulate the use of recycled materials

Material availability presents a central challenge within the circular economy. The limited availability of recycled materials, as well as difficulties in assessing their quality or conformity with product requirements that regulate primary materials and their supply chains, pose significant obstacles to their use. Recycled materials are also at a cost disadvantage compared to primary materials and need to be incentivized to achieve long-term competitiveness.

A key aspect of promoting sustainable material management is the effective implementation of forthcoming product-specific legislation within ecodesign and the introduction of digital product passports. These measures aim to promote the sustainable use of materials through transparent and accessible documentation of a product's lifecycle at all stages of the circular processes. A central component for achieving the desired outcome is industry participation, providing expert knowledge to ensure that the legislation is adapted to the needs of different product groups.

To create a robust market for materials, the conditions for recycled materials need to be strengthened. At the same time, quota obligations or minimum requirements for recycled materials constitute a significant intervention in the market's functioning, which can cause distortions in companies' competitiveness in the global market. The industry can formulate and steer toward strategies for sustainable material management on its own and does not benefit from restrictive requirements on instruments such as quota obligations. An excellent example of this is how one of the member companies of Teknikföretagen recently launched refrigerators with a total of 70% recycled plastic in the interior.

Blunt tools risk leading to unwanted consequences, such as favoritism of certain sectors or product groups at the expense of others or causing negative extraterritorial effects. Instead, it is necessary to introduce flexibility for technology development and innovations in material use, as well as actively listening to the business perspective to create well-balanced and sustainable solutions to the challenges.

Contribution

- The conditions and transparency for recycled materials need to be strengthened.
- Blunt tools, such as quota obligations or minimum requirements for recycled materials, risk leading to unintended consequences and distorting the market.
- Active dialogue with companies is key to creating well-balanced and sustainable solutions to the challenges of circular material usage.

Invest in research and development to build valuable knowledge

Sweden is one of the world's leading industrial nations and has a world-class research and innovation system. Swedish companies have been able to maintain their competitiveness through significant investments in research and the development of new production processes and smart products. The transition to a circular economy places additional demands on the research and innovation system, as new insights, collaborations, and solutions need to be developed.

For the Swedish industry, it is important that all participants in the research and innovation system—including academia, research funders, and research institutes—have favorable conditions to effectively fulfill their roles and strengthen the system as a whole. A well-functioning research and innovation system is essential for addressing complex challenges and enhancing Sweden's competitiveness.

Research and development play a crucial role in enabling the integration of circular principles into business operations. To ensure progress in research and development, increased investments and strong initiatives from both public and private actors are required. By increasing public funding for strategic collaboration programs, both private and public actors become involved. In this way, innovation is strengthened, and new solutions are promoted. This is a prerequisite for Sweden to participate in the global race in terms of technology development and create future prosperity.

A well-functioning technology and research infrastructure is a key component in this development. Such infrastructure includes, for example, test beds, which enable the development of new technologies and products. By providing realistic environments for testing and validation, these can accelerate the innovation process and expedite the introduction of new solutions. The research infrastructure should also include a robust technology infrastructure that helps actors share data and knowledge with each other. This should be linked to initiatives at the EU level, where the work with so-called data spaces—common areas for data sharing—is particularly relevant for the technology industry's circular transition.[37]

Regulatory sandboxes provide an environment for testing and validating business models and processes, fostering both innovation and regulatory compliance. Promoting collaboration within the industry and stimulating cooperation between different sectors, for example, through the establishment of competence centers and participation in European research and innovation programs, are other important steps towards creating an interdisciplinary and comprehensive understanding.

Contribution

- A robust research and innovation system is needed to create the right conditions for the development of new technologies, innovations, and business models.
- Research and innovation-promoting initiatives such as testbeds, regulatory sandboxes, and partnerships are important elements in product and technology development as well as for market introduction.
- A strong infrastructure for research and knowledge development includes improved opportunities for testing, validation, and data sharing.

[37] Common European Data Spaces, 2023

Expand the role of the authorities in guidance, permitting, and supervision related to the circular economy

The role of authorities in guidance, permitting, and supervision is crucial for ensuring the effective implementation of the circular economy. To enhance and ensure effective guidance in this area, active participation from both the EU and national authorities is required, providing clear guidelines and support. An increased level of cooperation and coordination between different authorities at both national and EU levels is necessary to create consistent and effective guidance for businesses. This is particularly important when viewed from the perspective of small and medium-sized enterprises.

The participation of the business sector in government dialogue, for example, is crucial for ensuring effective guidance. For this reason, an appropriate authority should be tasked with developing a strategy for the implementation of digital product passports in Sweden, in consultation with the business sector.

In addition, a well-functioning and effective supervisory system is crucial for ensuring equal conditions in the market and for combating unscrupulous and sometimes criminal actors. To achieve this, supervisory methods need to be developed in parallel with the design of new policy proposals. It is of utmost importance that Swedish supervisory authorities are allocated sufficient resources and expertise to effectively carry out their tasks. Increased national coordination of supervision, strengthened collaboration between different supervisory authorities, and enhanced follow-up and evaluation of supervisory work are necessary to strengthen the system.

Changes related to permitting are central to promoting a circular economy. For example, modifications to existing permits may be required to enable the circulation of recycled materials in former or existing processes, such as with former mining waste or landfills. By facilitating the permitting process, opportunities are created for increased sustainability and circularity within various operations. For instance, it can be challenging to sell "waste" as a raw material to create new products, even if it is not classified as hazardous waste. A specific example is the attempt to sell 6,000 tons of sand left over from blasting for use in the production of self-leveling compound. The administrative burden associated with this process is too great. As a consequence, this material ends up in a landfill, despite neither the company nor the customer desiring this outcome.

Contribution

- Companies need clarity, long-term stability, and guidance from responsible regulatory authorities. Targeted support and information efforts are necessary to ensure the competitiveness of small and medium-sized enterprises.
- Ensure that authorities are allocated sufficient resources to exercise effective market oversight.
- More efficient and predictable permitting processes create opportunities for increased circularity within the technology industry.

References

Boston Consulting Group, 2023. Nordic Circular Economy: A Pathway to Sustainable Growth and Resilience. Report.

Circular Sweden, 2023. Circular Report.. Report.

Cradlenet, 2021. Circular Economy Outlook Report. Report.

Common European Data Spaces, 2023. Available at: https://dataspaces.info/common-european-data-spaces/#page-content

Delegation for Circular Economy, 2022. Annual Report.

Ellen Macarthur Foundation, 2020. Circular Economy Growth Potential by Sector: Automotive, Transport and Logistics. Available at: https://emf.thirdlight.com/link/2ru2psupvqq-mwokve/@/preview/1?o

Ellen Macarthur Foundation, 2020. Circular Economy Growth Potential by Sector: Electronics. Available at: https://emf.thirdlight.com/link/qv1vxucc7dnu-zcr3zh/@/preview/1?o

FORMS, 2023. A Chemically Safe Future: Investments in Research and Innovation for Competitiveness, Preparedness, and Proactive Measures. Report.

IVL and Circular Sweden, 2022. Policy Measures for Enhanced Circularity of Products and Materials. Report.

Kahlert, S. och Bening, C. R., 2022. Why pledges alone will not get plastics recycled: Comparing recyclate production and anticipated demand. Resources Conservation and Recycling 181:106279.
Labshare, 2022. Labshare, 2022. https://thelabshare.com/B2B_marketplaces.html

Nilsson, H. and Holmström, S., 2023. "Short-sighted when VAT on repairs is increased." Svenska Dagbladet. Available at: https://www.svd.se/a/dwrgpj/hopplost-kortsiktigt-nar-moms-pa-reparationer-hojs-skriver-debattorer

Packaging Insights, 2022. Recycled PET “as expensive as gold” says UNESDA in appeal to EU for priority access. Available at: https://www.packaginginsights.com/news/recycled-pet-as-expensive-as-gold-says-unesda-in-appeal-to-eu-for-priority-access.html

Ramboll, 2023. Why circularity is key to a sustainable energy transition. Available at: https://www.ramboll.com/insights/resource-management-and-circular-economy/why-circularity-is-key-to-a-sustainable-energy-transition

The Governent, 2022. Committee Directive: Economic Instruments to Promote the Transition to a Circular Economy. Decision at the government meeting on June 16, 2022.

RISE, 2020. Profitability of Linear Consumer Products in Circular Business Models: Development of Tools and Application to Three Industries. Report.

RISE and the Expert Group for Circular Design Principles, 2022. Report by the Expert Group for Circular Design Principles.

SCB, 2023. Business Economy: Industry Key Figures. Available at: https://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START_NV_NV0109_NV0109O/BNTTO1/

SITRA/Vivid Economics, 2022. Tackling root causes: Halting biodiversity loss through the circular economy. Report.

Swedish Institute for Standards (SIS), 2022. Circular Economy. Available at: https://www.sis.se/standarder/omrade/cirkular-ekonomi/

Confederation of Swedish Enterprise, 2022. Create favorable market conditions for the emergence of the circular economy. Report.

Swedac, 2020. Standardization for Quality and Efficiency. Available at: https://www.swedac.se/standardisering-for-kvalitet-och-effektivitet/#:~:text=STANDARDISERINGSARBETE%20handlar%20i%20grund%20och,g%C3%A4ller%20s%C3%A5v%C3%A4l%20m%C3%A5tt%20som%20funktion.

Technology Industries of Sweden (Teknikföretagen), 2018. Circular Economy: Business with New Values. Report.

The Circularity Gap Report, 2022. Report.

The World Bank, 2022. Squaring the Circle: Policies from Europe's Circular Economy Transition. Report.

Wijkman, A., Bergman, E., and Clark, T., 2023. Debate: Do Not Stifle Circular Work with Increased Taxes. Dagens Industri. Available at: https://www.di.se/debatt/debatt-kvav-inte-det-cirkulara-arbetet-med-hojd-skatt/

Appendix 1 Interview questions

Status of the circular economy

1. How does your company currently work with the circular economy?

2. How do you plan to work with the circular economy in the future?

3. Have you identified the steps required to achieve this?
    - For example, setting goals, indicators, or key figures
    - Strategies for remanufacturing, recycling, and supply chain management

Obstacles to a circular economy

4. What obstacles do you encounter in the circular transition today, within the framework of your business?
    - Political and institutional obstacles (e.g., regulations, economic factors)
    - Technical obstacles
    - Norms or behaviors that hinder progress (e.g., lack of demand, lack of knowledge)

Drivers for a circular economy

5. Do you see any factors that would significantly facilitate the development towards a circular economy?
    - Technical solutions
    - Regulations and policy instruments
    - Other

Additional Factors

6. Are you involved in any collaborations, initiatives, or partnerships with other companies, industry organizations, or authorities in Sweden to promote a circular economy? Can you describe these and their impact on your operations?

Appendix 2: Brief description of the policy landscape of the circular economy

Many actors and stakeholders have attempted to formulate policy proposals aimed at promoting the circular transition. This is a complex task that requires carefully balancing of different economic interests and global and national economic structures, while also promoting collaboration among actors such as governments, businesses, and civil society.

Below is a brief description of the main features of the current policy landscape. Technology companies do not always share these policy proposals, which is described in more detail in the report, for example, regarding quotas and minimum requirements.

Circular principles need to be integrated into tax legislation.

One of the most prominent policy proposals in the field of circular economy focuses on using tax legislation to make circular business models more attractive and efficient. Among other things, IVL proposes changes to the current tax legislation to make repairs cheaper, for example by reducing VAT on second-hand sales and repair services and expanding the ROT deduction for repairs.[38] Circular Sweden also argues that today's double taxation on used products creates little economic incentive for reuse and highlights the need for updated tax legislation with reduced VAT on used or reused products.[39] Similar proposals also come from the World Bank, which includes VAT reductions, subsidies for recycled materials, increased taxes on primary raw materials, and a shift in the tax burden from labor to materials in their summary of policies needed to increase the attractiveness of circular business models.[40]

The Delegation for Circular Economy further proposes in its annual report a tax shift aimed at extending the lifecycle of products, primarily through various economic instruments, including incentives for companies to maximize product lifespan through service, repairs, reuse, and shared services. To encourage circular business models, they propose the introduction of fees on newly produced goods made from primary materials, reduced employer contributions for service and repairs, a repair deduction, as well as incentives for the servicification of products.[41] The Delegation also suggests an investigation to review accounting laws and audit recommendations, particularly the rules for depreciation and write-up of inventories, to facilitate companies' adaptation to circular business models. They point out that current rules lead to rapid depreciation of inventories, which can be an obstacle to the circular transition and long-term resource utilization. Adjustments may therefore be needed, especially for small and medium-sized enterprises.

Many leading figures in the field emphasize the need for updated tax legislation that better incorporates circular principles.

Public procurement can be a powerful tool to stimulate circular solutions.

Requirements for circularity in public procurement are another policy proposal that recurs among many actors. By acting as a contracting entity, the state has the potential to play a central role in driving development toward market-based sustainability in circular business models. The Delegation for Circular Economy identifies that public procurement, which represents around 20% of Swedish GDP, can

[38] IVL and Circular Sweden, 2022
[39] Circular Sweden, 2023
[40] The World Bank, 2022
[41] The Delegation for Circular Economy, 2022

become a powerful engine for circular resource flows by integrating circular requirements in procurements.[42] Currently, the purchase price is often prioritized in public procurements, which leads to a lack of incentives for suppliers to transition to circular production. IVL also highlights circular procurement requirements as a prioritized policy proposal, focusing on a minimum share of recycled materials in procured products. Reused products should also be prioritized within the framework of public procurement, according to IVL's compilation.[43]

Investments in increased traceability facilitate the circular transition

Another area of the policy landscape addresses technical measures for increased traceability in materials. IVL proposes legislation with enhanced traceability requirements for plastic products, which also includes expanded investments in sampling substances in recycled materials. [44] One of Circular Sweden's main inputs to policy is the need for more detailed information about the substances and materials a product contains. This, in turn, requires effective systems and processes for exchanging and managing product data. To ensure appropriate and relevant systems, companies' perspectives should be included in the development of digital product passports. [45]

Enhanced systems for collaboration and information exchange foster knowledge development and innovation.

Several actors emphasize the importance of systematic information exchange between value chain parties to achieve a circular economy. The World Bank highlights the importance of robust infrastructure that enables collaboration through data exchange, circular platforms, and industrial parks. Furthermore, the importance of knowledge development is emphasized through investments in research and development, efforts in skill development, and initiatives that increase customer awareness regarding the circular economy. [46] For example, IVL highlights the need for effective communication about the climate benefits of circular flows for products and materials. [47] This, in turn, requires the development of common measurement methods and approaches through cross-sectoral and interdisciplinary research initiatives.

Many believe that quotas or minimum requirements for the proportion of recycled materials are necessary tools to reduce the use of primary resources.

Many stakeholders emphasize that policy instruments regulating the relationship between primary and recycled materials are central to the transition to a circular economy. Examples of these instruments include quota obligations, where actors are required to meet a certain quota of recycled materials (with the option to buy, sell, or trade on the market), or statutory minimum requirements for the proportion of recycled material in new products. Circular Sweden, among others, is calling for the introduction of requirements in EU legislation regarding the content of a certain proportion of recycled material in new products. This is considered an effective way to ensure demand for recycled raw materials, stimulate the collection process, and increase the competitiveness of materials that are currently not profitable to recycle, such as plastic[48]. IVL shares the view that minimum requirements can be an important strategy to promote the circular transition. At the same time, they emphasize the importance of tailoring these requirements to fit the specific conditions within different sectors. [49] Teknikföretagen perceive

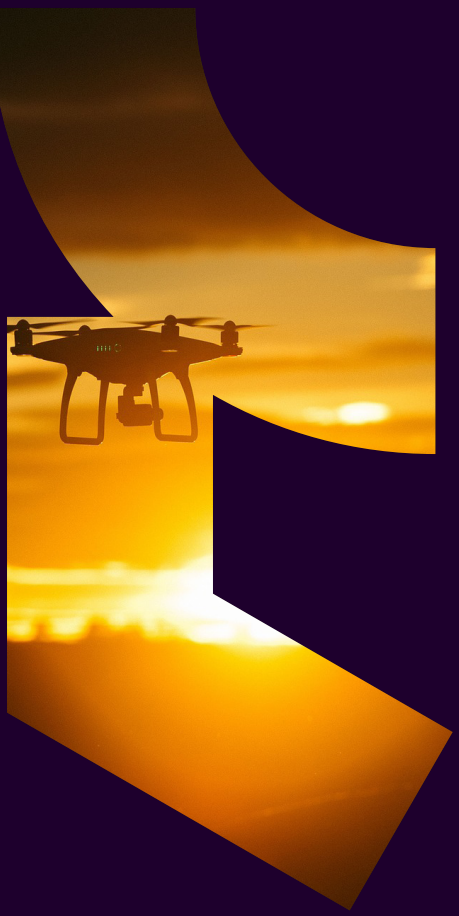
[42] Delegation for Circular Economy, 2022
[43] IVL och Circular Sweden, 2022
[44] IVL och Circular Sweden, 2022
[45] Circular Sweden, 2023
[46] The World Bank, 2022
[47] IVL och Circular Sweden, 2022
[48] Circular Sweden, 2023
[49] IVL och Circular Sweden, 2022

significant risks associated with the use of blunt instruments, such as quota obligations or minimum requirements for recycled materials, as these could lead to unintended consequences and distort the market.

Clear definitions are needed to enable effective work in circularity.

A common recurring policy proposal in the area of circular economy involves clearer definitions and clarification of key concepts. Ambiguities about what the circular economy means and how it should be measured create difficulties in prioritizing and implementing circular solutions. Key concepts such as recyclable, reused, and recycled need to be defined and standardized consistently across the entire EU, providing companies with clear guidance in their work with circularity.[50]

[50] IVL och Circular Sweden, 2022



The 4,500 member companies of Teknikföretagen account for a third of Sweden's exports and over one million jobs. Our task is to strengthen our members' competitiveness and drive sustainable development forward. Together with companies across the country, we shape the future of the technology industry –
we are Swedish Technology.

Technology Industries of Sweden