Final report

International transformation for circular economy

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Internationell transformation för cirkulär ekonomi

International transformation for circular economy

Title – Swedish Internationell transformation för cirkulär ekonomi
Title – English International transformation for circular economy
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Foreword

This project has been initiated and financed by RE:Source, one of Sweden's strategic innovation programs which in turn is financed by the Swedish Energy Agency, Formas and Vinnova.

RE:Source has, among others as an objective to produce knowledge and results for policy development. Decision-makers will based on that knowledge have more accurate data to base their decisions upon. RE:Source has followed the project and during the project was primarily represented by Elin Larsson, Program Manager and Jan Agri, Innovation Manager.

The project has been executed by a project group within AFRY, led by Anna Karin Jönbrink. In the project, several Swedish and international external actors with expert competence and/or with in depth knowledge from industry have been involved. These people have been helping the project group in identifying important factors, but also contributing input such as description of value chains for different product groups, and/or regarding drivers and barriers in different countries.

The project group would like to express its great gratitude for the confidence to carry out this project, and to everyone who has contributed to its execution in various ways.

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Swedish summary

Projektet som genomförts av AFRY på uppdrag av RE:Source har syftat till att identifiera och sammanställa de hinder som idag finns på den internationella arenan samt redovisa drivkrafterna för att ställa om till cirkulär ekonomi sett i ett globalt perspektiv.

Analys av import- och export, samt en enkätstudie, låg till grund dels för vilka länder och dels för att värdekedjorna för produktgrupperna möbler, kläder, elektronik och fordon studerades närmre. Studierna av värdekedjorna skedde genom att studera litteratur och annan tillgänglig information och genom att genomföra ett stort antal intervjuer med nyckelpersoner i de olika värdekedjorna samt med ett antal experter inom cirkulär ekonomi i olika länder. Även materialflöden för stål och papper studerades men i mindre omfattning.

Halvvägs i projektet hölls en workshop med 61 deltagare, bestående av industrirepresentanter och experter från forskningsvärlden och samhället i övrigt, där resultaten dittills presenterades och diskuterades. Efter workshopen gjordes en fördjupad studie genom intervjuer med internationella experter och internationella källor.

Under projektets gång har det visat sig att cirkulär ekonomi är mindre etablerat än förväntat, och fortfarande oftast sker i liten skala och i olika former av piloter. De internationella cirkulära flödena är dessutom ganska få. Detta trots att Cirkulär Ekonomi diskuteras intensivt av många beslutsfattare runtomkring i världen.

Projektet har lyckats samla en mängd kunskap om hinder och drivkrafter för cirkulär ekonomi i globala värdekedjor. Dessa kunde delas upp i kategorierna: **Samarbete, System och teknik, Lagstiftning och Politik, Kundmognad, Kunskap, och inte minst Ekonomi,** som i hela undersökningen visat sig vara en helt central fråga. Under ett slutseminarium med 66 deltagare bestående av industrirepresentanter och experter från forskningsvärlden och samhället i övrigt där de generella slutsatserna presenterades, samlades ytterligare synpunkter in via Mentimeter. Dessa har bidragit till den slutliga utformningen av denna rapport.

Resultaten i projektet kan sammanfattas i följande slutsatser

Generellt

- Den pågående internationella utvecklingen mot fler handelshinder och nationell protektionism kan hindra utvecklingen mot cirkulär Ekonomi.
- Många goda initiativ är redan igång (policyutveckling, samverkan och nätverk, aktiviteter i företag).
- Många initiativ fokuserar på cirkulär ekonomi, utan att ta hänsyn till påverkan på hållbarhet. Cirkulär ekonomi leder ofta till hållbarhetsmässiga förbättringar, men inte alltid.
- I de länder där Sverige har stor import och export ser vi en tydlig utveckling mot cirkulär ekonomi. Dock sker detta på olika sätt och med olika hastighet. Exempelvis är initiativen i Kina kraftfulla. Man kan också notera att länder som Nederländerna har tydliga och konkreta riktlinjer, och tex Tyskland har mer generella och övergripande riktlinjer.
- Enligt resultaten i denna studie är internationella cirkulära flöden inte så vanliga som förväntat, varför projektgruppen anser att hindren gentemot internationella cirkulära flöden än så länge är starkare än drivkrafterna.

Ekonomi

- Lönsamhet för alla parter längs kedjorna är helt centralt, då parter annars lämnar kedjan, och lönsamhet upplevs ofta svårt att nå, särskilt för internationella cirkulära flöden.
    - Cirkulära flöden passar inte i dagens system vilket innebär många extra aktiviteter och kostnader, inte minst för internationella flöden.
    - Att etablera internationella cirkulära flöden kräver stora investeringar, inte minst för mindre företag.
    - Arbetskraft är dyrt i många aktuella marknader samtidigt som nya produkter och jungfruliga material ofta är förhållandevis billiga.
- Materialvärdet på använda produkter, komponenter och material kan vara högre än kostnaden för att införskaffa dem och kan därmed göra cirkulär ekonomi lönsam.

Kunskap

- Kunskap saknas om när internationella cirkulära flöden är att föredra framför nationella eller lokala.
- Kunskapen byggs ofta separat i olika branscher respektive nationer/regioner.
- Kunskap och information upplevs ofta som otillräckliga för att företag ska våga fatta beslut om att ta nya vägar, tex våga införa internationella cirkulära affärsmodeller.
- Man ser en tydlig kunskapsbrist om cirkulär ekonomi hos många leverantörer.

Lagstiftning och Politik

- Såväl inom EU som i många EU-länder inom och på andra håll i världen, byggs nya regelverk för att driva på cirkulär ekonomi.
- Många regelverk skiljer sig mellan nationer och regioner, vilket gör det svårt för företag att agera i internationella cirkulära flöden.
    - Avfallsreglerna skiljer sig mycket mellan olika länder.
    - Produktreglerna skiljer sig mindre, särskilt inom EU.
- Regelverken motverkar i visa fall cirkulära flöden.
- Adminstrativa krav för import och export och, inte minst, transport av varor, har visat sig skapa stora hinder för övergången till internationella cirkulära flöden.

Konsumentbeteenden

- Kundmognad och status för begagnade varor skiljer sig stort mellan olika länder, men också mellan olika produktgrupper. Man ser exempelvis att personer med sämre ekonomiska möjligheter i vissa fall ser begagnade varor som en möjlighet, men ibland ser man också att man inte vill köpa begagnat för att man inte vill riskera att bli klassad som fattig.
- Kundacceptansen beror mycket på hur den cirkulära affärsmodellen tillgängliggörs och presenteras vilket kan påverka skillnaderna mellan olika länder.
- Unga flyttar idag mer mellan olika länder och städer än tidigare generationer, vilket ökar behovet av att hyra produkter, exempelvis möbler.

Samarbeten

- Samarbeten i värdekedjor varierar mellan olika nationer och regioner, men också för olika värdekedjor.
- Det är ofta svårt för aktörer att hitta rätt samarbetspartners internationellt inte minst då det på vissa håll finns en stor motvilja/rädsla kring att dela med sig av produktinformation

System och Teknik

- Digitaliseringen ses som en möjliggörare, inte minst genom att det skapar möjlighet att följa information om materielinnehåll och produkter genom värdekedjor.
- Standardiserade system och infrastruktur inkl återtagningslogistik för insamling och återvinning saknas eller är otillräcklig i många delar av världen.
- Effektiva system för att sortera ut värdefulla komponenter och material ur avfall saknas.

Rekommendationer

Hållbarhet måste säkerställas

- Målet är inte cirkulär ekonomi, utan hållbarhet, så man måste säkerställa att all utveckling och alla förändringar leder till hållbarhetsmässiga förbättringar.

Lönsamhet behöver säkerställas

- Kostnaden för arbetskraft behöver sänkas exempelvis genom minskad skatt på arbete.
- Grön upphandling kan användas som en drivkraft. (mål eller krav kan sättas).
- Ökade administrativa krav på internationella cirkulära flöden behöver elimineras.

Kunskap behöver delas

- Den kunskap som tas fram behöver delas mellan branscher, nationer och regioner.
- Kunskap om metoder och mod för att fatta beslut på annat underlag än traditionellt behöver utvecklas (VÅGA!).

Regelverk behöver harmoniseras och anpassas till cirkulära flöden

- *Avfallsdefinitioner* behöver ses över och harmoniseras mellan olika länder.
- *Lagar kring internationella dataflö*den behöver ses över så att de inte hindrar effektiva cirkulära system.
- Internationella standarder och definitioner för *kvalitet på återvunnet material* behöver utvecklas.
- Standarder och definitioner för vad som är cirkulärt behöver utvecklas (för att kunna använda i upphandling eller för tullättnader eller andra incitament).
- En global omställning kan stöttas av exempelvis frihandelsavtal och Aid for Trade och på liknande sätt kan länder som behöver hjälp med att implementera lagar kring hantering av avfall och liknande stödjas.
- Befintliga system och lagar behöver anpassas och utvecklas så att de *möjliggör en gradvis övergång och skalning till/av cirkulära affärsmodeller*.

Konsumentbeteenden behöver utvecklas

- Incitament för privatpersoner och företag att konsumera mer cirkulärt behöver skapas.

Samarbeten behöver underlättas

- Underlätta för små företag inom CE att hitta samarbetspartners internationellt.
- Underlätta delning av information längs cirkulära värdekedjor.

- Skapa system för att säkerställa kvalitet på cirkulära produkter och material så att aktörer längs kedjorna kan och vågar använda begagnade produkter/komponenter/material.

Teknik behöver utvecklas

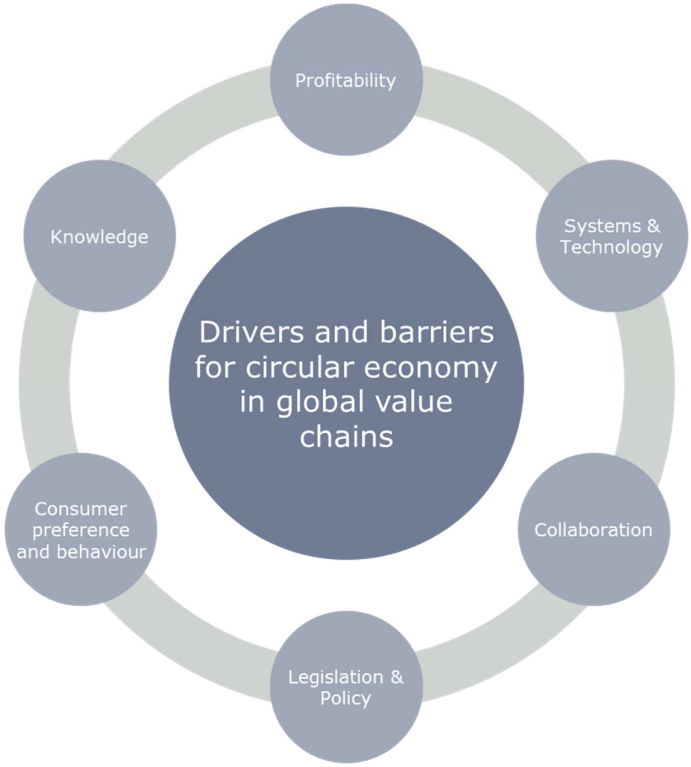
- Digitala lösningar för att möjliggöra internationella cirkulära system behöver utvecklas, tex produktpass. (Notera, att digitala lösningar också kan ha en negativ hållbarhetspåverkan, som måste vägas mot vinsterna).
- Hållbara och lönsamma system för internationell returlogistik behöver utvecklas.

Slutligen: Övergången till en internationell cirkulär ekonomi, kräver många förändringar. Projektgruppen menar att de två huvudsakliga riktlinjerna för övergången är att förändringarna leder till Lönsamhet för alla ingående parter, och till hållbarhet, då hållbarhet är målet med cirkulär ekonomi.

Med stöd från VINNOVA Sveriges innovationsmyndighet, Energimyndigheten, FORMAS, Strategiska innovationsprogram

English summary

The project carried out by AFRY on behalf of RE:Source has aimed to identify and compile the obstacles that currently exist in the international arena and to report on the driving forces for switching to a circular economy seen in a global perspective.



Analysis of imports and exports, as well as a web-survey, formed the basis for the choice of the value chains for the product groups furniture, clothing, electronics and vehicles to be studied. The analysis of the value chains was done by studying literature and other available information and by conducting a large number of interviews with key people in the various value chains and with a number of circular economy experts in different countries. Material flows for steel and paper were studied to a lesser extent. Halfway through the project, a workshop was held with 61 participants, consisting of industry representatives and experts from the research world and society in general, where the results so far were presented and discussed. After the workshop, an in-depth study was conducted, mainly through international sources, and through interviews with international experts.

During the project, it has been shown that circular economy is less established than expected, and still usually takes place on a small scale and in various forms of pilots. In addition, the international circular flows are quite few. This is despite the fact that Circular Economy is intensively discussed by many decision-makers around the world.

The project has managed to gather a lot of knowledge about obstacles and driving forces for circular economy in global value chains. These could be divided into the

categories: Cooperation, Systems and Technology, Legislation and Policy, Customer Maturity, Knowledge, and not least Profitability, which throughout the study proved to be a key issue.
During a final seminar with 66 participants consisting of industry representatives and experts from the research world and society in general, where the general conclusions were presented, additional views were collected via Mentimeter. These have contributed to the final design of this report.

The results of the project can be summarized in the following conclusions

Generally

- The ongoing international development towards more barriers to trade and national protectionism can hinder the development towards the Circular Economy.
- Many good initiatives are already underway (policy development, collaboration and networking, activities in companies).
- Many initiatives focus on circular economy, without taking into account the impact on sustainability. Circular economy often leads to sustainability improvements, but not always.
- In the countries where Sweden has large imports and exports, we see a clear development towards a circular economy. However, this happens in different ways and at different speeds. For example, initiatives in China are powerful. It can also be noted that countries such as the Netherlands have clear and concrete guidelines, while for example Germany has more general and comprehensive guidelines.
- According to the findings in this study, international circular flows are not as common as expected, why the project group considers barriers for international circular flows, so far, stronger than the drivers.

Profitability

- Profitability for all actors along the chains is central to make Circular Economy happen, else the actors will leave the chain, and this is often perceived as difficult to achieve especially for international circular flows.
    - Circular flows do not fit into the current system, which means many extra activities and costs, not least for international flows.
    - Establishing international circular flows requires large investments, not least for smaller companies.
    - Labor is expensive in many relevant markets while new products and virgin materials are often relatively inexpensive.
- The material value of used products, components and materials can be higher than the cost of retrieving them and can thus make circular economy profitable.

Knowledge

- There is a lack of knowledge about when international circular flows are preferable to national or local ones.
- Knowledge is often built separately in different industries and nations / regions.
- Knowledge and information are often perceived as insufficient for companies to dare to make decisions about taking new paths, such as daring to introduce international circular business models.
- There is a clear lack of knowledge about circular economy among many suppliers.

Legislation and Policy

- In the EU and in many EU-countries as well as elsewhere in the world, new regulations are being built to drive the circular economy.
- Many regulations differ between nations and regions, which makes it difficult for companies to act in circular, international flows.
    - Waste regulations differ greatly between different countries.
    - Product regulations differ less, especially within the EU.
- In some cases, the regulations even counteract circular flows.
- Administrative requirements for import and export and, not least, transport of goods, have been shown to create major obstacles to the transition to international circular flows.

Consumer behavior

- Customer maturity and status of used/second-hand goods differ greatly between different countries, and between different product groups. The study shows that people with poorer financial opportunities in some cases see used/second-hand goods as an opportunity, but sometimes also see that they do not want to buy used/second-hand things because they do not want to risk being classified as poor.
- Customer acceptance depend a lot on how the circular business model is made available and presented, which can affect the differences between different countries.
- Young people today move more between different countries and cities than previous generations, which increases the need to rent products, such as furniture.

Collaboration

- Collaborations in value chains vary between different nations and regions, but also for different value chains.

- It is often difficult for players to find the right business partners internationally, not least as in some places there is a great reluctance / fear about sharing product information.

Systems and Technology

- Digitization is seen as an enabler, not least because it creates the opportunity to follow material content and products through value chains.
- Collection, recycling systems and infrastructure for circular systems are lacking or inadequate in many parts of the world.
- Efficient systems for sorting out valuable components and materials from waste are lacking.

Recommendations

Sustainability must be ensured

- The goal is not circular economy, but sustainability, so it must be ensured that all development and all changes lead to sustainability improvements.

Profitability needs to be ensured

- The cost of labor needs to be reduced for example by reduced tax for labour in order to promote re-use, re-pair, re-manufacturing and so forth.
- Green procurement can be used as a driving force. (goals or requirements can be set).
- Increased administrative requirements for international circular flows need to be eliminated.

Knowledge needs to be shared

- The knowledge that is produced needs to be shared between industries, nations and regions.
- Knowledge of methods and courage to make decisions on a basis other than traditional needs to be developed (DARE!).

Regulations need to be harmonized and adapted to circular flows

- Waste definitions need to be reviewed and harmonized between different countries.
- Laws on international data flows need to be reviewed so that they do not hinder efficient circular systems.
- International standards and definitions for the quality of recycled material need to be developed.
- Standards and definitions for what is circular need to be developed (to be able to use in procurement or for tariff concessions or other incentives).

- A global change can be supported by, for example, free trade agreements and Aid for Trade, and in a similar way, countries that need help in implementing regulations, guidelines and principles on waste management and the like can be supported.
- Existing systems and laws need to be adapted and developed so that they enable a gradual transition and scaling to circular business models.

Consumer behaviors need to be developed

- Incentives for individuals and companies to buy and dispose of products in a circular way need to be created and promoted.

Collaborations need to be facilitated

- Make it easier for small companies within Circular Economy to find partners internationally.
- Facilitate the sharing of information along circular value chains.
- Create systems to ensure the quality of circular products and materials so that actors along the chains can and dare to use used products / components / materials.

Technology needs to be developed

- Digital solutions to enable international circular systems need to be developed. (Note that digital solutions can also have a negative impact on sustainability, which must be weighed against the benefits)
- Sustainable and profitable systems for international return logistics need to be developed.

Finally: The transition to an international circular economy requires many changes. The project group believes that the two main guidelines for the transition are that the changes lead to Profitability for all parties involved in the value chains (else they will leave the partnerships), and to sustainability, as sustainability is the main goal of circular economy.

Introduction and background

Most companies, including Swedish ones, have global value chains. In this report value chains include upstream and downstream actors in the entire product life cycle and material flows. To succeed in creating circular business with global value chains, an understanding of what the landscape looks like internationally is needed, for example in terms of what obstacles exist today and what driving forces can create change.

Re: Source has identified a need to investigate global obstacles and drivers for the transition to a circular economy within the program. This project will thus generate benefits for decision-makers, business and the public sector who work with or have international value chains. The project will contribute to Re:Source impact goals and result in the generation and dissemination of knowledge as well as a report that will be used for both dissemination of results and serve as a basis for strategic decisions in politics, business and the public sector.

The report is expected to provide Swedish decision-makers with information in the area of global value chains' significance for the circular economy. The report shall address both opportunities and limitations regarding development of regulations and policies as well as of business development.

Furthermore, the report is expected to provide companies with valuable strategic knowledge about the development of circular economy in important markets as support for companies' innovations and R&D investments as well as business projects.

Method used in the project

The project was conducted in the steps as illustrated in the figure below.

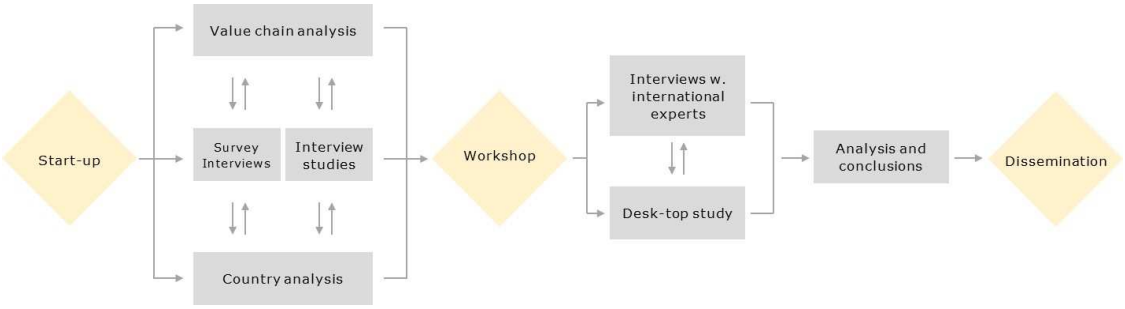


Figure 1 Project process

- Value chain analysis
  - Four global value chains were selected to be included in this project: electronics, furniture, clothing and vehicles/automotive. The choice was based on the value chains' relevance to Swedish international

trade, the value chains' potential for circular solutions and on the interest in circular initiatives that exist in the various industries. The global value chains of paper and steel were also included in a less detailed level. For each value chain, the current circular economy value chain activities were mapped and key drivers and barriers for an international transition to a circular economy were identified.
    - For each of the selected value chains several in-depth interviews were carried out, mainly with companies and organizations based in Sweden, but also with international supply or value chains, as well as with companies based in other countries (also with international supply and value chains). A web survey including close to 40 responses was also done with the aim to collect relevant information on these value chains and countries.
- Country analysis
    - Relevant countries were identified using import and export statistics. For these an analysis was conducted with regards to important initiatives driving (or hindering) implementation of circular economy.
- Workshop
    - The preliminary results of the first steps of the project were presented and discussed in a workshop were appr. 61 circular economy experts were participating from a wide range of companies and organizations.
- Interviews with international experts
    - A large number of interviews were carried out with international circular economy experts, both experts in circular economy in general and specifically related to the included value chains.
- Desk-top study
    - Literature studies were also conducted with the aim to complement and verify information gained in interviews.
- Analysis and conclusions
    - Based on the knowledge gathered in the previous steps the AFRY project team analyzed the information and drew conclusions and recommendations.
- Dissemination
    - Preliminary results from the project were presented during a second webinar having 66 participants. The final results are presented in this report.

The AFRY team that conducted the project include Anna Karin Jönbrink (Project Leader), Carolina Togård, Karin Lagercrantz and Ola Svending.

Circular economy in global value chains

Four value chains with relevance for Swedish international trade and with potential for circular solutions were selected to be studied in more detail in the project: electronics, furniture, clothing and vehicles/automotive. This section describes the ongoing circular initiatives, key drivers and key barriers for these value chains briefly. In chapter “Drivers and barriers for global circular value chains” drivers and barriers are described in more detail

Electronics

Electronics industry value chain

The consumer market and manufacturing in the electronics industry are both global, but a large part of primarily electronic components is manufactured in Asia (e.g. China, Taiwan, Malaysia and Vietnam). For heavier and larger products such as household electronics, it is more common for manufacturing to take place closer to the customer market. A producer often has many different suppliers and subcontractors, which makes the supply chains complex.

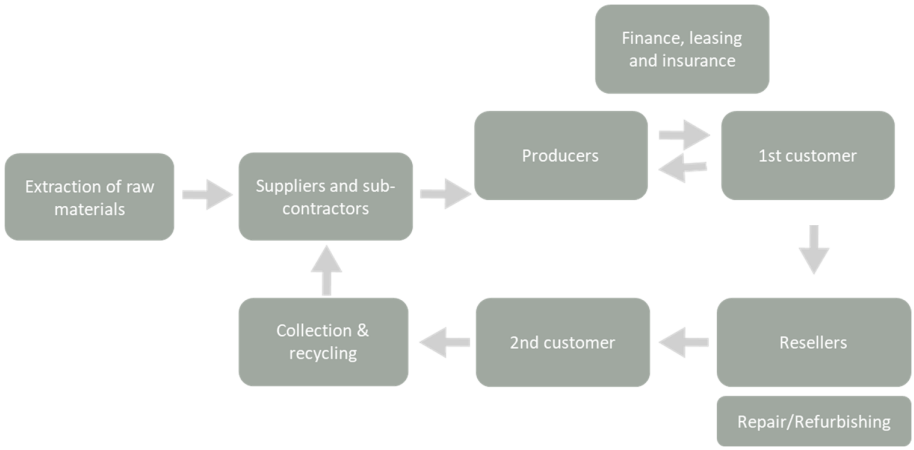


Figure 2. Current circular value chains in the electronics industry

Most of the interviewed Swedish producers have done pilot projects within the inner circles of circular economy (refurbish, reuse etc.) or product-as-a-service, but these initiatives have not yet been implemented as a part of their business model. However, it is common that producers have targets related to using recycled material. But we see that there is a growing interest among producers in both circular manufacturing and in the second-hand market.

The circulation of electronics is instead done by other players. The electronics industry has a well-functioning global secondary market where used electronics are refurbished and sold. Some of the used electronics are sold in the same market as it is bought, but generally there is a flow of used electronics that goes from premium markets (such as Sweden) to less rich countries where acceptance of used products and demand for cheaper electronics is greater.

Key drivers for an international transition to circular economy

There is already a profitable market for second-hand sales and leasing of more expensive electronics (like computers, printers and smartphones), both in Sweden and abroad. The market is further strengthened by circular procurement, and we can see that it has given producers an incentive to engage in the secondary market. In the long run, it can lead to a more circular product design. Another key driver is EU legislation, and specifically the Sustainable Product Initiative (SPI). Circular requirements on product design, providing spare parts and information can reduce the cost of repair and recycling.

Key barriers for an international transition to circular economy

One of the main barriers for circular business models for electronic products is cheap production of new products and a rapid technological development. This means that the value of electronics products decreases fast and that the product lifetime at a customer is short. Manufacturing companies rarely make a profit from producing products with a long lifespan as it looks today. Another key barrier is the cost of repairing and remanufacturing. Support is needed to make repairs and remanufacturing more profitable. Repairability and access to spare parts and information is important. Swedish producers often think that traceability and information are a good idea, but it is difficult to get the information from the complex value chains.

Another barrier is that recycled material is not as attractive as new. This is both because the cost of recycled material is sometimes higher than for virgin material, and because there is no guarantee of quality and content. Furthermore, many materials used in electronics that in the future may become scarce are not recycled because there is no profitability in the recycling chain. Recycling these materials requires large investments which are not profitable with today’s low market prices.

An obstacle for resellers of used electronics is that the inflow of used electronics is less than the demand, and they request incentives for customers to get rid of electronics in a circular way. Globally, formal collection systems are still lacking in many countries.

Furniture

Furniture value chains

Parts of the furniture value chain are global: sourcing of key raw-materials such as wood, metal, polymers and textiles, manufacturing of materials and components and manufacturing of furniture, while other parts are typically local: second-hand sales, repairing, renting/leasing, disassembling/sorting. A key reason for mainly local second-hand sales, repairing etc. is that assembled furniture are voluminous and thus expensive to transport and handle.

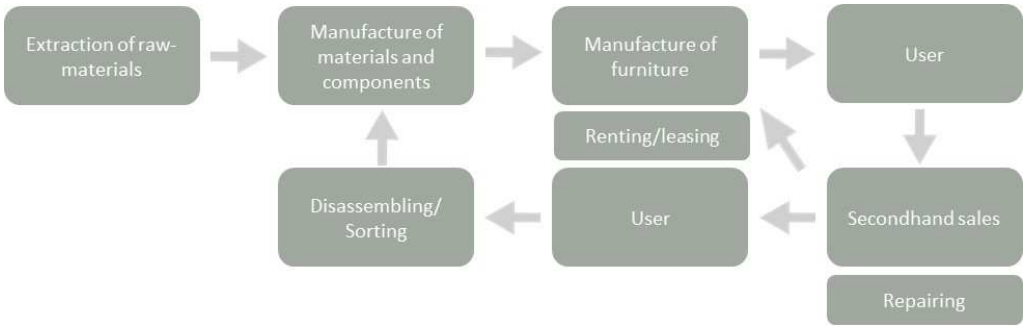


Figure 3: Current circular value chains in the furniture industry

Key drivers for an international transition to circular economy

Some consumer groups find second-hand furniture trendy and like the ideas of purchasing used products to reduce their footprint. These consumer groups are generally young, eco-concerned individuals in western Europe. Several e-trade platforms such as E-bay help creating market for used products including furniture. Many of these platforms are intended for national use, e.g. Blocket.se and Finn.no. REACH and other international regulations help manufacturers of furniture and components set relevant and internationally harmonized demands on suppliers.

Key barriers for an international transition to circular economy

As mentioned above, transporting assembled furniture is expensive and limits the possibility to move used products over greater distances. When crossing borders, the interpretations of waste definitions often classifies used or disassembled furniture as waste, which can complicate customs clearance.
Despite international regulations on e.g. chemical content, UK has other limits on e.g. flame retardants limiting trade of used furniture between UK and EU.
Identification of and access to correct spare parts is a key challenge for repairing furniture. As a result, ensuring the safety of e.g. a repaired office chair is jeopardized. This can limit the possibilities to sell refitted furniture to professional users. Product passports can relieve this challenge for new furniture after introduction of such passports, but for a foreseeable future most old furniture would not be covered by them.

Clothing

This chapter is based on statistics from Statistics Sweden and interviews with Swedish clothing companies working with circular economy.

According to data from Statistics Sweden and the interviews performed in this study, clothes companies in Sweden commonly have suppliers in Asia (e.g. India, Bangladesh and China) but also in the Middle East (e.g. Turkey) and Europe (e.g. Germany and Denmark). Some of the import markets export mainly thread and fabrics whereas others sew the clothes and export the final product. Common export markets for Swedish clothes companies are several in Europe (e.g. the Scandinavia, Germany, United Kingdom and Poland) but also the United States.

The Swedish clothing companies interviewed are testing several different circular business models, most commonly second-hand, renting, reparation as well as remake. The business models are being tested internationally. All companies interviewed also use recycled materials in the products and are trying to increase the share of recycled material.

The value chains in the clothing industry in Sweden are starting to become more circular but much still lies ahead. The figure below shows how the circular value chains look like today in the clothing industry in Sweden. However, although companies already have business models based on circular principles, little is fully circular since most textile waste is downcycled (or incinerated) internationally to for example insulation.

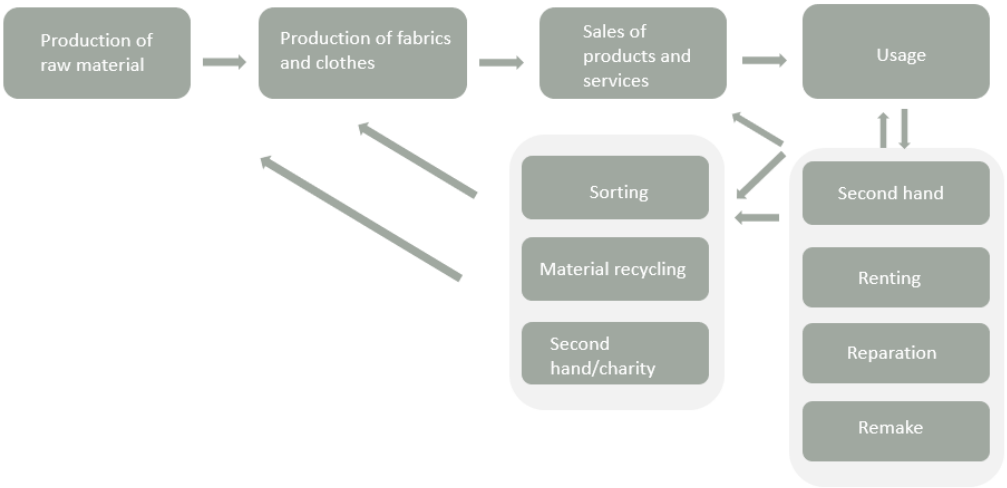


Figure 4: Current circular value chains in the clothing industry

Key drivers for an international transition to a circular economy

Several of the clothing companies perceive that the industry itself is one of the main drivers of the circular transition in global value chains. The retailers are for example ahead of their suppliers and have been taking circular initiatives before any circular economy measures were taken on the EU-level for the clothing industry. However, since the launch of the EU Green Deal, several circular economy initiatives on the

EU level have now been initiated and will support in driving the transition in the clothing industry. A few examples are the EU Strategy for textiles (European Commission, 2021a), the revision of the Waste Shipment Regulation (European Commission , 2021b), the upcoming producer responsibility and the promotion of digital product passport for providing consumers with information about products (European Commission, 2020). Another driver is that the second-hand market is becoming more trendy if different countries.

Key barriers for an international transition to a circular economy

Barriers highlighted in the interviews are for example that there is a lack of recycled textiles on the international market that is affordable, that is of enough quality and that fulfils chemical regulations. In Sweden, organisations and initiatives such as Re:newcell, Wargön Innovation and SipTex aim at enabling a more large scale textile-to-textile recycling. Some of the interviewed companies are considering buying recycled textile directly from Sweden instead of from, or as a complementary of, their current import countries.

Other challenges highlighted in the interviews were that there is a lack of actors offering reverse logistics internationally and that the market value for reused textiles is too low and transportation relatively very high. The low market price for used garments leads to that the clothing companies do not make any profit in collecting used clothing to sell abroad.

The interviewed companies also mentioned that it is difficult to find companies and organisations to collaborate with in the global value chain. It is also an uncertainty if every company should have their own platform for take-back, second-hand and rentals or if there should be a common supplier of these platforms which different clothing companies can collaborate with nationally and internationally. Smaller clothing companies find it difficult to find professional partners within recycling that can receive small amounts of clothes for recycling in different countries.

Other barriers mentioned were the definition of waste and the differences of the definition between different countries (difficult to transport garments between countries and much potential resources is classified as waste); lack of standardised infrastructure for collection, sorting and recycling within the EU; lack of sustainability knowledge and practice among suppliers which can lead to that circular solutions are not sustainable; and the chemical legislation makes it difficult to use recycled material.

Vehicle/Automotive

Automotive value chains

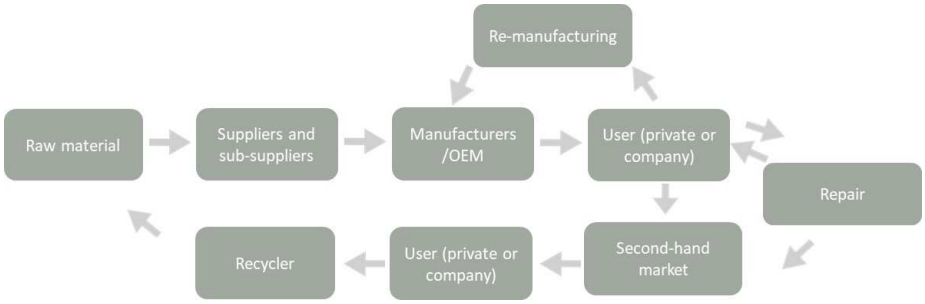


Figure 5 Current (circular) value chains in the automotive industry

Swedish companies in the automotive industry act on a global market, still having manufacturing in Sweden. Most raw materials and components come from Europe and Asia which means the value chains are strongly affected by global regulations as well as by national regulations in different parts of the world. Today the secondary market is global, even if the premium market of vehicles produced in Sweden is focused to the western world. Recycling take place globally, mainly for steel, and remanufacturing is already in place to a certain extent, usually nationally (e.g. gearboxes etc.). Repair of components is done globally, but to a greater extent where labour is cheaper.

One international expert point out that electric vehicles often end up in the third world at the end of their life cycle which makes it very difficult to create circular loops with materials and component from the vehicles. Many worn out cars end for example up in Egypt where there is a lack of good technology to recycle their batteries for example. With the methods used there, there is also a great risk that the batteries will start to burn, which is also a health hazard.

A former conservative industry is now changing dramatically through electrification. This also means that many components change completely. The rapid change is seen as an enabler for circular economy since changes are already on the agenda. Still some people think that since the new, important components, such as batteries, are developing that fast, they will perhaps become obsolete soon, and thus might be difficult to circulate later on.

Key drivers for an international transition to circular economy

For the automotive industry, the global second-hand business is, and has for a long time been, very profitable, thus driving towards circular economy. In the automotive industry, traceability have been important for ages, and the IMDS-system (International Material Data System) to keep track on materials and chemical content, has been widely used in the whole industry since year 2000 and drives towards circular economy. The development towards higher demands for re-used products and components, not least from public procurement, are also important drivers.

Key barriers for an international transition to circular economy

Some key players describe that managers hesitate to make brave decisions to change direction, for example towards new business models, due to lack of the information and knowledge they are used to get, they simply don't dare. In addition, the kind of information they request cannot be provided, it is not available due to that circular economy is so new to them, and experience to learn from is not available.

Some find it difficult to become profitable in circular models, not least when new components are cheap, and developing circular systems for complex value chains are challenging. It is also mentioned that different requirements, standards, and regulations in different markets make secondary material flows more difficult.

Another specific obstacle is the high demand on safety for automotive products, which in turn place great demand on components and materials. It is thus important to be able to ensure that you have the right quality of what you provide, which is seen as more difficult for second-hand products/components/materials than for new ones.

Paper

Paper value chains

The paper value chains are global. Most virgin fibre is sourced from the semi-natural forests in the northern hemisphere, or plantations in e.g. South America and Asia, while the paper products are converted and used globally. Also recycling of used paper products was global until 2018 when China and other mainly Asian countries stopped importing contaminated paper for recycling.
Material recycling of paper is well established, especially in Europe where the extended producer responsibilities are regulated and require paper packaging to be collected and material recycled. In other regions, e.g. USA the collection of used paper products is unregulated and managed by local authorities. This results in mixed quality and quantity of post-consumer collected material, with reduced material recycling efficiency as a result.

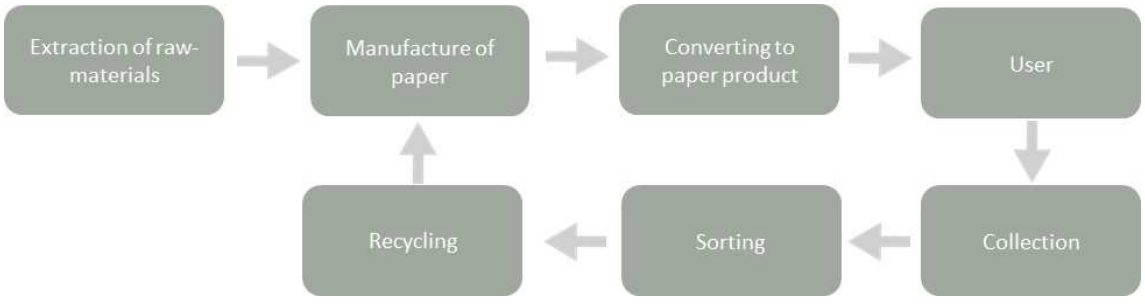


Figure 6: Current circular value chains in the paper industry

Key drivers for an international transition to circular economy

Collection and material recycling of many paper grades has been established in Europe and many other regions for decades. Paper for recycling is an internationally

traded commodity with internationally recognized standards defining quality levels etc.
Both national (e.g. Swedish extended producer responsibility scheme: FTI AB, https://www.ftiab.se/) and international (e.g. European cross-industry alliance: 4evergreen, https://4evergreenforum.eu/) product design guidelines are available or being developed with the aim to ensure that paper products can be fully material recycled efficiently.

Key barriers for an international transition to circular economy

Most paper products are designed to be single use products, for which material recycling is the best circular solution.
Combinations of paper and polymers and other materials often found in packaging limit the possibility to fully material recycle such packaging. Industries in Europe are however currently investing to ensure recycling of such materials.
Differences in the design guidelines mentioned above can create contradictory demands on e.g. paper packaging design and in the worst case limit the possibility to efficiently material recycle these or hinder international trade of products packed in such paper packaging.
The reduced use of newspapers and magazines is a global consumer behaviour shift that not only affect the production of printed media, but also the availability of old newspapers as a raw material for manufacture of e.g. tissue. Tissue producers face reduced availability and increased prices of their traditional recycled raw material and need to shift to alternative fibre sources.

Steel

Steel value chains

Steel is today one of the world's most recycled material with well-functioning markets all around the globe. When steel is scrapped today, about 80 percent is collected globally and recycled (Jernkontoret, 2020). Most of it with none or very little down-cycling, even if there are some difficulties for example by copper contamination of steel flow (often due to electric cables or similar in steel products that are recycled) Still the scrap is not enough for the global demand for steel, therefore manufacturing processes based on virgin material are also required.

Key drivers for an international transition to circular economy

The high value of metals, and the possibility to ensure the quality of recycled materials, to make them valuable for the next customer, are key drivers to circular economy. Existing systems, taking well care of metals from products and components, are also already driving towards recycling. The steel industry sees that one important way to drive circular economy even further would be to promote design for material efficiency and separation in order to increase reuse and recycling.

Key barriers for an international transition to circular economy

Global trade barriers, and different regulations when it comes qualities of recycled materials are the main obstacles to the international transition to a circular economy. The suggested new legislation within the EU Circular Economy Action Plan (CEAP), saying that materials must be recycled and used in the same kind of product as it was last time, might become an obstacle to recycling. This since it provides a lot of administrative work to keep track on which molecule is from which product, and that the same volumes of material will be needed for the same kind of products again.

Note

One can note that the suggested CEAP requirements on recycling content will probably not improve the total recycling when it comes to steel and most other metals, since all recycled material is already of high quality, and valuable on the market and thus every kg of recycled material is already used.

Global circular economy development

In this section, we will look at the circular economy development in some markets of relevance to Swedish trade, or that are in the forefront of the circular economy development.

Circular development in the EU

The Netherlands

This chapter is based on the country official documents and reports as well as interviews with senior circular economy experts supporting companies in the Netherlands and internationally with the transition to circular economy.

In 2016, the Dutch government published a comprehensive program for the country's transition to a circular economy (Government of the Netherlands, 2016). According to the program, the Netherlands will have a circular economy in place by 2050. To achieve this goal, the government has decided that by 2030, the country will have reduced its consumption of primary raw materials (minerals, fossil materials and metals).

In order for the transition to a circular economy to take place as quickly as possible, the government has set the following three goals (Governemnt of the Netherlands, 2021a):

- Ensure that production processes use raw materials more efficiently so that fewer are needed.
- When raw materials are required, sustainably produced renewable raw materials that there is a great access of must be used, such as plants, trees and food waste. The Netherlands wants to become less dependent on fossil raw materials.

- Develop new production methods and design products for circularity.

In 2018, the government published five agendas for five selected sectors/value chains that show how these sectors can become circular by 2050 (Governemnt of the Netherlands, 2021a). These sectors/value chain are:

- Biomass and food (focus on reducing greenhouse gas emissions and making different sectors "better").
- Plastics (focus on what is part of the New Plastics Economy Global Commitment led by the Ellen MacArthur Foundation).
- Manufacturing industry (focus on circular design and large-scale recycling).
- Construction (focus on innovation for circular and modular constructions. 50% of all raw materials consumed in the Netherlands come from the construction sector and a lot of waste also comes from there.).
- Consumer products (focus on re-use and on reducing the use of packaging).

The five sectors and value chains were selected due to their importance of country's economy and as well as their current large negative environmental impact.

In 2019, an implementation program (Circular Economy Implementation Program 2019 - 2023) was developed that transforms the five agendas into concrete measures for the five selected sectors and value chains (Government of the Netherlands, 2019a). The program clearly states which actor is responsible for each measure, which other actors that are involved, what the result of the measure should be, what effect the measure should generate and a time plan. By clarifying which ministries and other actors that lead the various projects, companies and other stakeholders can easily join and be involved in the work. The program also states how the implementation of the measures is to be financed. Most are financed through existing national budgets but also from various funds, ministries, foundations and institutes.

Drivers

According to a senior circular economy expert in Amsterdam, the transition to circular business models at large companies in the Netherlands is to a great extent driven by government expectations and incentives. The Dutch government has a deep interest to help companies to transition to more circular business models. Also, the Dutch government is in dialogue with other governments to increase the circular transition on international level and to decrease the barriers for international ecosystems. The expert says that the transition for traditional industries - such as oil & gas, is a complex process and needs to be approached as a systemic change - gradually. However, a clear goal of moving to renewables would be in line with the government target of 100% circular Dutch economy by 2050.

There are also several large Dutch companies that are pioneers in circular economy, such as Philips who works with product service system, upgrade their machines and work with dematerialization. Applying these strategies not only paves the way to sustainable business but also helps to future proof their business through innovation.

Naturally, the successful forerunners inspire small and medium-sized companies in the Netherlands too.

Recently, the government of the Netherlands has published an goal for all companies to implement circular product design wherever possible (Government of the Netherlands, 2021b).

Circular Economy Accelerator Portal (Government of the Netherlands, 2021b) is another driver and supports companies in answering questions about knowledge, partners, laws and regulations, and financing. The portal is a partnership between the industry organizations, the Green Brain takeaway and the Ministry of Infrastructure and Water Management.

Legislation, strict and clear goals are effective drivers for the transition to a circular economy says the senior expert.

Barriers

One of the main barriers and challenges is that small and middle-sized companies need to make large significant investments to turn their business model, says the senior circular economy expert.

Innovations

There is a myriad of innovation across the Dutch industry. In the area of renewable energy, there are large investments into hydrogen energy infrastructure. A innovation in the Retail and consumer sector is ‘Too good to go’ - an app which connects retails such a restaurant and supermarkets with the consumers and makes it possible to buy food that would otherwise be thrown away at competitive prices. The company has recently closed another funding round and is expanding to international market.

Financing of strategic investments and innovations

Strategic investments and innovations in the field of circular economy are funded by Invest-NL, among others.

Germany

Germany is one of the key markets for Sweden, and for the value chains studied, and has thus been studied more in depth. This chapter is based on the country official reports, international reports, interviews with two researchers within the field of circular economy as well as one network company in the within the reparation industry and one company from the clothing industry.

Germany has two programs at national level for the transition to a circular economy. These are the Waste prevention program (WPP) from 2013 which is being revised (BMUB, 2021) and the Resource Efficiency program III (Progress III) from 2020 (BMU, 2020). The most important measures in Progress III are described below. In Germany, resource efficiency is used as a concept instead of circular economy,

although more and more players are starting to use the English words "circular economy" more and more.

Waste prevention program and resource efficiency program (Progress III)

The Waste Prevention Program (WPP) will be updated and the implementation status of the current program has been investigated at national, federal and municipal levels (Wilts, Azak, Feder, Galinski, & Nicolas, 2020). The investigation shows the following on the national and federal level:

National level
The program has generally been difficult to implement at national level as only a few authorities have been aware of WPP. The authorities that are aware of the program have, however, had low motivation to work on the basis of it as there are no legal requirements, there are no resources and, above all, the division of responsibilities has been unclear in the program. Measures that also mean that waste prevention has been partially implemented but not in direct relation to WPP.

Federal level
WPP investigators note that most waste plans do not refer to any of the measures mentioned in the WPP, that it is unclear if any waste prevention measure is based on the WPP, that only half of the federal states have a person responsible for implementing the WPP. , that only one of the federal states has additional human resources responsible for the implementation, and that there was insufficient documentation about which waste prevention measures were initiated at the federal state level (references were usually to the municipalities).

The federal states referred to three obstacles to the implementation of the program:

• Weak legal binding

• Lack of human resources

• Lack of subsidies

In an interview with a senior circular economy researcher that do many policy assignments for the government, the researcher says that WPP is required by law but it is not a program with clear goals, activities and divisions of responsibilities, but more of a list of possible measures that could be taken to reduce waste generation. The researcher also says that the biggest responsibility for implementing the WPP lies at the federal level, but it is rather the regions that drive the work.

Progress III weighs heavier than WPP as a policy document and the Federal Ministry of Economy and Energy (BMWi) is heavily involved. However, the researcher thinks that Progress III is less ambitious than its predecessor (Progress II) as the activities that appear in the latest program are not as binding. In both Progress III and II, however, there has been a lack of sufficient concrete goals and divisions of

responsibility, which makes it difficult to follow up on how the programs affect the development of the circular economy in Germany. According to the researcher, none of the resource efficiency programs include any measures or objectives linked to international trade mechanisms or financial support for circular business models.

The circular economy roadmap

The Circular Economy Initiative for Germany has recently produced a roadmap for the circular economy for the country (Circular Economy Initiative Deutschland, 2021). The institute is funded by the Federal Ministry of Education and Research (BMBF).

According to another researcher in the field of circular economy in Germany, the roadmap for the circular economy in Germany was well and solemnly received in May 2021 by the government. Hopefully the road map will be used by all actors in Germany who want to work with circular economy as a basis for decision making and create cooperation between the parties. So far it is not known how much the current government will use the road map and soon there will also be a new election in Germany.

Barriers and drivers

General

One of the biggest barriers to establish and scale circular business models in Germany is the lack of clear guidance and goals for the circular economy by the government in Germany. It is not clear how the government views the issue and who is responsible for realizing the change. The ambiguity makes many companies hesitant to invest in their business models in a circular manner.

According to one of the researchers, the main obstacles to circular business models in Germany and in many other countries is that the tax on employer contributions is too high for the need for a lot of labour that circular business models often entail. According to a report published by the European Commission, a transition to a circular economy is expected to lead to 700,000 more jobs in the EU (Cambridge Econometrics, Trinometrics, ICF, 2018) and 7-8 million more jobs worldwide (ILO, 2019) when much labour comes to be needed to do repair services, remanufacturing, second-hand handling, rental, and more. The fact that high employer contributions are an obstacle to circular business models has been highlighted much in Sweden as well (The Swedish government, 2017; Swedish trade federation, 2018).

According to one of the researchers and a the co-founder of a network company of repairers, the younger generation in Germany has generally no problem with not owning products, but Germany has long been in a country with a focus on quality products, which has led to that owning products is part of Germany's ideology. In order for consumers to consume more circularly, the services need to be very easily accessible. It is usually possible to repair an item, but the transaction costs are

usually greater than buying a new one (you need to find a repairer and the repairs can take a long time).

Repair industry

The co-founder of a network company of repairers in Germany says in an interview that repair services are in short supply in Germany and that repairers experience many different challenges with their operations. A researcher of circular economy agrees and the both give several examples of drivers and barriers for the reparation industry in Germany.

Challenges/barriers:

- Products are becoming increasingly complex to repair and the access to product information from manufacturers is lacking
- It is difficult to access spare parts. Repairers need to travel to the country side to get hold of spare parts.
- Manufacturers require repairers to undergo company-specific training in order to have the right to repair their products. Sometimes manufacturers also require repairers to wear a special uniform when meeting customers.
- Some retail companies do not want to provide their customers with repair services as they think it would compete with their new sales.
- Products from other countries that are sent to Germany for reparation cannot be classified as waste (which they sometimes are and then they cannot be repaired)
- Most people in Germany still prefer buying new products as it is perceived as cheaper and more time efficient. A product can take several weeks to repair. In addition, there is a certain distrust of repairers as consumers sometimes do not feel that they can trust that the repairer will make an effort to repair the product.

Drivers

- In Germany, states can have their own rules for when a product is classified as waste, which is because the country is a federation. This means that the inflow of repair products can vary depending on where in the country the repairers are located.
- The new eco-design directive will make product information more accessible and facilitate for product reparation.
- Consumers are increasingly becoming more interested in consuming more sustainably in Germany.
- The EU circular economy action plan states that consumers' right to access spare parts and repair options is going to be strengthen.

There is an ongoing discussion in Germany about whether the repair services should be professionalized and offered by each producer or whether repair services should primarily be decentralized and offered by independent repairers.

Clothing industry

Barriers
Two barriers mentioned by a start-up company that rents out clothes are:

- they need to pay tax on their goods if they are to be transported in/out of Europe so they are not planning to expand outside Europe.
- They have not yet found an operator who can receive their garments for recycling when they have become obsolete. The company wants to great a closed material loop with their garments. The recyclers are either too small and not transparent enough or they are too large and require the clothing company to deliver large volumes of clothing for recycling.

Innovations

Techniques for better recycling are currently being developed in Germany. There is a lot of focus on chemical recycling through pyrolysis in combination with digitization and AI for better handling and sorting, for example AI that improves waste sorting through big data analysis. The possibilities around the block chain are also being investigated to facilitate industrial symbiosis.

BMU has recently developed a digital policy agenda for environmental work that includes measures to ensure that digital technologies work in harmony with the environment, climate and nature (BMU, 2020). Many of the measures relate to decisions taken at EU level. Examples of measures that the policy document addresses are producing better data for recycling, using digital product passports, developing standards, extending the life of hardware and having closed cycles for materials from digital technologies (e.g. smartphones).

In Germany, many companies are reluctant to develop innovative circular business models and digitization solutions that enable the circular economy. They prioritize finding solutions to save costs in their processes rather than investing in innovative solutions. This shows a study done by the Circular Economy Initiative Deutschland (Circular Economy Initiative Deutschland, 2021). The same applies to companies in other countries. Barriers can be organizational - that there is a lack of digital infrastructure, knowledge and or an attitude that what “already works” should not be changed. The reason why some companies choose “business as usual” can , according to the report, be due to that product designers are not yet be ready for digitalization, there is a high investment costs, uncertainties for ROI or there is a mistrust in releasing sensitive data in the value chain.

Financing of strategic investments and innovations
In Germany, the BMU and BMWi fund studies on innovations for the circular economy. BMWi works closely with the public banks. According to one of the researchers, there is a lack of clarity about how and where companies and organizations can apply for funding for whether they want to realize an idea around circular innovation.

France

In a previous project on behalf of RE:Source, *Prerequisites for an increased holistic and material perspective in circular economy*, (Jönbrink, 2020) we looked at legislation in France. The experts who now was asked about the outcome of this, all unfortunately agreed that it is far too early to say what effects it has had yet.

China

This chapter is based on information from scientific articles, reports and news articles, as well as from personal communication with a Chinese sustainability expert at an international company and an employee at a Chinese governmental organisation.

China was one of the first countries to embrace circular economy in legislation. circular economy policy has been included in the last four five-year plans (Ellen McArthur Foundation, 2019). One of the reasons for China's early actions is the rapid economic growth in the last decades which has caused environmental pollution and put a strain on raw material, energy, water and food (Yeh, 2014). Chinas circular policies have focused on clean production and resource efficiency, and have had (compared to circular economy policies in the EU) less focus on eco-design, business models and consumption (McDowall, o.a., 2017). Policy and development within circular economy are happening at both micro (consumer, companies), meso (industrial parks) and macro level (regions, provinces and cities) (Ogunmakinde, 2019). Several experiments with circular industrial parks and low-carbon cities have been made, with the goal of reducing greenhouse gas emissions but keeping the economic growth (Ogunmakinde, 2019). McDowall et al. argue that China's large-scale experiments seem to be more geared towards upscaling successes than the demonstration projects funded by Europe's Horizon 2020 program (McDowall, o.a., 2017).

Even if China historically has had a focus on resource efficiency and pollution, they are starting to include a larger part of the value chain in their circular policy. In 2017, Circular Development Action Plan was released, which (apart from policies on pollution prevention and resource efficiency) include policies concerning digital solutions connected to circular economy, circular design and circular business models (Ellen McArthur Foundation, 2019). Examples of measures in Circular Development Action Plan was implementing an EPR system (initially focusing on electronics, vehicles, lead batteries and packaging) and the initiative Chinese National Sword Campaign, that aims to increase the quality of imported secondary material. The ban on imports on plastic waste in 2018 was part of this initiative (Ellen McArthur Foundation, 2019). In 2021 China released their latest five-year plan for circular economy. The focus lies on recycling and waste management, but it also states that more efforts will be made to promote growth in the second-hand market, high-quality manufacturing, green design of key products and high-quality development in remanufacturing (China Daily, 2021) (China Briefing, 2021). According to an employee at a Chinese governmental organization, the Chinese government is currently seeking to establish an institute for circular economy with an

initial focus on recycling components from vehicles. When establishing this institute, EU and other forerunners in circular economy are used as benchmarks (personal communication, Chinese governmental organization).

Even if Chinese policy have started to include upstream processes, the main focus is still on improving recycling and waste treatment (personal communication, Chinese sustainability expert). Following the economic development, consumption has increased fast, and thus also the amount of consumer waste (e.g. in textiles and electronics) (Ellen McArthur Foundation, 2019). The Chinese government is introducing measures to tackle the increased waste but collection and recycling infrastructure is still underdeveloped (Ellen McArthur Foundation, 2019). Waste management of electronics is a particular challenge for China. The management of electronic waste is largely informal and the part that is informal is significantly more inefficient than the formal systems. The government is building more central and structured facilities for collection and recycling, and to get rid of smaller and polluting actors, the government now requires that recyclers have a certification (personal communication, Chinese sustainability expert). The Chinese government focuses on end-of-life flows for electronics in order to protect the environment, but also in order to ensure take back of material (Ellen McArthur Foundation, 2019) (China Daily, 2021). Chinese electronics manufacturers get most of their raw material nationally but is expected having to import material in the future. Thus, China is now focusing on finding new sources in other countries and on investing to be able to extract material from electronic waste. The government has previously made restrictions on export of secondary materials that are needed in manufacturing, and it is possible that this will increase in order to secure material supply (Ellen McArthur Foundation, 2019).

It is hard to say if, and how much, the circular economy policies have affected the large majority of Chinese companies and how effective the legislation is. Ellen McArthur (2019) reflects upon this and states that the legislation might result in a circular system, but that the policy is ”fragmented” and that integration is needed in order to achieve the wanted effect. (Ellen McArthur Foundation, 2019). Business Sweden writes that “short-term growth still rules supreme” in China and that often there is little concern for damaging the environment and exhausting resources (Business Sweden, 2018). They also point out that governmental policies need to be implemented in legislation in the provinces and cities to be effective, and that they are often “guidelines that have still not provided a real impact on the overall economy”. According to Ogunmakinde (2019) some of the problem that the transition to a circular economy is facing in China are high costs for circular activities, insufficient financial support, an absence of criteria to measure circular economy progress and insufficient experience and knowledge. According to a sustainability expert in China, there is also a lack of engineers and expertise.

Even if large-scale experiments such as industrial parks and low-carbon cities are an important part of China’s circular economy strategy, a Chinese sustainability expert argues that most circular businesses are small and mainly reach the rich part of the population. However, there are many small circular initiatives, and communities with

innovators and start-ups. Green Initiative in Shanghai (Green Initiatives, 2021) is one example. She also tells us that there is a large interest in events for sustainability, especially among tech companies. Further, she sees an interest from international partners and that big international players support and invest in small actors. According to her, large companies are the ones driving the transition to circular economy, and more legislation is needed to encourage circular economy.

Regarding consumer interest in circular products and services it is not yet a mature market in China. The awareness among citizens is very low and circular economy is still a new topic. But the interest and knowledge about sustainability and circularity is larger in the younger generation. Usually well-educated people, or people that have studied abroad are the ones that are most interested (personal communication, Chinese sustainability expert). The interest is also increasing for sharing services, e.g. shared mobility. Shared mobility is an area where consumer interest is growing. It is partly driven by the high-density population and the fast increase in passenger cars and the resulting pollution. As a consequence of this an increasing number of cities in China is implementing policies to lower passenger vehicle ownership and use. Due to these policies, the growth of new private cars in China is expected to slow down (Ellen McArthur Foundation, 2019).

There are several factors that could be advantageous for a circular economy transition in Chinese cities. Ellen McArthur (2019) identify several: A high concentration of material flows and manufacturing facilities, a high level of knowledge, fast digital development and development of sharing platforms, and proximity of manufacturer and consumer that could simplify reverse logistics. Yeh (2014) means that China’s manufacturing capabilities and strong local supply chain could make China a leader when it comes to remanufacturing and refurbishing. He also argues that moving of labor from manufacturing to services could be done without massive re-education efforts, as the skill level is similar. He also points out that due to the fast economic development, consumer demands in China might not be as rigid as in other economies and thus the level of adaptation to new business models (such as sharing) might be higher.

To conclude, circular economy strategies in China and Europe are different. (McDowall, o.a., 2017) argues that there is a possibility for China and Europe to learn from each other and, since they are trading a lot with each other there is a possibility to create synergies.

United States

This chapter is based on information from international reports, white papers and news articles.

A survey with 300 US-based executives done in 2019 show that the majority are planning to include circular economy measures in their business models, but that the share that has implemented circular economy measurements are low (16%) and that the focus lies on resource efficiency in production (ING, 2019). This suggests that circular economy in the US is still something new to US companies but that it is gaining interest. The companies perceive that the largest barrier to circular business

models is getting material back for recycling. This is no surprise, as the recycling infrastructure in the United States is reportedly “underfunded, outdated and inefficient” (Closed Loop Partners, 2021). China’s ban on plastic imports in 2018 help shed light on the inefficient national recycling system and has spurred policy making and innovation around recycling. Federal support for development of recycling infrastructure at state level has been considered, and an Extended Producer Responsibility (EPR) on single-use plastics is being discussed (Closed Loop Partners, 2021). However, as long as there are available landfills and as long as the fees for landfilling is low it might be hard to create more national circular flows (Circular CoLab, 2018).

Compared to legislation in EU and Asia, the US has some “catching up to do” (Closed Loop Partners, 2021). There are no explicit circular economy policies on federal level, but there are some circular initiatives at city level (e.g. “Circular Charlotte”) and state level that focus on waste management. Some states have EPR laws for different product categories (e.g. pharmaceuticals, electronics, batteries) and fees or a ban on single-use plastics. There are yet no EPR laws for packaging (Circular CoLab, 2018). However, some products have their own take-back system. In all states in the US, when buying a car battery at a car dealer you have to pay a deposit or return an old battery (ING, 2019).

A topic that is currently on the agenda in the US is the “Right to repair”. Several states proposed a right-to-repair bill in 2021, but it is only implemented in Massachusetts (already in 2013). The states have focused on different sectors (agriculture, healthcare, vehicles etc.). The Massachusetts legislation require vehicle manufacturers to make data on some repair and diagnostics available for cars produced later than 2015. As a consequence of this, most car manufacturers have made this data available in all states. However, the legislation might be revised to also include repair data on mechanics and electronics, which has caused the vehicle manufacturers to start a legal bid to prevent this. They argue that the information can be a cybersecurity risk for the vehicles (Godwin, 2021). Right to repair legislation might also be on the way on federal level. On July 9, president Biden signed a directive that encourages the Federal Trade Commission to propose additional regulation that prohibits manufacturers to bar repairs made by independent repair shops or individuals (Seddon & West, 2021). The right-to-repair movement already seems to have an effect on businesses. Just recently, Microsoft released a statement that they will be improving their repair services. This comes after a shareholder resolution that argued that Microsoft actively restricts the possibilities of repair of their products (Edie, 2021).

According to Closed Loop partners global brands and NGOs have been leading the charge towards circular economy. Mainly by using their purchasing power, but also through investments. One example of this is Closed Loop Infrastructure Fund, consisting of large retailer and consumer goods companies, that since 2014 finance recycling and circular economy infrastructure in North America (Closed Loop Partners, 2021). We can also see that private-public initiatives are driving the change. An example of that is US Plastics Pact, that has published a roadmap that aim to

ensure that all packaging will be reusable, recyclable or compostable by 2025 (US Plastics Pact, 2021). The report includes mandatory reporting and specific timeframes and is supported by almost 100 corporations, NGOs, research entities and state and local governments (Sustainable Brands, 2021). Private-public partnerships have also initiated textile collection as a way to enable textile recovery (currently 85% of textiles go to landfill). Policies for textile and textile waste are also being explored by some states (Any Resource Recycling Systems, Inc, 2020).

As in Europe, the second-hand market in the US is expected to increase fast in the coming years (thredUP, 2021), which suggest that there is consumer demand for second-hand goods. However, a circular business designer at a large Swedish furniture company mentioned that US is a difficult market when it comes to selling second-hand or renting products. One of the reasons is that customers relatively easy can sue a company in cause the product is faulty or has been involved in an accident.

Drivers and barriers for global circular value chains

In this section we have gathered drivers and barriers for global circular value chains identified in literature and interviews. Large parts of the value chains for electronics, clothing, furniture and vehicles are global. Therefore, many of the drivers and barriers that exist for circular business models in Sweden are also relevant internationally, and vice versa. However, some drivers and barriers only apply when operating in an international market. They often concern global differences in systems, standards, legislation, and culture. But also transport distances, policy and rules for international trade. The identified drivers and barriers relevant for a global circular transition identified in the study have been sorted into categories according to Figure below

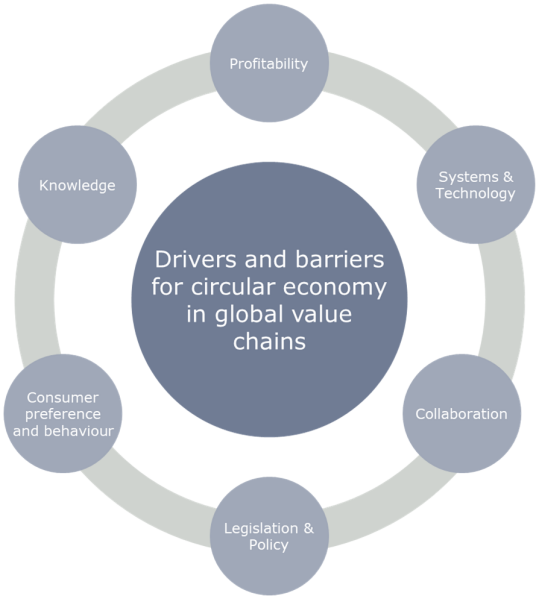


Figure 7. Categorisation of drivers and barriers for circular economy in global value chains

Drivers and barriers in these categories affect and interact with each other. We want to argue that the crucial issue is low profitability, or perceived low profitability, for circular business models compared to linear business models. Low profitability is a combined result of the barriers in the other categories, legislation & policy, systems & technology, collaboration, market culture, consumer preference and behaviour, and knowledge. Framing it in transitional change terminology, the linear economy can be described as a socio-technical regime that is stabilized by established practices and rules within all these categories. In order for circular business models to be able to compete on a larger scale, changes in all these areas are needed.

Regions and countries have different preconditions for a circular economy transition and the degree of "circular maturity" differs. Thus, drivers and barriers differ globally. Some parts of value chains are more global and thus the drivers and barriers are more similar globally (production, technical development), while some parts of the value chains are more local and thus have a larger variety in drivers and barriers (waste management, consumer preferences, governmental financial support, infrastructure).

As services are an important part of circular economy (both as part of product service systems and as enabler for other circular business models through repair, recycling etc.) we also looked at possible barriers for international circular services. According to an extensive survey made by Sitra (Tamminen, Sell, Forslund, Tipping, & Soprana, 2020), the barriers for trade in circular services are related to the previously mentioned barriers for trade of secondary material and goods, and data restrictions. Therefore, this will not be handled separately in this report.

Legislation and policy

Legislation and policy can drive and accelerate the circular economy transition by enabling circular business models to grow and compete with linear business models. But existing legislation and policy also need to be adapted for circular economy in order not to be a barrier.

Global drivers for a circular transition

Companies see coming legislation and policy as one of the most prominent drivers of circular economy. Legislation and policy development can make entire industries change by changing the regulatory landscape. Political clarity and direction are also important for companies to dare to invest in a circular transition. The study shows large differences between countries. For example, it seems as policies in the Netherlands are much clearer than in Germany, not least regarding division of responsibilities, which is seen as one main reason for the Netherlands becoming a forerunner in the transition towards a circular economy.

From the conducted interviews and the literature study, we see that the following policy initiatives act, or will act, as enablers of an international circular economy:

- *EU Circular Economy Action Plan (CEAP)*
  Many companies see the coming EU legislation as a main driver for global circular economy, and several companies and organisations think that EU legislation will set the standard and cause others to follow. Within CEAP we see these initiatives as the most promising:
    - *Sustainable Product Initiative (SPI)*
        - The core of the Sustainable Product legislative Initiative will widen the scope of the Ecodesign Directive beyond energy-related products so as to make it applicable to the broadest possible range of products (including services where appropriate) and make it deliver on circularity.
        - The Commission has also committed to consider amendments to the Ecodesign Directive, and, where appropriate, complementary legislative proposals, to regulate the following sustainability aspects: product durability, reusability, upgradability and reparability; the presence of hazardous chemicals in products; energy and resource efficiency; recycled content in products; remanufacturing and high-quality recycling; carbon and environmental footprints; restrictions to single-use and premature obsolescence; a ban on the destruction of unsold durable goods; circular business models; digitalization of product information and ways to reward the most sustainable products
- *Product passports (stand alone, or as part of the above described SPI)*
  Product passports are seen as an enabler as they can increase traceability and can provide information about the product that will make repairing, remanufacturing and recycling more efficient and thus more profitable. Product passports could also help in keeping unwanted substances out of the circular flows. World Economic Forum and the Battery Alliance believe that data flows are an important piece of the puzzle to ensure that the increasing

use of batteries is sustainable, both environmentally and socially. However, while many see product passes and traceability as a solution, there are those who are sceptical. There is a concern that too much data will be required, something that both increases the administrative burden and that there is a conflict between sharing information and being competitive. There is also some scepticism about how to ensure that the product passports are updated during the lifecycle of the product, e.g. if a consumer decides to repaint a piece of furniture.

- *Circular procurement*
  Circular procurement is increasing in Europe and both the furniture and electronics industry see this as a driver for product-as-a-service (PAAS) offers and for repairing and refurbishing. In UK, circular procurement of electronics with requirements on a minimum share of refurbished products has increased producers' interest of refurbishing and reselling their products. In the long run this could mean that products are designed to circulate. Several of the interviewees think that Swedish authorities should take greater responsibility when it comes to incentivise companies and private individuals to buy and get rid of products in a circular way. Some also think that stringent requirements or targets on circular procurement would be helpful in acceleration the transition.
    - One note is that it is quite common to think that authorities should take greater responsibility when it comes to getting companies and private individuals to buy circular, and to "get rid of things in a circular way
- *Extended Producer Responsibilities, EPR's and other initiatives for increased collection*
  Several industries see a need to increase the collection of products and materials globally in order for their circular economy solutions to scale. Producer responsibility already exist in the EU and in many countries for certain products groups, such as electronics, tyres and packaging materials and is expected to be expanded to include more product groups. According to article 11 §1 in the EU Waste Directive (2008/98/EC), all EU member states shall have systems in place for separate collection of textiles by 2025. France is the only EU country with an EPR scheme for textiles, the Netherland is calling for an EU-wide obligation for EPR for textiles and Sweden is introducing an EPR for textiles from 1 January 2022 (European Commission, 2021b). The interviewed clothing companies look much forward to a wide implementation of EPR in order to increase the availability of second-hand clothes and recycled textiles.
- *International quality standards for secondary materials and remanufactured products*
  Material recycling is increasing in EU and markets need to be created for these (OECD, 2021). Today, the lack of standards causes customers to be less willing to purchase recycled goods (Grafström & Siri, 2021) and quality

standards and material content standards could help in this. International quality standards for secondary materials and remanufactured products could increase the demand, and increase the profitability of recycling (Circular Electronics Partnership, 2021) (Institute for European Environmental Policy, 2021). Also remanufacturing could benefit from quality standards as it makes it possible to distinguish remanufactured from repaired products, and that this would increase demand on remanufactured products (European Manufacturing Network, 2021). In China, the automotive industry prohibits remanufactured parts to be used for warranty (Ellen McArthur Foundation, 2019). It is possible that quality standards could be a solution to this.

- *International definitions for circular products and services*
  International standards for circular products and services are important to be able to implement circular economy and to measure progress. Definitions can be used in green procurement, for tax reliefs, in trade agreements and certifications (Circular Electronics Partnership, 2021). Currently, circular economy standards are being developed by ISO. Circular economy criteria are also being developed for the EU Taxonomy (European Commission, Categorisation system for the circular economy, 2020) (Institute for Environmental Policy, 2021). According to an expert in circular financing, the proposed criteria for circular economy in the EU taxonomy will set a minimum level, but as the criteria are not very ambitious and are vaguely formulated, it might not be a strong driver of circular economy, at least in the near future.

    - *The EU Taxonomy* (EU Commission, 2021)
      The EU Taxonomy is right now developing criteria for circular economy and have provided some preliminary results. They will be used to define if a company fulfil the EU taxonomy and will be considered sustainable or not. At this stage the criteria are quite basic and generic, under four main headlines: SC 1 - Circular design & production, SC 2 - Circular use, SC 3 - Circular Value Recovery, SC 4 - Circular Support , and can possibly in a next step be developed to clear criteria for different kind of businesses. Depending on the formulations in the final version of the EU Taxonomy criteria for circular economy, these will potentially have a big impact on the transition to circular economy in Europe.

- *Using trade agreements to drive an international circular transition*
  Up until now trade agreements is an untapped opportunity to accelerate the circular economy transition (Institute for European Environmental Policy, 2021). Trade agreements and ‘Aid for trade’ can drive and support a global circular economy transition and help avoid unfair competition (OECD, 2021). In order to do so international definitions for circular products and services as well as proper trade codes that makes it possible to distinguish these are needed (Kommerskollegium, personal communication, 2021). Companies want a level playing field in global trade and would like to see an increased

focus on trade in climate politics (Dagens Industri, 2021) (Svenskt Näringsliv, 2021). The introduction of EU Carbon Border Adjustment Mechanism (CBAM) is a step in this direction.

Global barriers for a circular transition

Even if legislation and policy for circular economy is being developed, lack of political will is still seen as a barrier. According to a circular expert in Germany, lack of political direction is making companies wait with investing in circular business models and is one of the key barriers for scaling up circular business models in Germany. Apart from the absence of legislation, there are a number of existing policies, laws and regulations that act as barriers for international circular business models. We can divide them into three groups:

- International barriers to trade
- Differences in national requirements and rules
- Policies and regulations that are not adapted to circular business models

International barriers to trade are direct barriers to trade that are regulated in trade agreements and laws. Different national requirements and rules act as indirect barriers to trade in that they make international trade more difficult by making it cumbersome and costly to operate in several markets. The barriers that are interesting to study from a circular economy perspective, and for this report, are the barriers that relate to trade in goods and services that are more important for circular business models (trade in waste, secondary materials, second-hand products, product service systems, services related to repair, recycling, etc.). Policies, rules and laws that are not adapted to circular business models include laws, rules and policies that do not concern trade, but that make it more difficult or costly to have a circular business model compared to a linear business model.

International barriers to trade

- *Transport and trade of waste, secondary materials and second-hand goods*
  The most common obstacle for international circular business models mentioned in both interviews and literature is restrictions on trade with waste and related processes. Global restrictions on trade with waste are regulated in the Basel convention, with the goal to prevent environmental dumping in countries with less stringent environmental regulation. Due to insufficient classification of waste in trade codes and difficulties in determining secondary goods and material from waste, secondary goods and materials are also affected by these restrictions.

  Within EU the waste trade is regulated in the Waste Shipment regulation and should be common for all members, but during the interviews it has become clear that the implementation differs between nations. This has resulted in uncertainty about what may be shipped and not, and means that something that was allowed to ship in one country can be judged as illegal shipping

when arriving in other country. In addition, the process of applying for a the trade permit is time consuming. This makes international circular flows less profitable and hinders an international upscaling of circular business models. A Swedish recycling company told us that this prevents some materials from being recycled, as the fractions are too small to be economically feasible to recycle in Sweden, and that the transaction costs of getting a trade permit makes it too costly and inefficient to send them abroad for recycling. Used electronic products are also affected by this, as they are classified as hazardous waste. Companies trading used electronics that we have spoken to mention this as a cumbersome process and something that could be improved, but as their products are expensive enough they usually have no problem with goods being classified as waste, and they seem to be able to be profitable despite increased costs connected to transportation. Thus, we think that this might be a more prominent problem for low value goods. Furthermore, business models trading low value goods might be more sensitive to high transportation costs.

The classification of waste is restricting trade in second-hand goods and material is well documented in literature (Alaranta & Turunen, 2020) (Institute for European Environmental Policy, 2021), and the EU rules on waste shipment is under development at EU level in order to support a circular transition (European Commission, Waste shipments - revision of EU rules, 2021). Updated classification on electronic waste has already been made by World Customs Organization (WCO) and are coming into force during 2022 (World Customs Organization, 2020). Hence the problem with insufficient classification of waste is likely to diminish in the coming years, but this requires a harmonized interpretation and implementation of the new classifications on a national level. On the other hand the restrictions on trade of waste is increasing globally (OECD, 2021)(see section “Global circular economy development”).

- *National import and export bans on secondary goods*
  A related problem is national import and export bans on used products and goods for remanufacturing, recycling and repair. This type of bans have often been introduced to protect the national market from competition. An example of this is the import ban on second-hand products in Brazil: All imports of second-hand consumer products are prohibited and second-hand industrial products are only allowed to be imported if it does not compete with a local producer (International Trade Administration, 2019) (The Brazil Business, 2014). As a result, *international* circular business models do not work in these countries. In an interview with a global manufacturer of printers and ink cartridges they told us that their global refurbishment system for ink cartridges is not working in Brazil. Another example of this type of national restriction is restrictions on import of second-hand goods in Tunisia and Turkey, which has resulted in that textiles for recycling must be cut in Sweden before being sent there for recycling. According to the textile

companies, the additional labour and processing costs ends up making recycled textiles as expensive as newly produced fabric.

- *Data flow restrictions*
  Circular business models will need a new type of collaboration between actors in the value chain, and more data needs to be shared between actors in different parts of the world. Data flows between countries can be a problem if there are restrictions on what data can be moved between countries or regions. An example of this is the GDPR, which prevents personal data from being shared outside the EU. This means that data containing personal data references may not be exported from the EU. Restrictions on the type of data that may be transferred between countries should be studied so that they do not (more than necessary) hinder the transition to a circular economy at an international level.

Differences in national requirements and rules

- *Administrative burdens and costs*
  Differences in standards, certifications and legislation makes it costly for companies to operate in several markets. Registering, administering and fitting into different systems costs both time and money, and it is especially difficult for small and medium-sized businesses (which is common for circular businesses). To harmonize international regulations that impact circular businesses in order to reduce the administrative burden and cost of circular products and services is important. According to the Swedish industry association Teknikföretagen, harmonization in order to facilitate circular economy is especially important for laws within material flows, waste and transport (Teknikföretagen, 2020).

- *Market compliance of secondary goods and materials*
  Another barrier is differences in legal requirements in different markets, combined with difficulties in tracing the origin and content of second-hand goods and secondary materials. This means that companies see a risk in using used goods, components or materials, as it is harder to guarantee that they meet the legal requirements. One example is differences in chemical requirements. It is less of a problem if the product was produced in Europe (because the EU rules are among the strictest) but if it comes from outside of Europe, or if the origin is unknown, it becomes a risk that makes companies avoid secondary goods and materials.

- *Efficiency of second-hand market*
  Differences in legal requirements and standards in markets also mean that it can be inefficient for companies to have a global secondary market because the product is limited to certain markets.

Policies, laws and regulations not adapted to circular business models

- *Taxes and bans not adapted for circular business models*
  Companies see a need for regulations to be adapted for used materials and

products, nationally and internationally. The Swedish chemical tax on electronics is one example. The tax applies to new electronics, but also used electronics that is sold by a reseller. The tax can be a large part of the cost of heavier used electronics and thus reduces profitability of selling secondary products (Svenska Dagbladet, 2021). It applies to both national and imported used goods. Another example is increasingly more stringent international chemical legislation which hinders the reuse of older products and components. This seems to be less of a problem in markets were the technical development is faster and old components quickly lose their value, but it is mentioned as a hinder by some companies that have more long-lived products. Not all things should circulate (and hazardous substances is one example of that), but companies argue that ever stricter regulations will have consequences for the possibilities to circulate products, and that policy makers need to be aware of this when designing future policies.

- *EPRs could be improved to better gain the inner circles of circular economy*
  Another barrier that has emerged in the study is that although producer responsibility schemes (EPR) is driving circularity of materials, it could be improved to better gain the inner circles of circular economy (reuse, repair etc.). As most EPRs are designed today, a company must either pay to the EPR or take full responsibility for the end-of -life of its product, and this can be difficult to guarantee. A small producer of consumer electronics that tries to develop a more circular system for his products (including take-back, repair and reuse), explained that when selling small volumes in several countries, the costs of paying for EPRs is high and that “99% of the time and money is spent on administration and costs connected to the linear system, and the complexity at the international market” and that it leaves little money and energy to develop something more circular. That EPRs are not supporting the inner circles of Circular Economy is also acknowledged by OECD, who argues that the EPRs are not taking into consideration how well a product can circulate (OECD, 2021), and Teknikföretagen, who see that an opportunity to legally transfer the extended producer responsibility to another company could enable reuse to a greater extent (Teknikföretagen, 2020).

Profitability

With a few exceptions listed below, the profitability measures and demands on circular business models are well aligned internationally.

Global drivers for a circular transition

- *Consumer drive*
  Some consumer groups incl. young, eco-conscious groups often in financially strong regions e.g. western Europe are willing to pay for circular products and services. This includes both purchasing second-hand products such as clothing as well as renting e.g. tools when needing them rather than buying and storing.
- *Company actions*
  Companies follow this development by setting up new or adjusting old business models. Selling e.g. second-hand products that have been purchased at low or zero cost, allows such companies to have radically lower restricted capital which helps reaching stronger profits. Other companies can lower their restricted capital by purchasing e.g. used ICT equipment.
- *Extended producer responsibility*
  Introducing extended producer responsibility schemes for more product groups can be a solution to force companies considering circular solutions. Today, producers of many product groups do not need to consider costs for waste management of used linear products, as consumers typically pay for this via municipal fees. Europe already have extended producer responsibility obligations for packaging, electronics etc.

Global barriers for a circular transition

- *Existing financial systems*
  The financial systems have since long been developed for linear product systems. Hence, traditional financing systems typically have difficulties

correctly assessing the value of a circular business and the risks associated to e.g. liquidation of a circular business as the value of e.g. second-hand products are difficult to estimate. This is in particular the case for circular business models including rental, for which significant bank loans may be needed. Banks in the Netherlands and France are however examples where the financial sector have adopted to circularity more than in other European countries. In other markets, e.g. USA it is unclear how e.g. circular start-up companies can seek funding.

- *Investment needs*
  Some industry sectors, e.g. European paper industry, are sometimes hesitating to invest in infrastructures needed to utilize recycled materials because of volatile recycled raw-material prices. Another example is critical raw materials (CRM) recycling, which needs investments and economies of scale in order to be economically viable, but where the interest of investing is low due to low and volatile CRM prices (CEWASTE, 2021).
- *Sharing with new partners*
  Allocating the income from selling a second-hand, repaired chair between companies buying repairing, transporting and selling require new partners and relations. Establishing such partnerships can be a challenge, especially when there is need for international relations.
- *Cannibalism*
  Introducing circular business models, e.g. re-selling used products, can cannibalize on a company's linear business model if the linear business model is more profitable. Such companies are therefore seldom willing to re-design their products to ensure that they can easily be refitted for secondary use. Product that are not designed to enable repair, or where spare parts are difficult to identify and obtain will be difficult and costly to sell as a second-hand products. This is relevant for several product groups including furniture, for which a challenge is also that many furniture has long lifetimes before they potentially need to be repaired. Changing vital parts of e.g. a chair can then be difficult as they since long are out of stock.
- *Salary costs*
  Finally, a key challenge for circularity is high salary costs in markets where consumers otherwise are willing to pay for second-hand products, e.g. in the Nordics. This is in particular relevant for furniture that is voluminous and must be repaired and sold locally.

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Systems & Technology

Technology development can help enable a transition to a circular economy, but going from linear to circular will also require changes in current systems and technology. In this section we have gathered drivers and barriers connected to systems and technology that we see are relevant for an international transition.

Global drivers for a circular transition

- *Digitalisation*
  Data and digitalisation is an important component in the development of efficient and profitable systems needed for circular business models; such as recycling, repair and remanufacturing. Data and digitalisation are also seen as an enabler for new types of business models such as sharing services and PAAS. An example of this is traffic data that can be used to optimize public transport or other types of shared mobility.

Global barriers for a circular transition

- *Systems and infrastructure for collection and recycling globally*
  Systems and infrastructure for collection and recycling is missing or insufficient in many parts of the world, which complicates circular flows and results in a loss of valuable resources. An example mentioned by car manufacturers in Germany is the difficulty of creating a circular flow of car batteries from electric cars, as electric cars often end up in developing countries at end-of-life and “disappear” or are insufficiently recycled. In a survey with 300 US companies, getting material back for recycling was seen as the largest barrier for circularity (ING, 2019). Recyclers also need investments or incentives to develop technology and infrastructure to recycle materials that are not commercially recycled today, e.g. several CRMs (CEWASTE, 2021) that are commonly used in electronics.
- *Efficient systems for sorting out valuable components from waste streams*
  There is a lack of efficient technology and systems for sorting out valuable electronic components for repair and remanufacturing from waste streams.

Sorting systems need to be developed and automated in order for it to be profitable to reuse components for re-manufacturing on a larger scale.

- *Digital infrastructure for sharing product information.*
  Digital infrastructures for sharing product information to players in the value chain and to consumers need to be developed. In order not to make product passes or similar solutions an 'administrative nightmare', companies request a solution that works globally. According to an interviewed expert on traceability, it is not likely that there will be one global system for this, but it is important that the systems are compatible and that it is possible to share data between them.
- *Efficient reverse logistics systems and finding international providers*
  Transport costs and reverse logistics are challenges for circular companies with customers in different countries (Teknikföretagen, 2020). The logistic system is not optimized for retrieval, which makes it very costly. Another challenge for companies is finding international reverse logistics providers. An electronics producer with manufacturing in China says that sending products back for remanufacturing is very difficult and expensive (sending products from the US to China is almost impossible and from EU to China gets expensive) and that he thinks that it might be impossible for him to remanufacture in China. He considers moving his production to EU, but this will be much more costly, and he has troubles finding suppliers.
- *Finding international logistics providers for reverse logistics*
  It is difficult for companies to find international logistics partners for reverse logistics. A clothing company says that they have only found a logistics partner for reverse logistics of second hand (a customer buys a garment and wants to sell the garment as second hand to another consumer). The clothing company has only found an efficient C2C solution in Sweden where the garments are transported directly between consumers. However, in other countries the second-hand garments need to pass the warehouse. The solution varies in different markets and the company asks for a uniform solution for reverse logistics that works in the EU.

Collaboration

The transition to a circular economy requires a systemic change, and simultaneous and coordinated changes from several actors are often needed in order for a circular business model to function. Depending on the type of business model, these collaborations might be national or international.

Global drivers for a circular transition

- *Collaboration saves costs and let us learn from each other*
  Collaboration can lead to reduced costs by creating resource-efficient systems or by learning from each other. As a circular value chain can differ from a classic linear value chain, the relationship between different actors in the value chain changes, and companies might need to cooperate in new ways. Collaboration has been identified as one of the key success factors for circular business models (Sitra, 2021). One example of how collaboration can help overcome barriers for circular business models is a Swedish insurance intermediary that specialises on insurance for shared products. By working together with the sharing platforms and accessing data about the products they are able to better assess the value of used products, and to better assess the risks.

- *Large companies can affect the whole value chain*
  Large players that set clear targets and directions can have an effect on the possibility and willingness of their suppliers to make investments needed to accelerate a circular transition, as this sends a clear signal about future demand. One example is targets on using recycled materials, that can create a pull through the system and spur investments and action from suppliers and manufacturers (Closed Loop Partners, 2021). This can be especially effective if several companies come together and set similar targets.

Global barriers for a circular transition

- *Difficulty finding international partners for circular initiatives*
  When trying to start a circular initiative in other countries, companies say it is hard to find the right international partners. An electronics company argue that it should be made easier to find “green suppliers” and circular partners in the EU and would like a database or similar where suppliers and partners could be searchable. Some companies mean that the interest in and knowledge of circular economy is lower in many producing countries (e.g. in Asian countries) than in EU, and that this makes it harder to collaborate.

- *Partners for small scale companies*
  Smaller circular businesses seem to have a problem finding partners that suits “their size”. A clothing company in Germany raised the problem of not being able to find a recycling partner with whom they can create a closed loop with the textile materials they use. The recyclers are either too small and not transparent enough or they are too large and require large volumes of clothing for recycling. Another example is insurances for sharing platforms. Low

volumes of shared products on the platform means a higher risk for the insurance company and results in higher insurance costs. In order to get a cost efficient insurance higher volumes are needed, but many sharing platforms are relatively small today.

- *Trademark protection, liability and competitiveness*
    - Companies are sometimes concerned that collaboration and sharing of data will give advantages to others and decrease their competitiveness, which might restrict the level of collaboration.
    - Producers are sometimes concerned about losing control of their products and trademark or that sales and profit will decrease if repair and maintenance services are offered by independent actors. This can make it hard for repairers and maintenance to collaborate with producers.

Consumer preference and behaviour

Circular business models may need to be adapted for different markets to meet the needs and preferences of consumers from different cultures and backgrounds. By understanding different consumer groups, adapting the circular business models for different markets and by making circular “consumption” convenient, the consumer acceptance of circular business models should increase. These are the drivers and barriers regarding consumer preference and behaviour that have been identified from a global perspective:

Global drivers for a circular transition

- *Young people are more likely to rent, share, borrow compared to older generations*
  New start-ups with young people as target group, e.g. in Germany. In China, the interest for the sharing economy is increasing among younger people.
- *The younger generation moves more between different cities and countries than before, and thus are more likely to rent or buy for example furniture*

second-hand.
The demand for renting furniture and furnishings are increasing. A rental model for furniture and furnishing would be particularly attractive if the same company provides rentals in several countries. Driving force for ex. global furniture companies.

- *Enabling: higher acceptance of used products in low-income countries.*
A large proportion of used goods that companies collect in Sweden can be sold on a global market instead of recycled or incinerated in Sweden. Much of the collected textiles and electronics are sold as second-hand to low-income countries because the products cannot be sold in Sweden and because of the economic incentives in lower income countries.

Global barriers for a circular transition

- *Varying status of second-hand products globally*
In some countries, second-hand has a low status and in general there is a lack of confidence among consumers about the hygiene factor on used goods and it is perceived as complicated to buy second hand. The circular business models need to be adapted from country to country. In Poland, second-hand has a low status. While there is a high demand of more sustainable consumption and second-hand products in the Netherlands. A clothing company says that they have not noticed any particular differences between the demand for second-hand in their markets because they promote and display their second- clothes the same way as they do with the new clothes. Another clothing company thinks second-hand is easier for customers to try compared to renting.

- *The market for lower-quality second-hand goods may soon be saturated as the proportion of middle-income earners increases globally*
The Swedish government highlights the risk that the international market for second-hand will become increasingly saturated when more people become middle income earners and say that the system needs to change (Swedish Government, 2020). A comment from the authors: this can also be seen as a driver for increasing the life cycle of products and motivating consumers in Sweden (and the rest of the Western world) to buy more second-hand products.

- *Large transaction costs for repair services and second-hand consumption.*
Consumers are more prone to throw away and buy new instead of selling/donate, buying second-hand or repairing. Small ranges of second-hand products, few sizes, long transport distance and a discomfort of wearing second-hand are examples of barriers for second-hand consumption according to clothing companies and a Norwegian study. The repair industry has difficulties growing their businesses which also is due to transaction costs for customers but also because of the lack of available spare parts. Examples from Germany and Norway.

- *There is a lack of incentives for consumers to return products for reuse and recycling globally.*
  Only a small share of products come back for resale, remanufacturing, repair and recycling, and companies request incentives for both private and business consumers to get rid of products in a circular way.
- *Customers want discounts from retailer or producer for circular behaviour.*
  Customers want discounts from the retailer or the producer for returning their products to them for recycling or reuse. However, the retailer or producer is not necessarily the one making a profit from the collection, but another actor along the value chain. Creating take-back systems that both incentivizes the customer and actors in the value chain can be challenging in global value chains

Knowledge

Circular economy is still a niche and under development. We need to learn what is profitable, how it can be sustainable, what should be circulated and how we should cooperate. In some areas there is already enough knowledge, but it needs to be shared. Development takes time, and to accelerate development we may also need to learn how to make decisions in uncertainty. In this section, we have gathered the drivers and barriers that can be linked to knowledge and that are relevant from an international perspective.

Global drivers for a circular transition

- *Swedish companies are driving the transition internationally.*
  Suppliers are beginning to adapt to the demand for ex. recycled material.
- *Knowledge of the benefits of Circularity is increasing internationally*
  Policy development and other initiatives are increasing, as well as introducing circular economy knowledge in different educations all around the world.

Global barriers for a circular transition

- *Lack of knowledge among consumers and players internationally about the value of used products.*
  It does not pay to sell clothes for second hand to international partners. Clothing companies says that much second-hand garments still have high value.

- *Lack of knowledge about redesign, remanufacturing and product design.*
  - Clothing companies say that their suppliers have little knowledge about redesign and remanufacturing. Redesign is done in Sweden but on a small scale due to high labour costs. Only expensive brands can make profit on redesigning a garment instead of sending a unsold garment to a sorting and recycling facility.
  - Lack of knowledge from suppliers of materials and product designers about what is sustainable. Choices are made that are believed to be sustainable, but which are not, for example selection of recycled material.

- *Lack of knowledge on circular business models in the financial sector*
  The financial sector (banks, insurance etc.) has little knowledge on how to assess the value and the risks of circular business models. According to a circular financing specialist, financial institutions need more experience and statistical data on circular business models. They also need to learn how to ensure value from used products (e.g. from a sharing service) in case of a liquidation. Further, financial institutions need to learn how to properly price future risks of linear business models, caused by e.g. legislation or resource scarcity (Schröder & Raes, 2021).

- *Knowledge is built in silos, by industry and in regions (eg EU / USA)*
  Thus there is much knowledge that is not used.

- *Lack of detailed knowledge about, for example, profitability and business models*
  not least internationally. Business leaders hesitate to make decisions about major changes.

- *Uncertainty regarding rules and legislation for circular business models*
  As many circular companies are breaking new grounds and as much legislation has not been develop with circular business models in mind, there is a lot of uncertainty regarding what legislation that applies and how it should be interpreted.

- *Uncertainty regarding the sustainability effects of reverse logistics*
  More knowledge is needed about the environmental effects of increased transport as a result of increased circular flows (Teknikföretagen, 2020).

- *Lack of knowledge regarding sustainability of materials and product design*
  Clothing companies say that suppliers often are not aware of the sustainability performance of different recycled materials.

Changes in global value chains in a circular economy

In several countries such as Sweden, the Netherlands and Germany, there are an increasing number of companies providing repair services, renovation services, rental services, second-hand and as well recycled or sustainably sourced materials for production. Does this mean that value chains are moving towards becoming more regional rather than global when transitioning to a more circular economy? Will we become less dependent on today's import countries and relocate production more regionally?

According to Circle Economy, a transition to a circular economy should create more local economies through "closed-loop" value chains, which will strengthen local economies and create local jobs (Circle Economy, 2020). A senior researcher within circular economy in Germany says that in a circular economy there will be local material cycles, but there is still great value in maintaining the global value chains since countries have different prerequisites and it is also a way to support each other's economies. The researcher says that if each country had its own circular economy, much material would need to be incinerated.

A consultant within circular logistics says that in order to create circular flows of products and materials, the value chains need to become more local or regional, otherwise it will become too expensive and difficult if the products are to be transported several times around the world when for example reverse logistics become more common. Carrier and transportation costs are also likely to continue to increase, which also will motivate more regional value chains. The consultant stated that the Swedish company Tarkett's circular value chain as a good example. Tarkett, a company providing floor and wall materials, has gathered manufacturing, sales, take-back and recycling in the Nordic region. A challenge to create more circular logistics is that logistics companies need to collaborate more in order to transport goods and materials in the most resource efficient way.

A logistics company in Sweden working with circular logistics says that it is very unsustainable to have raw materials, components and products sent back and forth from one side of the globe to the other until final product eventually ends up at the sales market. Value chains must become more regional.

To succeed with circular business models, they need to be developed and piloted locally in order to get a good understanding of the customers, the available infrastructure and to facilitate collaboration with local actors, says a circular economy expert working at a large furniture company. However, in order to run second-hand shops successfully, regional collaborations are necessary because it becomes too complicated if the goods are to be transported between national borders partly due to that the goods might easily be classified as waste.

However, global value chains will still be needed in a circular economy. The circular economy export mentions that in the furniture industry, for example, the production and handling of spare parts is very labor intensive. Therefore, companies will probably continue to have suppliers of spare parts in countries with low labor costs. Digital systems will probably also be global, says the expert, for example systems regarding product passports.

One furniture company's existing sofa suppliers can today receive used sofas and assess which parts of the sofa that can be used as spare parts. However, an increasing number of more independent actors that can also support with the renovation and repair of larger furniture are appearing more locally and regionally. The furniture company has not yet decided if they will try to make the activities around furniture renovation more local. Challenges are for example around trademark protection and patent rights.

An electronics producer argues that they (and others in the industry) don't know if remanufacturing should be done where the product is manufactured or if should be done more locally. The question is complex, and they will have to collaborate and try different solutions with other actors in the value chain.

At the project´s final workshop the participants were asked how they think that the global value chains will change in a circular economy (Appendix C). Most participants answered that the value chains will become more local (still having global value chains), that there will be more collaboration in the value chains and that there will be more data and information sharing and increased digitalization. Other participants commented for example that there will be more cross industrial solutions, slower consumption and solutions for first-mile collection.

Insights and discussion

During the project a lot of interviews with experts and industry representatives has been held, and a lot of documents and other written materials from all over the world has been scrutinized. In this chapter, the project group try to provide their main insights based on the study.

Some of the insights were expected, while others were quite unexpected.

It´s a lot of talk, and not so much done – yet.

- Circular economy has been discussed intensively for many years now, by authorities and industry, but still there are only a few real examples of international circular economy value chains in place.
- Among the interviewed *producers*, only few have any international experience of circular business models at all. International circular initiatives for Swedish manufacturing companies thus do not seem to take place to any great extent today, even if many companies have done some national pilot projects and there is an interest in learning more. The pilot projects often include collaborations with other actors. It seems that they find it easier to test locally, because of greater challenges with different legislations in international value chains, it is logistically easier when the value chains are close, but also because it is easier to work together culturally locally in terms of knowledge and interests.

How to go from small to large scale?

- Most projects are still on a small scale, reasonable because it is a learning process. At the same time, large-scale solutions are needed to achieve more cost-effective solutions. The market is often perceived as uncertain and therefore companies does not dare to take the risk to build large-scale solutions as it is often requiring large investments in terms of time and money. Perhaps more political support is needed in the transition from small to large?

How and when to go from local to global?

- Large Swedish companies can influence their suppliers by setting requirements. Still very few collaborations on pilot projects and knowledge exchange seem to take place in the international value chains. How can international collaborations and forms of collaboration be supported to build "international knowledge”? However, there are some industries and circular businesses that are both large and international. One of them is metal recycling, and another is the secondary market for electronics. For electronics, the international aspect is a success factor, since the demand for second-hand electronics on some less economically strong markets is higher than on the Swedish market, which enables that more of the used electronics can be resold. In the longer term, with an increasing middle class also on

these markets, this effect may diminish, and we need to become better at buying used electronics in the western world as well.

- If there are already circular actors, many of the respondents declare that they do not know how to find them internationally?
- With global markets and global value chains, circular economy needs to be seen in a global perspective and legislation and policy for a circular economy must be set on an international level.
- It is not one answer to what is best in terms of sustainability and profitability - global value chains or more local ones. Some things will be circulated better locally and others better globally and it also varies between different countries and for different kind of products depending on the possibilities.

How to dare change?

- It is clear that circular economy and circular business models are new and not sufficiently known to many top managers, which makes it difficult to navigate. This leads to that managers hesitate to make brave decisions to change direction, for example towards new business models. They see a lack of the information and knowledge they are used to get to decide upon and thus they simply don't dare.

Balance between regulations and simplifying for change

- We also see a need for balance between legislation and standards that drive development but still do not to increase the administrative burden for circular companies. Harmonization of international laws and regulations is an important part of this if we want global circular value chains.

Who is responsible?

- One difficult question is: Who will take the responsibility to support the transition in countries where a lot of production takes place today but where there are no national initiatives for circular economy? Is it desirable? In Europe, there is a lot of development support for the circular economy, but it is unclear whether it exists in many of the countries where a large part of Swedish producers' production takes place.
- During the project, we have seen that knowledge regarding circular economy, and how to support it, is built in separate silos, for example in different kind of industries, and different parts of the world. In order to support the transition, and not make every silo need to learn by themselves, the knowledge has to be shared between the different silos.

Conclusion and recommendations

The results of the project can be summarized in the following conclusions:

General

- The ongoing international development towards more barriers to trade and national protectionism can hinder the development towards the circular economy
- Many good initiatives are already underway (Policy development, collaboration and networking, Activities in companies)
- Many initiatives focus on circular economy, without taking into account the impact on sustainability. Circular economy often leads to sustainability improvements, but not always.
- In the countries where Sweden has large imports and exports, we see a clear development towards a circular economy. However, this happens in different ways and at different speeds. For example, initiatives in China are powerful. It can also be noted that countries such as the Netherlands have clear and concrete guidelines, while for example Germany has more general and comprehensive guidelines.
- According to the findings in this study, international circular flows are not as common as expected, why the project group consider barriers for international circular flows, so far, stronger than the drivers.

Profitability

- Profitability for all actors along the chains is central to make circular economy happen, else the actors will leave the chain, and this is perceived as difficult to achieve especially for international circular flows.
    - Circular flows do not fit into the current system, which means many extra activities and costs, not least for international flows.
    - Establishing international circular flows requires large investments, not least for smaller companies.
    - Labor is expensive while new products and virgin materials are often relatively inexpensive.
- The material value of used products, components and materials can be higher than the cost of retrieving them and can thus make circular economy profitable.

Knowledge:

- There is a lack of knowledge about when international circular flows are preferable to national or local ones.

- Knowledge is often built separately in different industries and nations / regions.
- Knowledge and information are often perceived as insufficient for companies to dare to make decisions about taking new paths, such as daring to introduce international circular business models.
- There is a clear lack of knowledge about circular economy among many suppliers.

Legislation and Policy

- In the EU and in many EU-countries as well as elsewhere in the world, new regulations are being built to drive the circular economy.
- Many regulations differ between nations and regions, which makes it difficult for companies to act in circular, international flows.
    - Waste regulations differ greatly between different countries.
    - Product regulations differ less, especially within the EU.
- In some cases, the regulations even counteract circular flows.
- Administrative requirements for import and export and, not least, transport of goods, have been shown to create major obstacles to the transition to international circular flows.

Consumer behaviour

- Customer maturity and status of used/second-hand goods differ greatly between different countries. The study shows that people with poorer financial opportunities in some cases see used/second-hand goods as an opportunity, but sometimes also see that they do not want to buy used/second-hand things because they do not want to risk being classified as poor.
- Customer acceptance depends a lot on how the circular business model is made available and presented, which can affect the differences between different countries.
- Young people today move more between different countries and cities than previous generations, which increases the need to rent products, such as furniture.

Collaboration

- Collaborations in value chains vary between different nations and regions, but also for different value chains.
- It is often difficult for players to find the right partners internationally, not least as in some places there is a great reluctance / fear about sharing product information.

Systems and Technology

- Digitization is seen as an enabler, not least because it creates the opportunity to follow material content and products through value chains.
- Collection, recycling systems and infrastructure for circular systems are lacking or inadequate in many parts of the world.
- Efficient systems for sorting out valuable components and materials from waste are lacking.

Recommendations

Based on the findings in the study, the main recommendations are listed below. One can note that the recommendations might be used by different actors, such as industry leaders and policy developers. The list will provide a holistic view of what is needed to enable the transition towards international Circular flows. Thus, we do not want to divide the recommendations, but want the target groups to see it all, and to choose what is important for each of them in every single case.

Sustainability must be ensured

- The goal is not circular economy, but sustainability, so it must be ensured that all development and all changes lead to sustainability improvements.

Profitability needs to be ensured

- The cost of labor needs to be reduced for example by reduced tax for labour in order to promote re-use, re-pair, re-manufacturing and so forth.
- Green procurement can be used as a driving force. (goals or requirements can be set).
- Increased administrative requirements for international circular flows need to be eliminated.

Knowledge needs to be shared

- The knowledge that is produced needs to be shared between industries, nations and regions.
- Knowledge of methods and courage to make decisions on a basis other than traditional needs to be developed (DARE!).

Regulations need to be harmonized and adapted to circular flows

- Waste definitions need to be reviewed and harmonized between different countries.
- Laws on international data flows need to be reviewed so that they do not hinder efficient circular systems.
- International standards and definitions for the quality of recycled material need to be developed.
- Standards and definitions for what is circular need to be developed (to be able to use in procurement or for tariff concessions or other incentives).

- A global change can be supported by, for example, free trade agreements and Aid for Trade, and in a similar way, countries that need help in implementing laws on waste management and the like can be supported.
- Existing systems and laws need to be adapted and developed so that they enable a gradual transition and scaling to circular business models.

Consumer behaviors need to be developed:

- Incentives for individuals and companies to buy and dispose of products in a circular way need to be created.

Collaborations need to be facilitated

- Make it easier for small companies within circular economy to find partners internationally.
- Facilitate the sharing of information along circular value chains.
- Create systems to ensure the quality of circular products and materials so that actors along the chains can and dare to use used products / components / materials.

Technology needs to be developed

- Digital solutions to enable international circular systems need to be developed. (Note that digital solutions can also have a negative impact on sustainability, which must be weighed against the benefits)
- Sustainable and profitable systems for international return logistics need to be developed

Finally: The transition to an international circular economy requires many changes. The project group believes that the two main guidelines for the transition are that the changes lead to Profitability for all parties involved in the value chains (else they will leave the partnerships), and to sustainability, as sustainability is the main goal of circular economy.

List of publications

No material has been published during the project.

Communication

The project started with a web survey which was sent out broadly to industry, through different channels, reaching some 1500 persons in industry but only got some 45 answers. In June a webinar to describe the first findings and discuss them with the 61 participants was held. In September a final webinar to present the final results was held. The information about the webinar reached about 3500 persons through different channels including AFRY external communication, RE:Source and individual LinkedIn messages, 140 people were registered, and about 66 participated. During the webinar, Mentimeter was used

to gather feedback from the participants (Raw data in Swedish, see Appendix C), which was used to improve this final report. After the webinar several of the participants contacted the project group to discuss findings and get mor details about the results.

Figure 8 Word-Cloud in Swedish to describe the participants at the seminar

When the report is available on Re:Source's website, AFRY will draw attention to this through posts on social media and by sending the report to the webinar participants.

An open, international webinar regarding sustainable supply/value chain management will be held (preliminary 7 December) by AFRY, where results from this study will be included.

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Med stöd från VINNOVA Sveriges innovationsmyndighet, Energimyndigheten, FORMAS, Strategiska innovationsprogram

Appendix

Appendix A – Data from export and import study

Appendix B – Web Survey

Appendix C – Mentimeter answers at the seminar on 29 september

Appendix A – Data from export and import study

De viktigaste kategorierna och deras viktigaste import- och exportländer

Från SCB:s data "Varuimport till samtliga länder efter varugrupp KN 2, 4, 6, 8-nivå och handelspartner, sekretessrensad, ej bortfallsjusterat. År 1995 - 2020"

Svensk import för valda produktkategorier, per land (länder i topp)

IMPORT (kkr)

	Finland	Tyskland	Norge	Polen	Danmark	Nederländerna	Kina	Storbritannien	Italien	Frankrike
PAPPER OCH PAPP; VAROR AV PAPPERSMASSA, PAPPER ELLER PAPP	2 777 160	2 471 881	2 309 496	1 589 206	1 182 210	730 902	610 248	317 482	299 542	294 874
KLÄDER OCH TILLBEHÖR TILL KLÄDER, AV TRIKÅ	205 131	2 627 170	486 496	680 612	1 621 499	1 051 316	3 618 575	622 454	663 239	232 562
KLÄDER OCH TILLBEHÖR TILL KLÄDER, AV ANNAN TEXTILVARA ÄN TRIKÅ	281 787	2 405 977	581 973	977 223	1 963 732	1 185 641	4 888 027	522 086	896 513	167 179
JÄRN OCH STÅL	5 878 304	9 080 195	2 235 280	494 641	1 525 922	4 167 251	124 893	3 739 222	1 568 038	2 196 411
ELEKTRISKA MASKINER OCH APPARATER, ELEKTRISK MATERIEL SAMT DELAR TILL SÅDANA VAROR; APPARATER FÖR INSPELNING ELLER ÅTERGIVNING AV LJUD, APPARATER FÖR INSPELNING ELLER ÅTERGIVNING AV BILDER OCH LJUD FÖR TELEVISION SAMT DELAR OCH TILLBEHÖR TILL SÅDANA APPARATER	2 949 178	24 724 733	4 110 383	10 997 958	7 658 331	32 509 534	15 284 613	6 312 464	2 794 064	6 878 938
FORDON, ANDRA ÄN RULLANDE JÄRNVÄGS- ELLER SPÅRVÄGSMATERIEL, SAMT DELAR OCH TILLBEHÖR TILL FORDON	3 926 300	63 471 091	2 852 437	6 606 583	2 036 310	9 682 921	2 880 359	9 892 629	5 239 199	11 970 585
MÖBLER; SÄNGKLÄDER, MADRASSER, RESÅRBOTTNAR TILL SÄNGAR, KUDDAR OCH LIKNANDE STOPPADE INREDNINGSARTIKLAR; BELYSNINGSARMATUR OCH ANDRA BELYSNINGSARTIKLAR, INTE NÄMNDA ELLER INBEGRIPNA NÅGON ANNANSTANS; LJUSSKYLTAR, NAMNPLÅTAR MED BELYSNING, O.D.; MONTERADE ELLER MONTERINGSFÄRDIGA BYGGNADER	592 780	2 704 985	1 295 247	4 858 758	2 591 610	630 669	7 490 638	247 029	1 036 158	209 542
Totalt (för dessa 7 kategorier)	16 610 640	107 486 032	13 871 312	26 204 981	18 579 614	49 958 234	34 897 353	21 653 366	12 496 753	21 950 091

Topp 5 %
Topp 10%
Topp 20%
Topp 30%
Under medel

Med stöd från
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FORMAS
Strategiska innovations-program

RE: SOURCE
Med stöd från VINNOVA Sveriges innovationsmyndighet, Energimyndigheten, FORMAS, Strategiska innovationsprogram

Frankrike	Belgien	Ungern	Sydkorea	USA	Vietnam	Bangladesh	Estland	Indien	Totalt (endast för dessa länder)	
294 874	249 924	128 470	128 139	116 999	1 529	129	137 410	40 193	14 050 601	Bottom 20%
232 562	493 895	3 384	45 354	85 998	150 750	3 382 951	54 794	402 098	17 860 218	Bottom 30%
167 179	351 802	1 375	182 599	120 020	415 018	1 839 652	250 050	745 927	18 944 413	Bottom 50%
2 196 411	1 776 993	7 287	930 454	275 183	205		62 238	138 821	38 333 639	Top 30%
6 878 938	2 465 233	5 787 950	2 127 353	3 702 780	6 087 401	82	2 882 780	450 360	155 906 170	Top 20%
11 970 585	22 187 306	2 977 655	4 699 646	1 775 264	97 496	21 275	664 696	416 939	165 329 119	Top 10%
209 542	394 871	135 790	11 176	117 864	673 870	10 387	1 590 615	223 002	28 813 903	Top 5 %
21 950 091	27 920 024	9 041 911	8 124 721	6 194 108	7 426 269	5 254 476	5 642 583	2 417 340		

RE: SOURCE
Med stöd från VINNOVA Sveriges innovationsmyndighet, Energimyndigheten, FORMAS, Strategiska innovationsprogram

Från SCB:s data "Varuexport till samtliga länder efter varugrupp KN 2, 4, 6, 8-nivå och handelspartner, sekretessrensad, ej bortfallsjusterat. År 1995 - 2020"

Svensk export för valda produktkategorier, per land (länder i topp)

EXPORT (kkr)	Finland	Tyskland	Norge	Polen	Danmark	Nederländerna	Kina	Storbritannien	Italien
PAPPER OCH PAPP; VAROR AV PAPPERSMASSA, PAPPER ELLER PAPP	1 718 462	16 552 659	4 641 931	3 373 712	4 230 847	4 482 658	3 241 062	6 538 977	5 294 384
KLÄDER OCH TILLBEHÖR TILL KLÄDER, AV TRIKÅ	2 086 194	1 117 868	1 682 695	378 739	1 096 822	321 423	94 283	439 519	104 388
KLÄDER OCH TILLBEHÖR TILL KLÄDER, AV ANNAN TEXTILVARA ÄN TRIKÅ	1 982 770	1 861 705	2 033 323	688 143	1 297 014	513 677	102 796	725 284	180 328
JÄRN OCH STÅL	3 602 882	12 391 476	2 319 823	2 576 295	2 757 001	1 681 620	3 755 851	2 322 049	4 416 711
ELEKTRISKA MASKINER OCH APPARATER, ELEKTRISK MATERIEL SAMT DELAR TILL SÅDANA VAROR; APPARATER FÖR INSPELNING ELLER ÅTERGIVNING AV LJUD, APPARATER FÖR INSPELNING ELLER ÅTERGIVNING AV BILDER OCH LJUD FÖR TELEVISION SAMT DELAR OCH TILLBEHÖR TILL SÅDANA APPARATER	12 540 908	10 802 976	22 461 125	2 867 252	20 168 160	4 512 616	4 612 581	4 081 504	2 451 542
FORDON, ANDRA ÄN RULLANDE JÄRNVÄGS- ELLER SPÅRVÄGSMATERIEL, SAMT DELAR OCH TILLBEHÖR TILL FORDON	13 340 933	21 095 613	15 203 269	7 716 482	11 614 883	15 879 162	12 979 316	12 960 130	5 214 377
MÖBLER; SÄNGKLÄDER, MADRASSER, RESÅRBOTTNAR TILL SÄNGAR, KUDDAR OCH LIKNANDE STOPPADE INREDNINGSARTIKLAR; BELYSNINGSARMATUR OCH ANDRA BELYSNINGSARTIKLAR, INTE NÄMNDA ELLER INBEGRIPNA NÅGON ANNANSTANS; LJUSSKYLTAR, NAMNPLÅTAR MED BELYSNING, O.D.; MONTERADE ELLER MONTERINGSFÄRDIGA BYGGNADER	3 449 610	2 576 690	7 824 185	906 899	3 108 769	698 533	212 178	1 082 102	327 852
Totalt (för dessa sju kategorier)	38 721 759	66 398 987	56 166 351	18 507 522	44 273 496	28 089 689	24 998 067	28 149 565	17 989 582

Topp 5 %
Topp 10%
Topp 20%
Topp 30%
Under medel

RE: SOURCE
Med stöd från VINNOVA Sveriges innovationsmyndighet, Energimyndigheten, FORMAS, Strategiska innovationsprogram

Frankrike	Belgien	Ungern	Sydkorea	USA	Vietnam	Bangladesh	Estland	Indien	Totalt (dessa länder)	
3 204 587	2 080 336	840 148	190 369	2 192 087	200 829	94 922	306 442	873 823	65 589 848	Bottom 20%
166 187	102 439	10 665	52 368	131 031	256	278	64 666	4 457	8 242 338	Bottom 30%
253 640	184 125	8 669	58 268	292 962	2 007	601	98 482	4 963	10 810 736	Bottom 50%
2 517 541	1 294 462	277 308	1 824 411	4 392 051	112 886		444 427	1 402 640	53 532 559	Top 30%
2 764 535	1 776 462	761 343	981 395	8 085 318	215 654	51 299	1 419 687	1 717 680	107 422 283	Top 20%
11 674 663	16 794 468	536 177	3 828 375	25 013 198	128 331	1 106	4 482 641	941 360	192 017 511	Top 10%
889 127	603 437	58 741	47 620	1 007 884	4 852	360	120 930	10 339	23 728 883	Top 5 %
21 470 280	22 835 729	2 493 051	6 982 806	41 114 531	664 815	148 566	6 937 275	4 955 262		

Handelsdata per land och kategori 2019 (SCB)

Fordon Störst Import

FORDON, ANDRA ÄN RULLANDE JÄRNVÄGS- ELLER SPÅRVÄGSMATERIEL, SAMT DELAR OCH TILLBEHÖR TILL FORDON	Import		Export	
	Ton	kkr	Ton	kkr
Totalt	1 787 401	173 238 478	1 987 814	224 762 034
Tyskland	651 316	63 471 091	157 146	21 095 613
Belgien	180 807	22 187 306	247 131	16 794 468
Frankrike	133 119	11 970 585	115 110	11 674 663
Storbritannien och Nordirland	113 968	9 892 629	89 123	12 960 130
Nederländerna	77 158	9 682 921	176 300	15 879 162
Polen	75 697	6 606 583	79 923	7 716 482
Tjeckien	62 525	5 592 925	17 108	1 837 969
Italien	69 930	5 239 199	34 938	5 214 377
Japan	37 854	4 987 014	27 924	4 272 913
Sydkorea	37 789	4 699 646	26 537	3 828 375

Fordon Störst Export

FORDON, ANDRA ÄN RULLANDE JÄRNVÄGS- ELLER SPÅRVÄGSMATERIEL, SAMT DELAR OCH TILLBEHÖR TILL FORDON	Import		Export	
	Ton	kkr	Ton	kkr
Totalt	1 787 401	173 238 478	1 987 814	224 762 034
USA	9 475	1 775 264	173 592	25 013 198
Tyskland	651 316	63 471 091	157 146	21 095 613
Belgien	180 807	22 187 306	247 131	16 794 468
Nederländerna	77 158	9 682 921	176 300	15 879 162
Norge	43 804	2 852 437	109 979	15 203 269
Finland	38 755	3 926 300	108 296	13 340 933
Kina	43 360	2 880 359	97 045	12 979 316
Storbritannien och Nordirland	113 968	9 892 629	89 123	12 960 130
Frankrike	133 119	11 970 585	115 110	11 674 663
Danmark	27 476	2 036 310	102 526	11 614 883

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Strategiska innovations-program

Med stöd från VINNOVA Sveriges innovationsmyndighet, Energimyndigheten, FORMAS, Strategiska innovationsprogram

Elektriska Maskiner Störst import

Elektriska maskiner och apparater, elektrisk materiel samt delar till sådana varor; apparater för inspelning eller återgivning av ljud, apparater för inspelning eller återgivning av bilder och ljud för television samt delar och tillbehör till sådana apparater	Import		Export	
	Ton	kkr	Ton	kkr
Totalt	692 855	177 438 369	374 688	132 883 667
Nederländerna	31 235	32 509 534	4 114	4 512 616
Tyskland	106 686	24 724 733	36 319	10 802 976
Kina	158 051	15 284 613	8 262	4 612 581
Polen	64 257	10 997 958	17 988	2 867 252
Danmark	49 025	7 658 331	59 401	20 168 160
Frankrike	24 768	6 878 938	9 062	2 764 535
Storbritannien och Nordirland	15 896	6 312 464	7 349	4 081 504
Vietnam	1 006	6 087 401	324	215 654
Ungern	19 309	5 787 950	4 166	761 343
Irland	1 392	4 704 830	583	225 212

Elektriska maskiner störst export

Elektriska maskiner och apparater, elektrisk materiel samt delar till sådana varor; apparater för inspelning eller återgivning av ljud, apparater för inspelning eller återgivning av bilder och ljud för television samt delar och tillbehör till sådana apparater	Import		Export	
	Ton	kkr	Ton	kkr
Totalt	692 855	177 438 369	374 688	132 883 667
Norge	27 905	4 110 383	66 853	22 461 125
Danmark	49 025	7 658 331	59 401	20 168 160
Finland	18 349	2 949 178	42 193	12 540 908
Tyskland	106 686	24 724 733	36 319	10 802 976
USA	8 134	3 702 780	11 742	8 085 318
Kina	158 051	15 284 613	8 262	4 612 581
Nederländerna	31 235	32 509 534	4 114	4 512 616
Storbritannien och Nordirland	15 896	6 312 464	7 349	4 081 504
Polen	64 257	10 997 958	17 988	2 867 252
Frankrike	24 768	6 878 938	9 062	2 764 535

Med stöd från VINNOVA Sveriges innovationsmyndighet, Energimyndigheten, FORMAS, Strategiska innovationsprogram

Järn och stål störst import

Järn och stål	Import		Export	
	Ton	kkr	Ton	kkr
Totalt	3 890 449	42 005 345	5 517 692	63 172 949
Tyskland	906 949	9 080 195	961 971	12 391 476
Finland	611 346	5 878 304	402 310	3 602 882
Nederländerna	346 826	4 167 251	154 705	1 681 620
Storbritannien och Nordirland	234 198	3 739 222	190 842	2 322 049
Norge	300 839	2 235 280	306 685	2 319 823
Frankrike	150 332	2 196 411	128 513	2 517 541
Belgien	203 068	1 776 993	102 806	1 294 462
Italien	106 043	1 568 038	266 786	4 416 711
Luxemburg	175 463	1 548 288	2 447	34 563
Danmark	156 135	1 525 922	361 325	2 757 001

Järn och stål störst export

Järn och stål	Import		Export	
	Ton	kkr	Ton	kkr
Totalt	3 890 449	42 005 345	5 517 692	63 172 949
Tyskland	906 949	9 080 195	961 971	12 391 476
Italien	106 043	1 568 038	266 786	4 416 711
USA	16 732	275 183	415 827	4 392 051
Kina	9 257	124 893	163 462	3 755 851
Finland	611 346	5 878 304	402 310	3 602 882
Danmark	156 135	1 525 922	361 325	2 757 001
Polen	45 683	494 641	231 381	2 576 295
Frankrike	150 332	2 196 411	128 513	2 517 541
Storbritannien och Nordirland	234 198	3 739 222	190 842	2 322 049
Norge	300 839	2 235 280	306 685	2 319 823

Med stöd från VINNOVA Sveriges innovationsmyndighet, Energimyndigheten, FORMAS, Strategiska innovationsprogram

Papper, papp och varor störst import

PAPPER OCH PAPP; VAROR AV PAPPERSMASSA, PAPPER ELLER PAPP	Import		Export	
	Ton	kkr	Ton	kkr
Totalt	1 211 704	14 457 719	9 560 024	81 168 511
Finland	292 913	2 777 160	166 460	1 718 462
Tyskland	204 100	2 471 881	2 031 658	16 552 659
Norge	287 616	2 309 496	295 135	4 641 931
Polen	154 745	1 589 206	416 253	3 373 712
Danmark	64 166	1 182 210	402 545	4 230 847
Nederländerna	48 652	730 902	634 775	4 482 658
Kina	14 656	610 248	454 876	3 241 062
Storbritannien och Nordirland	18 093	317 482	843 462	6 538 977
Italien	14 942	299 542	627 710	5 294 384
Frankrike	14 587	294 874	354 965	3 204 587

Papper, papp och varor störst export

PAPPER OCH PAPP; VAROR AV PAPPERSMASSA, PAPPER ELLER PAPP	Import		Export	
	Ton	kkr	Ton	kkr
Totalt	1 211 704	14 457 719	9 560 024	81 168 511
Tyskland	204 100	2 471 881	2 031 658	16 552 659
Storbritannien och Nordirland	18 093	317 482	843 462	6 538 977
Italien	14 942	299 542	627 710	5 294 384
Norge	287 616	2 309 496	295 135	4 641 931
Nederländerna	48 652	730 902	634 775	4 482 658
Danmark	64 166	1 182 210	402 545	4 230 847
Polen	154 745	1 589 206	416 253	3 373 712
Kina	14 656	610 248	454 876	3 241 062
Frankrike	14 587	294 874	354 965	3 204 587
USA	2 187	116 999	244 072	2 192 087

Med stöd från VINNOVA Sveriges innovationsmyndighet, Energimyndigheten, FORMAS, Strategiska innovationsprogram

Möbler störst import

möbler; sängkläder, madrasser, resårbottnar till sängar, kuddar och liknande stoppade inredningsartiklar; belysningsarmatur och andra belysningsartiklar, inte nämnda eller inbegripna någon annanstans; ljusskyltar, namnplåtar med belysning, o.d.; monterade eller monteringsfärdiga byggnader	Import		Export	
	Ton	kkr	Ton	kkr
Totalt	826 498	31 735 339	781 000	25 801 242
Kina	161 799	7 490 638	4 819	212 178
Polen	159 834	4 858 758	55 289	906 899
Litauen	144 821	3 012 215	5 644	213 431
Tyskland	49 322	2 704 985	98 167	2 576 690
Danmark	62 981	2 591 610	86 736	3 108 769
Estland	33 595	1 590 615	1 778	120 930
Norge	13 262	1 295 247	185 182	7 824 185
Italien	33 457	1 036 158	17 550	327 852
Vietnam	18 766	673 870	22	4 852
Nederländerna	6 549	630 669	30 852	698 533

Möbler störst export

möbler; sängkläder, madrasser, resårbottnar till sängar, kuddar och liknande stoppade inredningsartiklar; belysningsarmatur och andra belysningsartiklar, inte nämnda eller inbegripna någon annanstans; ljusskyltar, namnplåtar med belysning, o.d.; monterade eller monteringsfärdiga byggnader	Import		Export	
	Ton	kkr	Ton	kkr
Totalt	826 498	31 735 339	781 000	25 801 242
Norge	13 262	1 295 247	185 182	7 824 185
Finland	6 326	592 780	82 479	3 449 610
Danmark	62 981	2 591 610	86 736	3 108 769
Tyskland	49 322	2 704 985	98 167	2 576 690
Storbritannien och Nordirland	2 460	247 029	42 935	1 082 102
USA	487	117864	30 282	1 007 884
Polen	159 834	4 858 758	55 289	906 899
Frankrike	2 760	209 542	26 667	889 127
Nederländerna	6 549	630 669	30 852	698 533
Belgien	4 678	394 871	30 063	603 437

Med stöd från VINNOVA Sveriges innovationsmyndighet, Energimyndigheten, FORMAS, Strategiska innovationsprogram

Kläder (Trikå) störst import

KLÄDER OCH TILLBEHÖR TILL KLÄDER, AV TRIKÅ	Import		Export	
	Ton	kkr	Ton	kkr
Totalt	74 759	20 293 934	19 915	8 794 250
Kina	16 668	3 618 575	60	94 283
Bangladesh	20 790	3 382 951	02	278
Tyskland	5 938	2 627 170	1 935	1 117 868
Danmark	4 243	1 621 499	2 345	1 096 822
Turkiet	5 151	1 139 787	11	3 313
Nederländerna	2 347	1 051 316	507	321 423
Polen	1 381	680 612	997	378 739
Italien	1 192	663 239	181	104 388
Storbritannien och Nordirland	1 326	622 454	692	439 519
Belgien	1 029	493 895	235	102 439

Kläder (Trikå) störst export

KLÄDER OCH TILLBEHÖR TILL KLÄDER, AV TRIKÅ	Import		Export	
	Ton	kkr	Ton	kkr
Totalt	74 759	20 293 934	19 915	8 794 250
Finland	531	205 131	6 860	2 086 194
Norge	968	486 496	3 398	1 682 695
Tyskland	5 938	2 627 170	1 935	1 117 868
Danmark	4 243	1 621 499	2 345	1 096 822
Storbritannien och Nordirland	1 326	622 454	692	439 519
Polen	1 381	680 612	997	378 739
Nederländerna	2 347	1 051 316	507	321 423
Österrike	37	20556	460	168 044
Frankrike	369	232 562	407	166 187
USA	122	85 998	131	131 031

Med stöd från VINNOVA Sveriges innovationsmyndighet, Energimyndigheten, FORMAS, Strategiska innovationsprogram

Kläder (Ej trikå) störst import

KLÄDER OCH TILLBEHÖR TILL KLÄDER, AV ANNAN TEXTILVARA ÄN TRIKÅ	Import		Export	
	Ton	kkr	Ton	kkr
Totalt	63 966	22 802 241	20 719	11 722 975
Kina	17 998	4 888 027	58	102 796
Tyskland	4 181	2 405 977	2 779	1 861 705
Danmark	4 147	1 963 732	2 312	1 297 014
Bangladesh	9 593	1 839 652	3	601
Nederländerna	2 140	1 185 641	941	513 677
Polen	1 763	977 223	1 433	688 143
Italien	799	896 513	193	180 328
Indien	2 386	745 927	10	4 963
Turkiet	2 227	702 796	52	10 862
Norge	860	581 973	3 324	2 033 323

Kläder (Ej trikå) störst export

KLÄDER OCH TILLBEHÖR TILL KLÄDER, AV ANNAN TEXTILVARA ÄN TRIKÅ	Import		Export	
	Ton	kkr	Ton	kkr
Totalt	63 966	22 802 241	20 719	11 722 975
Norge	860	581 973	3 324	2 033 323
Finland	491	281 787	5 146	1 982 770
Tyskland	4 181	2 405 977	2 779	1 861 705
Danmark	4 147	1 963 732	2 312	1 297 014
Storbritannien och Nordirland	782	522 086	935	725 284
Polen	1 763	977 223	1 433	688 143
Nederländerna	2 140	1 185 641	941	513 677
USA	124	120 020	217	292 962
Frankrike	166	167 179	388	253 640
Österrike	32	26 324	567	246 179

Med stöd från VINNOVA Sveriges innovationsmyndighet, Energimyndigheten, FORMAS, Strategiska innovationsprogram

Appendix B – Web Survey

Vilka drivkrafter för cirkulär ekonomi ser ni i era import- och exportmarknader?

Begränsade möjligheter

Lagstiftningen och konsumenternas ökade medvetenhet

Ökad efterfrågan från i synnerhet offentlig sektor. Flertalet lagstiftningsinitiativ.

Nya beteendemönster på marknaderna

Ökad miljömedvetenhet

Ökad kravställning från myndigheter

Lönsamhet först och främst. Att få en sådan bra dator/telefon för pengarna. I Sverige är hållbarhetstänket längre men många av våra kunder köper och säljer till oss 100% med tanke på det ekonomiska.

Med stöd från VINNOVA Sveriges innovationsmyndighet, Energimyndigheten, FORMAS, Strategiska innovationsprogram

Vad behöver utvecklas internationellt för att ni ska kunna vidareutveckla/skala upp era cirkulära aktiviteter?

Samarbete mellan aktörer i leveranskedja, samt effektivt genomförbara cirkulära lösningar

internationella lagar

Skärpt lagstiftning kring avfall, att fasadtegel inte utan kostnad får skickas som avfall

Ett transportsystem som främjar reverse logistiks och inte bara jobba linjärt. Policies som främjar cirkulär ekonomi på riktigt.

Kvalitetssäkring av de maskinkomponenter som ska ingå i cirkulära flöden.

Fri handel/eliminering av tulldokumentation.

Kompetens, Engagemang

En god hemmamarknad.

Framför allt attityder och förståelse. Detta skulle kunna underlättas genom ESG arbetet och lättöverskådliga standardiserings-plattformar.

Ökad samsyn länder emellan.

Gemensam approach till cirkularitet

Normer, båda kulturella och lagliga.

Återvinning inom anläggningsindustrin är en lokal marknad

Lagstiftning som underlättar och förtydligar när avfall upphör att vara avfall och blir en produkt.

Ansvar för kvalitet
Transparent dokumentation

insamling av textil, mappning och handel av waste, skalning av digitala idn på plaggnivå, policy/standard/lagar som premierar ökat användande av befintliga varor och begränsar användning av nya resurser

Kunskap, nationella, regionala och lokala resurser som är sammanknutna för att vara så effektiva som möjligt.

En global koldioxidskatt skulle kunna ge en bra skjuts åt det cirkulära.
Vår interna erfarenhet är att kunskapsutbyte mellan regioner är värdefullt för att stimulera cirkulära aktiviteter.

Lättnader i avfallslagstiftning. Möjliggöra återtillverkning/återförsäljning av gamla produkter när det gäller lagkrav avseende farliga ämnen - information saknas ofta.

Är ffa de företagsekonomiska incitamenten som behöver klargöras.

Återvinningssystemen av material. Först och främst glas

Internationella KPI kring cirkularitet som man kan räkna in i affärsplaner.
Kanske bra att jobba på att får bort dem negativa KPI:
- Patent begränsningar - dåligt med gemensamma standarder -> Fortfarande inte samma mobil laddare !
- utnyttjande av befolkningsgrupper i vissa länder tillåter låga priser som uppskattas av stora före tag som ska vara role-modells: H&M, Volkswagen -> ingen straff stoppa detta tills idag - varför inte det ?

Bättre förståelse för elektroniktillverkning på många olika plan. Allt från material till processer.

LAGKRAV!! , Även inspireras av Ekodesign

I första hand interna processer men i framtiden behövs standardisering för att kunna recirkulera konkurrentprodukter

Tydliga enhetliga regelverk som följs

Lika juridik på avtalssidan B2B samt utveckling av jordabalken och dess motsvarigheter i andra europeiska länder där vi agerar.
Likhet i syn på LCA, Likhet i syn på värdering av miljöpåverkan över längre livslängder på hissinstallationer

Standardisering av material, förändringar i Baselkonventionen, utvecklade tekniker för materialåtervinning, infrastruktur för insamling av uttjänt utrustning, lagstiftning på t ex EU-nivå, kunskap och kompetens hos inköpare

Mer incitament till att ta hand om befintliga resurser. Det behöver vara dyrare att vara linjär (råvaror) och billigare att vara cirkulär (arbetskraft).
Vi behöver särskilja återanvändning från avfallslagstiftning och börja mäta och följa upp den grad vi återanvänder i. Jag vet att EU utforskar minskad VAT på använd elektronikutrustning. Helt enkelt att fortsätta stimulera det hållbara. Även när det cirkulära är mer lönsamt för alla parter så händer det inte i tillräcklig skala. Mycket handlar om beteendeförändringar.

Värdekedjor och lagstiftning som främjar cirkularitet

Ekonomiska möjligheter / finansieringsmodeller att kunna ställa om till circulär ekonomi ifrån linjär ekonomi.
Logistiska utmaningar - vilket är miljömässigt bästa alternativ gällande var en produkt ska återtas för t ex återvinna, energietvinna, ev.deponi. Mognad i branscher .- initialt dyrare alternativ för många producenter - hur hantera konkurrens mmot slit och släng? Se över lagar - ev lagändring jordabalken för att kunna leasa/leverera produkt som tjänst istället för att man säljer produkt till en fastighet. Energiåterlagringsmöjligheter och regler.. mm

Vilka hinder ser ni för era cirkulära aktiviteter i era export- importmarknader?

Insamlingsgraden påverkas primärt av att det är mer incitament, främst ekonomiska att inte återbruka eller återvinna. Efterfrågan av återbrukade varor o tjänster tror vi främst skapas av att beställare ställer om sina upphandlingar.

Svar: i vår roll att leda ett konsortium för utveckling, tillverkning, installation, drift, uppdatering, nedmontering och återvinning av kompletta rörpostsystem i städer

Behöver anställa mer produktionspersonal, men det är så hög ekonomisk tröskel och stor risk per anställd så vi undviker detta.

Framförallt begränsad tillgång på produkter på andrahandsmarknaden kombinerat med kulturen och mognaden att konsumera cirkulärt. Men största utmaningen är att få in produkter och att ändra beteenden kopplat till det. Trots att det är mer lönsamt för alla parter så händer det inte i den skalan det bör.

Avfallslagstiftningens restriktioner kring export och import av avfall är ett hinder för återtag av produkter.

Grus, sten och jord är lokala produkter. Det finns ingen

Ej relevant. Frågan utgår från att export/import är önskvärt. Det är det inte alltid.

Om vi talar olika marknader, ej i utgångspunkt i export/import men utifrån geografi, så ser vi ett starkare driv i Europa, lett av olika krafter som politisk utveckling och större mognad. Vi ser alltså en viss eftersläpning på andra marknader men trots allt mindre eftersläpning än väntat, till exempel i Nordamerika där det nu verkar börjar hända en del.

Det är mycket som behöver samverkas kring, viktigt att bygga förtroenden, nätverk och att ge och ta.

RE: SOURCE
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Appendix C – Mentimeter answers at the seminar 29 september

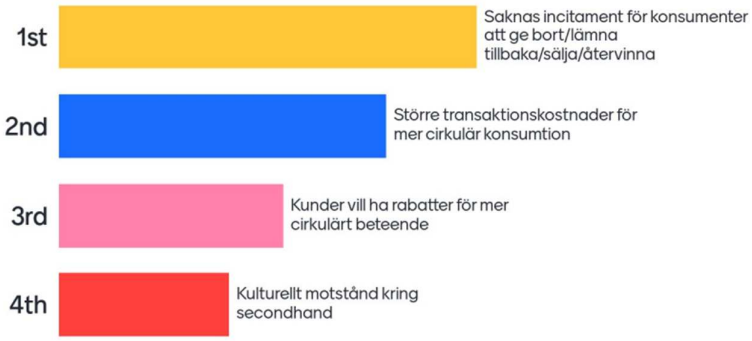
Politik - Vilket hinder tycker du är viktigast?

Mentimeter

30

Konsument - Vilket hinder tycker du är viktigast?

Mentimeter



28

System/teknik - Vilket hinder tycker du är viktigast?

Mentimeter

25

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Samarbete - Vilket hinder tycker du är viktigast?

Mentimeter

23

Hur tror du att värdekedjorna kommer att förändras?

Mentimeter

26

RE: SOURCE
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Vilka branscher representerar ni?

Mentimeter

46

Vilken roll har du i din organisation?

Mentimeter

44