



**CHALMERS**  
UNIVERSITY OF TECHNOLOGY



# **Sustainable Reusable Packaging**

What makes it or breaks it?

Master's thesis in Industrial Ecology

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**DEPARTMENT OF SPACE, EARTH AND ENVIRONMENT**

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MASTER'S THESIS 2021

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## **Abstract**

Today's packaging system presents many sustainability challenges, especially post-use management. The sustainability challenges are in the ecological and social as well as economic dimensions and it is important to address them holistically. Using the framework of backcasting, this thesis explores which sustainability criteria can be used as a guide when developing a sustainable business model for reusable packaging and packaging solutions. Furthermore, the current packaging system is evaluated with respect to the sustainability criteria, to identify challenges that need to be addressed to achieve a sustainable future system for reusable packaging. Suggestions for business models and how they relate to the developed sustainability criteria and future scenarios are also presented, as well as critical aspects that need to be considered to be successful in the sustainable reusable packaging market. The conclusion that can be drawn is that it is important to take a holistic approach to the sustainability challenges. There is one business model in particular that stands out and deliver well when evaluating against future scenarios and sustainability criteria. However, it is up to Stora Enso to decide which recommendations to follow and what trade-offs to make before deciding on a final strategy.

Keywords: Reusable packaging, backcasting, circular economy, sustainability transformation, packaging system



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Sofia Johansson & Emilia Sandolf, Gothenburg, June 2021

## Abbreviations

- **B2B** - Business-to-business
- **B2B2C** - Business-to-business-to-consumer
- **B2C** - Business-to-consumer
- **BMC** - Business model canvas
- **CEPI** - Confederation of European Paper Industries
- **FSC** - Forest Stewardship Council
- **ISO** - International Organisation for Standardization
- **IUCN** - International Union for Conservation of Nature and Natural Resources
- **MLP** - Multi-Level perspective
- **UNEP** - United Nations Environment Programme
- **UN SDG** - United Nations Sustainable Development Goals
- **WCED** - World Commission on Environment and Development
- **WWF** - World Wide Fund for Nature



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# 1

## Introduction

In today's linear economy, high volumes of waste are generated by human activity. Different types of packaging are a large share of this. In 2018, the EU citizens produced 492 kg of municipal waste per capita of which 174 kg was packaging waste[1–3]. 40.9 % of these packages were made out of paper and cardboard, 19.0% plastic, 16.1% wood, 5.0% metal, and 18.7% glass[2].

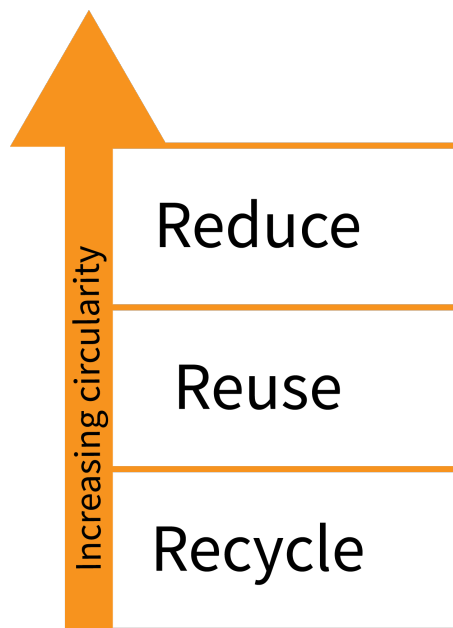
The packaging waste generated can result in adverse impacts on the environment. Landfills poses an environmental burden both as they take up space in nature, and cause pollution in air, soil, and water, while waste treated in incineration plants gives rise to air pollution[1]. Littering of packaging in nature is another aspect that result in harmful ecological impacts. A material getting large attention in the packaging waste debate is plastic. Plastic packaging waste is resulting in negative impacts due to numerous reasons. One reason is its non-degradable nature, combined with the widespread use in single-use packaging[4]. It is estimated that 60-95% of the waste that ends up in the ocean is plastic, with the use of single-use products playing a significant part in the problem[5]. In 2010 alone, 4-12 million tonnes of plastic entered the ocean[4]. Plastic waste poses, for example, a choking hazard to animals[6].

It is not just the plastic containers as such that cause problems but also microplastics. Microplastics are particles with a size of 5 mm or less[7]. One reason for the presence of these particles in nature is said to be mechanic degradation of larger plastic objects[8]. Today, there is still considerable uncertainty about the actual impact of microplastics on the environment[7, 8]. However, research shows that microplastics can act as vectors for toxic and persistent chemicals that may enter the human body through food[9, 10].

The current packaging system poses economic burdens as well. According to a report composed by Ellen MacArthur foundation[11], 95% of the material value of plastic packaging is lost after the first use-cycle. In addition, as much as 32% of packaging is not captured by any collection system, leading to indirect costs to society as it ends up in nature as well as the urban environment. However, the plastic that is actually collected and recycled loses its quality in the recycling process and cannot usually be used in the same application again. The recycled content instead become an inferior form of plastic. This phenomena is called down-cycling and due to this, plastic is usually not recycled a second time.

Despite the negative effects caused by the widespread use of packaging, it will most

likely always be needed one way or another, as long as distribution of goods continue. Given the mentioned environmental and economic drawbacks of today's packaging system, there is room for improvement. But how improvements are best made to achieve the most sustainable packaging system as possible is a complex question. One way could be to shift from a linear to a circular economy. The transition from a linear business model to a circular business model is often represented with three strategies called the 3R framework[12, 13]. These 3R's are divided into categories of increasing circularity, see figure 1.1. According to the 3R framework reuse of products is generally a better option than recycling. However, many surrounding factors have to be taken into account, such as energy use, logistics, costs and social aspects. Although there may be no need for virgin material in the case of reuse, energy and costs for cleaning and logistics have to be considered, as well as the potential inconvenience, for the end users, of returning the packaging. The willingness of consumer to return the packaging must also be taken into account. Reusable packaging can potentially reduce waste and plastic pollution, and result in lower CO<sub>2</sub> emissions compared to single-use packaging[14].



**Figure 1.1:** The 3R framework of circular economy[15, 16]

According to the International Organisation for Standardization (ISO), reusable packaging is defined as:

'packaging or packaging component which has been designed to accomplish or proves its ability to accomplish a minimum number of trips or rotations in a system for reuse.'[17]

Hence, reusable packaging has the same application areas as regular packaging, but requires a system for reuse.

Reusable packaging has also been used in the past but has in many cases been exchanged for expendable solutions in the past decades. The main reason for this trend was to simplify logistics for different actors in the supply chain[18]. However, current trends point towards an increase in reusable packaging, due to the negative environmental effects of single-use solutions[18].

Reusable packaging has the potential to be used both as business-to-business (B2B) and business-to-consumer (B2C) solutions, the former being implemented more extensively than the latter today[14]. Reusable packaging is also used as business-to-business-to-consumer packaging (B2B2C). The B2B reusable packaging market is quite widespread with the use of pallets and plastic crates, but a growing interest in developing B2C and B2B2C reusable packaging can be seen[18]. Reusable packaging in B2B could for example be in form of crates, pallets and bulk containers and are intended to be large and rigid to fit the purpose of the many transports and reuses[19]. B2C applications of reusable packaging could be divided into four main categories: refill at home, refill on the go, return from home, and return on the go[14]. Refill at home means that the consumer buys the container with the desired product, and when it is time for a refill the consumer does it at home by either purchase the refill in stores or online (e.g. personal care products such as soap). Refill on the go works in a similar way as refill at home, only that the refill takes place in a physical store (e.g. coffee to go). Return from home works in such way that the consumer prescribes to a service to retrieve a product by home delivery, and after use the containers are collected by business for cleaning and refill. Return on the go means that the consumers purchase the product but return the packaging themselves e.g. at a store or a place for collection for the containers to be cleaned and refilled. B2B2C applications have the consumer as a final user but the packaging will pass intermediate hands. Examples on B2B2C solutions could be a company that provide a logistics service for reusable packaging when consumers buy products from a third party online.

Reusable packaging could have other benefits besides reducing the environmental impact, such as potentially lowering costs for companies. In a study done by Mollenkopf et al., brand owners have been showed to save money by using industrial (B2B) reusable packaging[20]. However, the same study also mentions that companies do not always experience cost savings related to reusable packaging. It is further explained that studies focusing on evaluating costs for companies regarding reusable packaging in the past has often excluded cost for logistics. Hence, there are studies aimed to solve this knowledge gap by focusing on evaluating variables affecting the cost of reusable packaging solutions, compared to single-use solutions [20, 21]. In aforementioned study, it has been shown that the cost for the container is the variable affecting the profit to the highest extent[20]. Furthermore, the cost appeared to demonstrate that especially for larger containers, reusable packaging was more economically viable, whereas for smaller ones, dispensable solutions were preferable. Other factors of interest were proven to be average daily volume and delivery distance. It was concluded that as the distance for transport increases, dispensable solutions turn out to be gradually more viable. Any similar study focusing

on the potential economic savings for packaging companies has not been found.

Nevertheless, reusable container solutions are also resulting in other costs than those for the traditional expendable alternatives. Investments in the containers as well as in the novel infrastructure needed is inevitable expenses[21]. Other unavoidable expenses includes the costs required for the extra transport needed to implement a returnable packaging system. Finally, costs related to the tracking of containers as well as the supervision of the container quality are needed. Costs that are avoided are instead those e.g. related to discarding and the continuous cost of virgin material[20].

The most positive effects from reusable packaging is connected to the environmental impact. Studies[22–24] have shown that compared to single-use packaging, reusable packaging can have less negative environmental impact when considering greenhouse gas emissions, toxicity, eutrophication and waste generation. Additionally, the energy consumed by the extra transport needed in a reusable packaging system has been showed to be negligible when compared to the overall energy consumption of the whole packaging system[24, 25]. In a study[26] where single use corrugated boxes were compared to reusable plastic containers (RPC) through a life cycle analysis, it was noted that the corrugated single-use boxes had some environmental benefits due to the material, while the RPCs had some environmental benefits due to the fact that it was used several times. Hence, reusable corrugated boxes could be interesting to explore from an environmental point of view. However, further research is needed to determine the environmental and economic impacts of reusable packaging as well as how the logistics may be developed[18].

The demand for packaging is high in society due to the widespread distribution of goods. In addition, the demand is only rising when e-commerce is used to a larger extent. In the EU, the number of people with access to internet that have bought goods or services over internet has increased from 62 to 72 % from 2015 to 2020 [27]. In Sweden, the numbers correspond to 78 and 86 %[27, 28]. E-commerce can be anticipated to increase even more with the global covid-19 pandemic[29].

The increased use of packaging result in concrete challenges for companies that provide packaging. The importance of providing sustainable packaging are getting more critical due to the negative drawbacks of today’s packaging system. An increased environmental awareness among customers and new regulatory measures are both examples on aspects that can encourage the packaging-providing companies to improve their packaging offering[30, 31]. Hence, it is no longer just the current economic gains that are necessary, but also to consider how the company will remain relevant in the long term. Packaging companies that cling on to old patterns and routines risk becoming non-relevant and unattractive to customers<sup>1</sup>. Future policies such as potential bans on single-use items or plastics might even prohibit old business models entirely, or at least put high charges for companies which do not adapt.

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<sup>1</sup>According to employees at Stora Enso



Stora Enso is a listed renewable materials company, which is one of the leading companies in Europe considering packaging solutions, and with business worldwide[32]. Today, single-use packaging is what is dominating current packaging system and hence the type of packaging that Stora Enso is mainly providing. As for every profit driven corporate, Stora Enso need to be able to monetise on their business model. Therefore, it could be of interest to gain knowledge regarding how to be successful even in the future when today's disposable alternatives might not be relevant anymore. Hence, Stora Enso wants to understand how they could play a key role in the transformation towards sustainable packaging solutions.

## **1.1 Aim**

The aim of the thesis is to explore what is required to be successful in the market of sustainable reusable packaging and based on this provide Stora Enso with a good basis for decisions regarding the further development of the company's sustainable reusable packaging offering. The ambition is both to identify new innovations and their business models as well as measures that must be taken to succeed in reusable packaging and meet the sustainability targets. It will also be explored if it is a business opportunity that the company should take at all, based on the sustainability potential of reusable packaging, and if so how to proceed.

## **1.2 Limitations**

The thesis will consider both primary packaging, which is the packaging that is in direct contact with the product, as well as secondary and tertiary packaging, which are used for bulking and transport of products respectively. Business-to-business-to-consumer (B2B2C), business-to-consumer (B2C), and business-to-business (B2B) packaging will all be included in the research. There will be no restriction in terms of material. Even though fibre-based products will have the biggest focus, other materials such as plastic, glass, and metal, will also be examined to be able to look at existing solutions on the market.

The geographic boundaries for the project will be set to include the European as well as the US market. However, the main attention will be on Europe. In the case of legislation, only European law and directives will be considered. The time aspect of the subject under investigation will be set to 10 years for implementation of the potential business model. However, earlier action will be taken in the final action plan developed by the company. The project will result in recommendations for Stora Enso, but no complete action plan as such.

## **1.3 Research questions**

The goal is to gather information about the current state of reusable packaging and analyse potential business models in reusable packaging with respect to sustainabil-

ity principles. This analysis will be used to provide a basis for decision for Stora Enso when deciding if they want to enter the market of reusable packaging or not. The research questions are as following:

- Which sustainability criteria could guide Stora Enso in development of a reusable packaging business model?
- What are the current state of packaging in the European and US market and its sustainability challenges?
- Are there business models in reusable packaging that are suitable for a fibre-based packaging company such as Stora Enso? If so, which ones?
- What are the critical success factors in sustainable reusable packaging?
- If a business model in reusable packaging is suitable for Stora Enso, what are the next steps to be taken?

# 2

## Theory

### 2.1 Sustainable development

The concept of *sustainable development* emerged sometime between the late 1960s and early 1980s[33]. In 1972, a conference took place in Stockholm that addressed the environmental problems caused by man's industrialised society. The conference was requested by the Swedish government as they felt that environmental degradation needed international cooperation. The resolution for the conference mentioned that it was 'desirable to provide a framework for comprehensive consideration within the UN of the problems of human environment in order to focus the attention of Governments and public opinion on the importance and urgency of this question'[34]. During this global conference, there were extensive discussions between the developed countries of the north hemisphere and the developing countries of the south[33]. The discussions focused on the causes of environmental degradation and how to deal with it in the future. The southern countries felt that environmental degradation was a threat to life, while the northern countries felt it was a threat to the economy. This implied that developing countries in the south were in dire need of industrialisation that was sustainable, although the word sustainable was not used here but *ecodevelopment* was used instead. For the rich countries of the north, the focus was more on halting environmental pollution and conserving natural resources. The concept of *ecodevelopment* had earlier been developed by the panel of experts on development and environment at a conference in Switzerland in 1971. The panel stated that the environmental problems were of different character in the northern countries and the southern countries, where the southern countries' problems were more connected to poverty while the problems in the north were connected to the industrialisation. However, they also stated that whichever is the cause of the problems, they are threatening humankind[35].

As a result of the Stockholm conference 1972, *United Nations Conference on the Human Environment*, an action plan was created and United Nations Environment Programme (UNEP) was formed and this was very important for the emergence of the sustainable development concept[33]. Another organisation that was important for this concept is the International Union for Conservation of Nature and Natural Resources (IUCN) which was formed in Fontainebleu in 1948[36]. The focus for IUCN was conservation of the nature. UNEP on the other hand focused on environment and development, but together with the World Wide Fund for Nature (WWF) these two organisations created the *World Conservation Strategy*[37] and in the final

draft 1979 the concept of sustainable development was included[33].

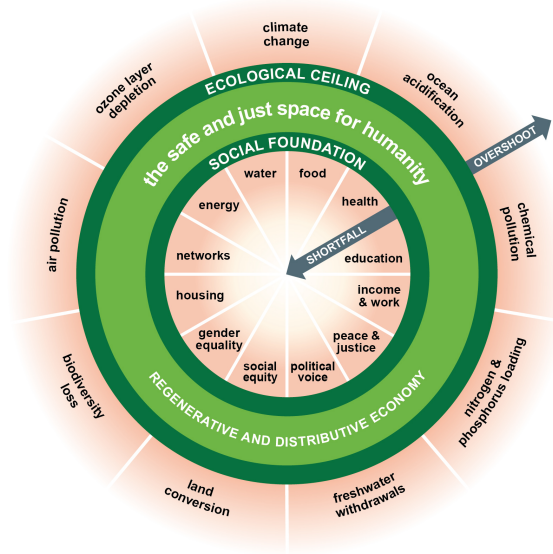
Ten years after UNEP was formed, 1982, a conference was held in Nairobi to review and follow up on the *Stockholm Action Plan* and to chart the way forward for UNEP[33]. The review of the action plan from the Stockholm conference showed that little had been made and that it was needed to put more focus on the interaction between human activities and the environment. The World Commission on Environment and Development (WCED) was established in 1983 as a result of the conference held in Nairobi[33, 38]. The commission published a report in 1987 with the title *Report of the World Commission on Environment and Development: Our Common Future*, also known as *The Brundtland report* after Gro Harlem Brundtland who was the chairman of the commission[33, 38, 39]. In this report, the concept of sustainable development, first mentioned in the *World Conservation Strategy*, was elaborated and the definition of this concept given by the Brundtland commission is

‘development that meets the needs of the present without compromising the ability of future generations to meet their own needs[39].’

Sustainable development can be described in three dimensions; the social, the ecological and the economic[40]. The three dimensions may be considered as preconditions for means that may help us achieve a sustainable society. We do not know what means will be used by future generations to develop in a sustainable way and meet the human needs, but by preserving the conditions that is required for these means, Hedenus, Persson and Sprei explain in their book *Sustainable development: nuances and perspectives* that it could be reasoned that we act in a sustainable way[40].

The three dimensions can be illustrated as a doughnut, see figure 2.1. The doughnut model was developed by Kate Raworth[41] and builds upon the idea of an economy which fulfils the human needs while protecting the ecological environment. The doughnut consists of an ecological ceiling which should not be overshoot, and a social foundation which should not be subject to a shortfall. The space between the ecological ceiling and the social foundation is a safe and just operating space for humanity. It represents a sustainable economy where we do not exceed the ecological limitations but meet the human needs.

The ecological dimension of sustainability consists of two parts: production capacity and the ability of nature to adapt to changing conditions, the so-called assimilation capacity[40, 42]. The first means that nature needs to be able to provide humanity with resources. These resources, also known as ecosystem services, can be *provisioning* such as clean water and edible plants, *regulating* in the form of regulating large environmental systems such as water purification and pollination, *cultural* such as access to outdoor recreation and leisure, and *supporting* which is essential for the other forms of resources to be available. Supporting ecosystem services are needed for the other three services to function and include for example photosynthesis and the cycling of substances. The assimilation capacity is, as mentioned, Earth’s ability to handle pollution and other negative environmental impacts from human activi-



**Figure 2.1:** The doughnut model[41].

ties. An example of this is how the ocean absorbs large amounts of  $\text{CO}_2$  from the atmosphere in order to handle the emissions from human activity. Despite this, the massive emissions of  $\text{CO}_2$ , caused by humans extracting carbon from the lithosphere, are too large for the ocean to handle at the moment, and that is why we experience a rapid warming of the planet[43].

The social dimension of sustainability can be divided into two types of relations, vertical and horizontal, and equity/justice[44]. The horizontal relations consists of relations between people and organisations at the same level, while vertical relations, also called formal institutions, are of a more hierarchical character and include relations between people and institutions, such as legal systems[40]. These two types of relations interact with each other and are not independent. The equity and justice focuses on inter- and intragenerational justice and may be considered to have intrinsic value. If equity and justice have intrinsic value, it must not contribute towards any means for sustainable development in order to be considered important for sustainability, but it is valuable in itself as it is an important part of the definition of sustainable development[40, 42].

The economic dimension focuses on the management of resources that is required for meeting human needs[40, 42]. The resources could be divided into man-made capital and finite natural resources, where the first is exactly what it sounds like; things created by people. The man-made capital can be used to produce goods and refers to things like buildings, human capital, financial capital and knowledge to mention a few. The latter, finite natural resources, consist of e.g. fossil oil and natural gas, phosphorous and metals. The main question regarding economic sustainability is how the capital in the form of both man-made and natural resources, could be man-

aged for the present and the future. In the case of finite natural resources, they are not renewable and there is hence a limited availability. The question of how these resources should be distributed between generations is difficult to answer, especially since we do not know how future generations will want to use them. Something that Hedenus et. al.[40] highlight is that by creating closed circular flows, we can use these resources in this generation, but at the same time ensure that they are available for future generations.

### 2.1.1 Circular economy

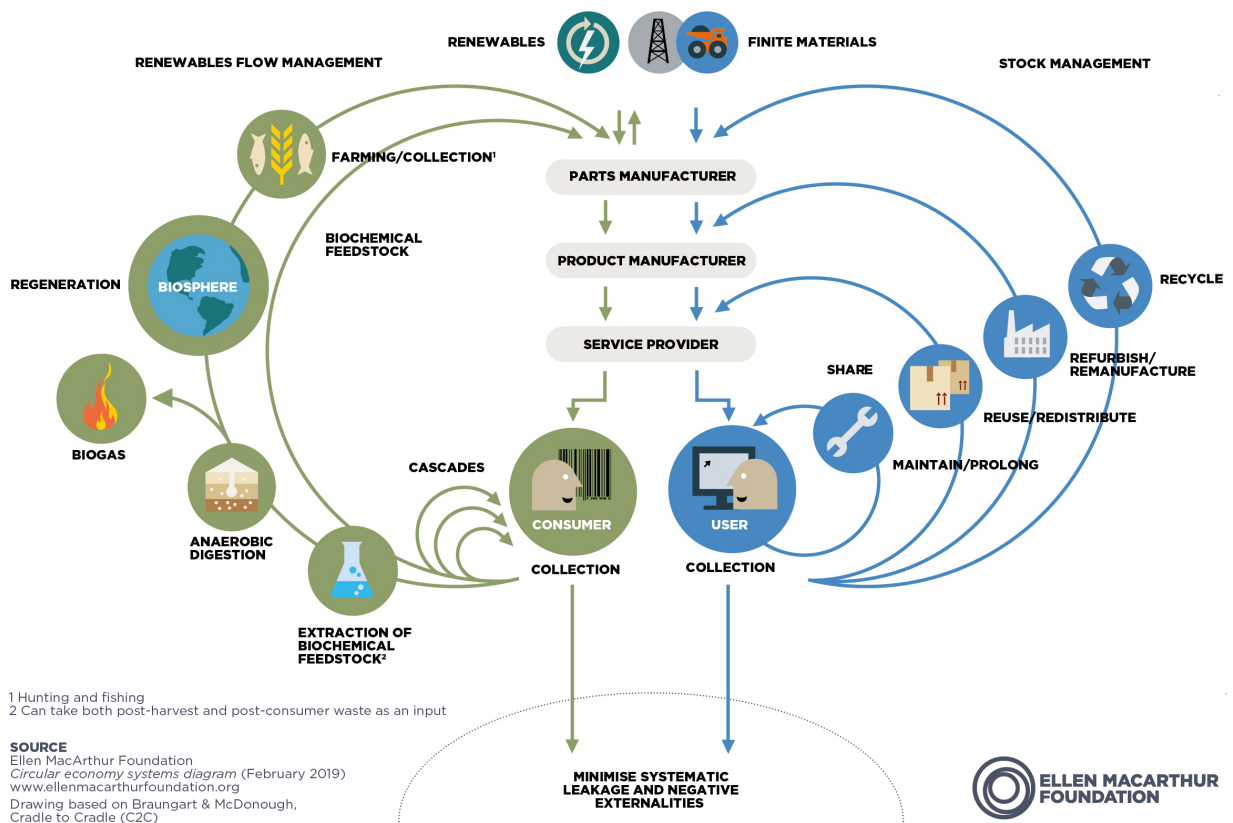
It is not entirely clear how the concept of the circular economy came about, but it is thought to have been inspired by Rachel Carson's book *Silent Spring*, from 1962[16]. Circularity as a concept is something that recurs in natural processes and it is we humans who have introduced linear systems into the world[45]. The linear economy that dominates today relies heavily on optimising the use of resource stocks and streamlining the use and value of created products. The circular economy however, focuses more on maintaining the value of products and goods for as long as possible and optimising the flow of resources, rather than their stocks. The definition of circular economy, according to the Ellen MacArthur Foundation, is:

'an economy that is restorative and regenerative by design and aims to keep products, components, and materials at their highest utility and value at all times, distinguishing between technical and biological cycles[46].'

The circular economy concept hence advocates a system where the product is followed from cradle to cradle instead of from cradle to grave, see figure 2.2. According to Stahel, Braungart and McDonough[47], the cradle to grave approach is in itself unsustainable and following a product in a cycle can be applied in any large system in our society.

Circular economy is often talked about in association to the 3R framework, see figure 1.1, which presents strategies that can be used for transitioning from a linear to a circular economy[15, 16]. The strategies are reduce, reuse and recycle, where the first is preferable. According to this framework, reduce is the preferred approach to use when trying to move from a linear business model towards a circular and more sustainable business model within a company.

Reuse is number two on the list of strategies for transitioning to a circular economy. Although reuse is not the first strategy on the list, it is still a highly favoured over recycling as less material and energy is used. Today, recycling is the most common way of treating packaging in Sweden, corresponding to 70% of all packaging that reaches the market[48]. However, the recycled material is not necessarily converted into new packaging but could also end up as material in other products such as furniture or plastic bags[48]. Although reuse should be prioritised before recycling, according to this logic, reusing is not in itself more sustainable than recycling. It



**Figure 2.2:** An illustration of the biological and technical circular flows in a circular economy, from Ellen MacArthur Foundation and based on Braungart and McDonough's Cradle to cradle concept[46].

is highly dependent on a lot of factors within each system respectively. If 100% of the material is recycled in a system in an energy efficient manner, but in the reuse system all material is disposed at the end-of-life of the product, the system with only recycling is probably more sustainable from an ecological point of view. The environmental impact of reusable packaging depends on variables such as the material, weight, and number of uses[26]. Material and weight influences the ecological impact of a recyclable packaging, but instead of the number of reuses being important, the recycling process in the end of life becomes crucial. What is important to remember though, is that a reusable packaging can only be used a limited number of times before it becomes unfit for its purpose. Therefore, even for reusable packaging, consideration must be given to how it will be treated at the end of its life cycle.

### 2.1.2 United Nation's Global Sustainable Development Goals

The seventeen Sustainable Development Goals (UNSDGs) were launched in 2015 as part of Agenda 2030, a resolution adopted by the General Assembly of the United Nations[43]. The goals aim for a more sustainable world from both a social, economic, and environmental point of view. The goals advocates for human rights

for all people regardless of background but stresses the inequalities that affect the most vulnerable people in the world depending on factors such as gender and socio-economic background. Even though progress is made in certain areas, major action need to be taken for the world to meet all seventeen goals by 2030. Drawbacks such as the ongoing covid-19 pandemic has slowed down and complicated the work and new threats and challenges can be seen over the world. The seventeen goals consist of 169 targets with indicators to follow the progress, and the goals are:

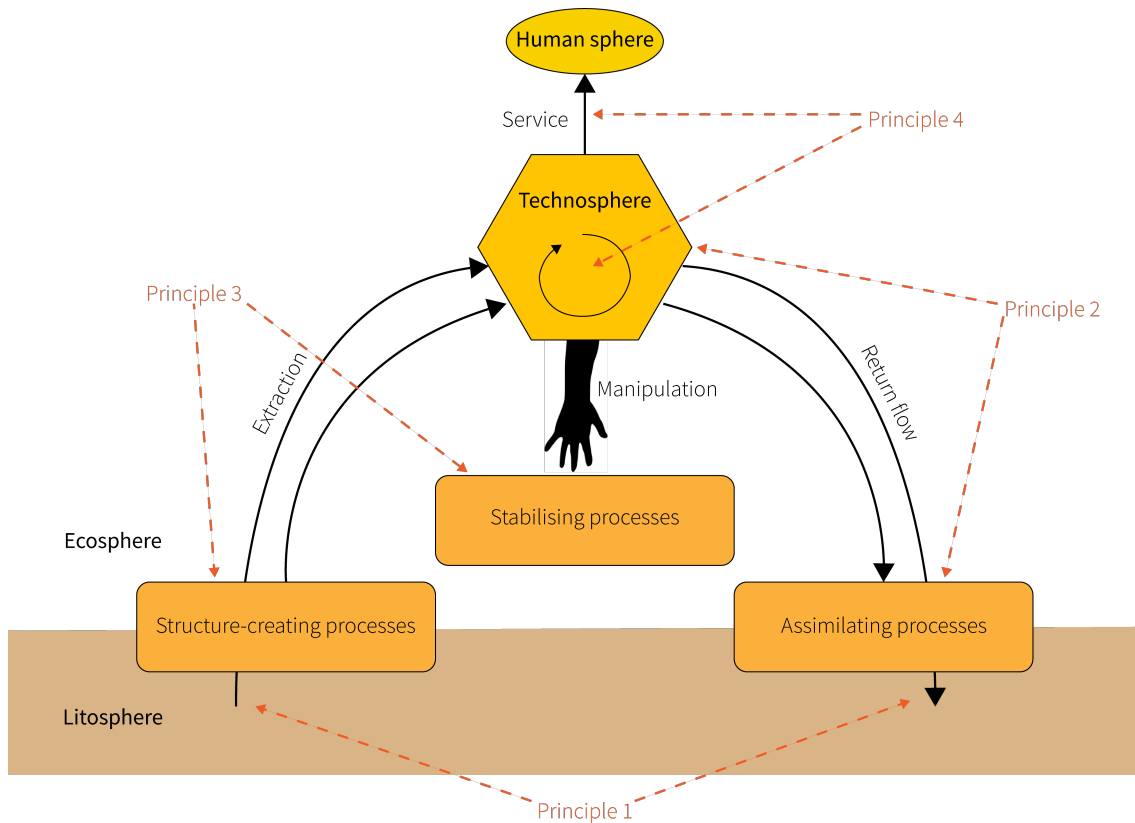
1. No poverty
2. Zero hunger
3. Good health and well-being
4. Quality education
5. Gender equality
6. Clean water and sanitation
7. Affordable and clean energy
8. Decent work and economic growth
9. Industry, innovation, and infrastructure
10. Reduced inequalities
11. Sustainable cities and communities
12. Responsible consumption and production
13. Climate action
14. Life below water
15. Life on land
16. Peace, justice and strong institutions
17. Partnerships

### 2.1.3 4 socio-ecological principles for sustainability

The four principles for sustainability were originally presented by Holmberg, Robért and Eriksson[49] and later further developed by Robért, Daly, Hawken and Holmberg[50]. These are based on the preconditions for life where life cannot be sustained in an ever degrading environment. Hence, basic biological and physical processes such as thermodynamical laws, photosynthesis and the cyclic principle form a basis for the four principles. How all principles relate to each other, the eco-, litho- and technosphere as well as the human sphere is illustrated in figure 2.3. The principles can be seen as system conditions that need to be met in order to have a sustainable society and they are[49, 50]:

1. Substances from lithosphere must not systematically increase in the ecosphere.
2. Substances produced by society must not systematically increase in the ecosphere.
3. The physical basis for the productivity and diversity of nature must not be systematically deteriorated.
4. Fair and efficient use of resources with respect to meeting human needs.





**Figure 2.3:** Centre of gravity of each principle[49].

The first principle means that fossil material and fuels cannot be extracted faster from the earth's litosphere than the earth is able to reintegrate it into the earth's crust. This is due to the fact that an increase in substances from the litosphere in the ecosphere may cause irreversible changes to our environment, that may harm life as we know it today[50].

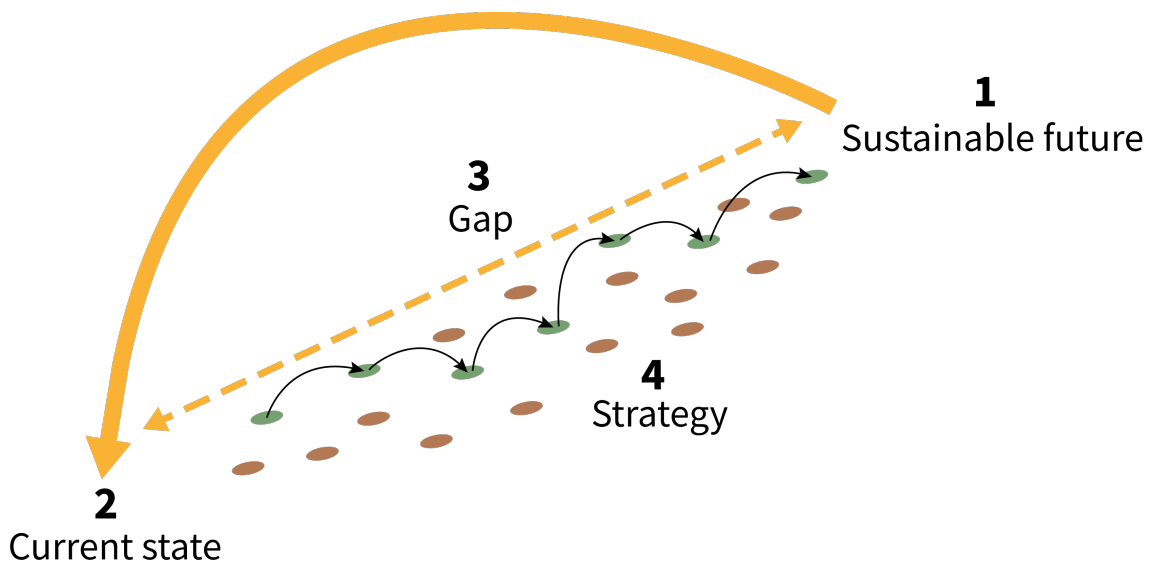
The second principle means that the production and disposal of substances that are produced by society should not be faster than earth's ability to integrate these into natural biological cycles again. As in the first principle, the reason is that increasing amounts of these substances in the ecosphere may cause irreversible changes to our environment, that may harm life as we know it today[50].

The third principle means that we must protect the diversity and productive capacity of the environment by not harvesting or manipulating the ecosystem to an extent that these are deteriorated. If this happens, we will not be able to live out of the things that nature produces for us, since there will be nothing. Without the ecosystem services we will not be able to live as we today[50].

The fourth and last principle means that we need to be resource-efficient when meeting human needs. This is very much connected to the Brundtland definition of sustainable development, see section 2.1. With higher efficiency, more human's needs will be met[50].

## 2.2 Backcasting

According to Holmberg and Rob  rt, people tend to use past experiences and trends to forecast and plan the future[51]. However, if we want to move towards a sustainable future, it might not be best practice to use our unsustainable present as a springboard[52, 53]. Instead, one can assess what needs to be done today in order to reach the sustainable future that we desire[54]. Backcasting is a framework for imagining a desirable and sustainable future based on how we define what is sustainable, and from there explore how we might bridge the gap between the present and our desirable future[44, 51, 52], see figure 2.4. It is especially useful when faced with complex problems where external factors have a strong influence and the problem is based on dominant trends[51]. According to Holmberg and Rob  rt, the time horizon must be long enough to implement large and disruptive changes[51]. This framework might help organisations and society to create a strategy for moving towards a sustainable future through analysing their present with respect to what is desirable in this future[52].



**Figure 2.4:** The backcasting framework[44, 51, 52].

Backcasting can be traced back all the way to 1976, when Lovins explored future energy paths[55]. Later, researchers such as Robinson have developed it in fields that focus not only on energy futures, but also on desirable futures in general[56]. Common to the various methods of backcasting is simply the envisioning of a desirable future, whereupon it is explored by what means one can achieve it[54]. However, backcasting has evolved over the years, and there are now several existing versions that approach the issue in different ways. One example is The Natural Step backcasting approach, which differs from other approaches by considering criteria for sustainability[44].

The strategic backcasting framework developed by John Holmberg and Karl-Henrik

Robèrt, the Natural Step, is conducted through four main steps[42, 44, 52, 54]. These are presented in the list and further explained in the sections below.

1. Defining criteria for sustainability
2. Describing the current situation in relation to the criteria for sustainability
3. Envisaging and discussing the future
4. Finding strategies for sustainability

Within each step of backcasting, different tools can be used. These can be tools for involving stakeholders, analysis of data, design of scenarios and communication[54].

When conducting backcasting, it may be of interest to involve stakeholders in the process. Whether or not stakeholders should be involved, and which stakeholders are relevant, depends on the purpose of the project. For instance, the overall purpose may be the resulting action plan in step 4, or the learning of the backcasting process itself[57]. Hence, the two purposes may require different ways to tackle the problem. Participatory backcasting is an approach of using stakeholder involvement. The approach is essential both because stakeholders are often affected by a project but also because of their knowledge and resources that could contribute vastly to the process[54]. Other advantageous outcomes of involving stakeholders could be increased collaboration and networking amongst interest groups, as well as a jointly created vision of a desirable future with the associated problems and measures[57].

### **Step 1: Defining criteria for sustainability**

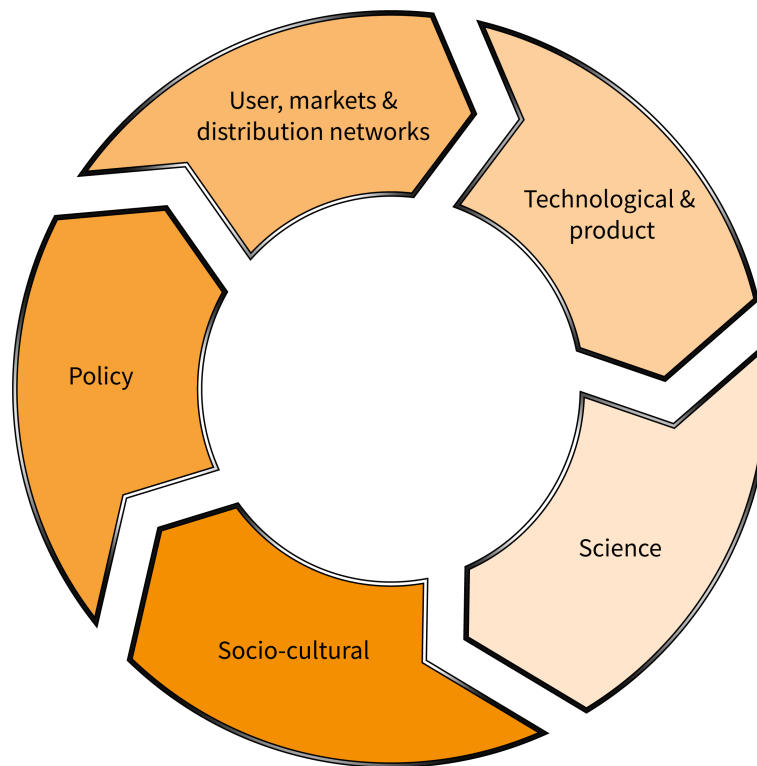
The first step in backcasting is to decide the guiding criteria, also called sustainability criteria, which are used as a framework in the following steps. If sustainability criteria are not set from the beginning, the risk is that existing trends become the base of the work which would oppose the whole backcasting approach[44, 52]. The criteria should be general, since the idea is not to visualise the future in detail, but rather as something that could be the outcome of many different scenarios[51]. When developing criteria for a backcasting project it is crucial to define what is of importance for reaching a sustainable future. The criteria could vary between projects, but in some previous studies the so called system conditions are highlighted [44, 52, 54]. The system conditions explain four main aspects that must not be overly compromised if society is to be considered sustainable. As presented in section 2.1.3, these include to not systematically increase substances from the lithosphere and society in the ecosphere nor systematically deteriorate nature's productivity and diversity as well as having a fair and efficient use of resources with respect to meeting human needs[44].

Another important aspect to keep in mind is that all dimensions of sustainable development should be considered in the guiding criteria. Hence, the ecological, social and economic dimensions must all be treated[57]. Criteria could be developed uniquely for a project but could also originate from an already existing set of criteria. Examples of criteria that could be used are for example the 17 Sustainable

Development Goals and their targets, or Sweden's Environmental Goals[57]. After deciding upon some guiding criteria, weighting can be performed to determine the importance of each criteria. However, weighting is not necessary[57].

### Step 2: Describing the current situation in relation to the criteria for sustainability

After defining the guiding criteria for a sustainable future, the current system should be mapped[44, 52, 57]. The mapping is to be used in the following steps. The current system should be related to the criteria from the first step and the outcome will be a good understanding of the gap between today and the desirable, sustainable future.



**Figure 2.5:** The five categories of the sociotechnical system according to Geels[58, 59]

In order to map the system and relate it to the criteria, detailed inventory tools can be incorporated, such as life cycle inventory, as long as they relate to the criteria[44]. A way of mapping in a structured way is to use the multi-level perspective (MLP) framework[60]. The multilevel perspective is a theory about how technological changes or transformation occur and builds upon the sociotechnical system, i.e. the technological system which is established and maintained by social factors, further explained in section 2.3. The idea behind MLP is that regime shifts are caused by emerging new technologies that are found in the niches. The landscape level may put pressure on the sociotechnical regime and cause instability which creates space for niche technologies to mature and replace or disrupt the current sociotechnical

regime[54].

The sociotechnical system can be divided into five categories, described by Geels[58, 59]. These are presented in figure 2.5. With a basis in these categories one may map the system in three nested levels; macro, meso and micro. The levels have been described by Geels[58, 60] and are called sociotechnical landscape, regimes and niches respectively. The mapping will result in a matrix where the six categories will be mapped at each level.

### Step 3: Envisaging and discussing the future

Step three in backcasting is about envisioning the future and identifying leverage points[42, 44, 61]. This is done in order to bridge the gap between the desirable sustainable future and the present. According to Donella Meadows[62, 63], leverage points are places in a company, organisation or other system where a minor change can make a large and critical impact. The idea is basically that one should identify places in the system where one can intervene and cause a disruption which will transform the system.

Even though efforts are made to steer the development in society towards more sustainable paths, there are voices arguing that the focus does not lie at the origin of the problem, thus the current efforts will not be enough to change the route which society moves along[63]. Instead, efforts are focusing on quick fixes and attempts that does not lead to the transformational changes that are needed[63]. More specifically, research and efforts are often conducted within one discipline, forgetting the system perspective[63]. During this process, it is important to focus on the service delivered by a product rather than the product itself[61]. By opening up and asking wide and open questions it is more likely that radical ideas are created, which might lead to a true transformation.

One theory regarding leverage points, suggested by Meadows, is a hierarchy describing where in a system that interventions are most effective[62]. The theory has later been developed by Abson et. al[63] which aggregated the list of places to intervene into system characteristics consisting of the four categories: *parameters*, *feedbacks*, *design* and *intent*. The leverage points related to *intent* are the most effective points whereas leverage points for *parameters* are the least effective. *Parameters* are adjustable and easy to solve, such as implementing a tax, or changing components of a system such as flows. *Feedbacks* are instead interactions within a system that affects the dynamics between the different parts. *Design* is related to the institutions and social frameworks. Lastly, the leverage points derived to *intent* are about the fundamental values and norms that are the foundation to the existing paradigms in society. The current sustainability science is mainly focusing on the leverage points in the least effective end of the scale, the opposite of what scientists like Abson and Meadows argue effectively would lead to transformational change of society's in many cases unsustainable paradigm [62, 63].

### Step 4: Finding strategies for sustainability

In the fourth step, the strategy that will help move towards the future through the leverage points is created. It is suggested that when deciding upon a strategy, the uncertainties and risks should be acknowledged and used for adaptation of the strategy[64, 65]. According to Holmberg[44], there are four important things to consider when forming a strategy towards the desirable future envisioned through backcasting:

1. Will each of the things we do actually bring us closer to the desirable sustainable future, i.e. will it e.g. reduce our environmental impact?
2. Will the different measures build upon each other so that we do not end up in a dead end?
3. Is each measure going to give us the intended value soon enough? For example, we cannot invest in something that will not pay off until in 20 years.
4. Will the measures actually help in the societal transformation towards a sustainable future and can we change at a sufficient speed without too much losses?

## 2.3 Sociotechnical systems

As both Geels and Ceschin explains, sociotechnical systems are systems that is consisting of different interlinked parts such as technology, policies, infrastructure, etc.[59, 66]. It is further explained that these constitutions together live up to important functions in society. Examples of sociotechnical systems could hence be the transport system or the packaging system. To perform technological transitions, e.g. of aforementioned packaging system, the sociotechnical system needs to change. In a sociotechnical system, it is not only the technology as such that needs to change but also other factors as policies and norms[58].

The socio-technical system could be explained to have three levels: landscape, regimes, and niches[58, 60]. Taking a closer look at regimes, Geels have envisioned the level as built up by five different categories, which were presented in figure 2.5[59]. These categories are built up by interweaved rules, which are not just building up the categories themselves but also link the different categories together. Geels also propose a classification of these rules into regulative, normative, and cognitive rules. The regulative rules are formal rules in society such as laws, sanctions, and standards. Normative rules could for instance be existing values and norms. Lastly, cognitive rules are more abstract and could for example be in form of beliefs or priorities.

## 2.4 Business model generation

Business model canvases are templates used for either presenting old business models or developing new ones. The theory is based on the book *Business Model Generation* by Alexander Osterwalder and Yves Pigneur[67]. The BMCs consist of nine different building blocks that explain how a company is built and by how profit is gained. The building blocks are: customer segments, value propositions, channels, customer relationships, revenue streams, key resources, key activities, key partnerships, and cost structure.

The value propositions explains what kind of value you are offering your customer, i.e. why they should be interested in your product or service. A value proposition could be that your business model offers a very cheap service compared to other companies, or that the design is superior to other products. Customer segments are as the name reveals a description of which types of customers your business aims to reach. Customers could both be end-users as individuals or other businesses that are the users of your products or services. Channels are the ways by which you reach your customers. Channels could hence be for example web-sites or retailers. Customer relationships describes how your company engage with the customers, which could be for example by personal assistance or self-service. Revenue streams are about how the money is generated by your business model. Revenue streams could, for instance, be in form of subscription fees, usage fees, and leasing of your products. Key resources explains what assets that are needed for the business model to function as planned. These resources could both be in physical form such as machines and raw material but also in form of financial resources. Other important assets could e.g. be what is needed from a human resources perspective, such as competent staff. The key activities expresses which activities you as a company should execute for the specific business model to work. If the company sells a product, an example could be production. Key partnerships describes what companies you need to partner up with for your business model to work. A partnership could be for example with suppliers or logistic companies. Finally, the cost structure is about all the expenses that the business model results in. Salaries for the employers and cost of raw material could be examples of costs.

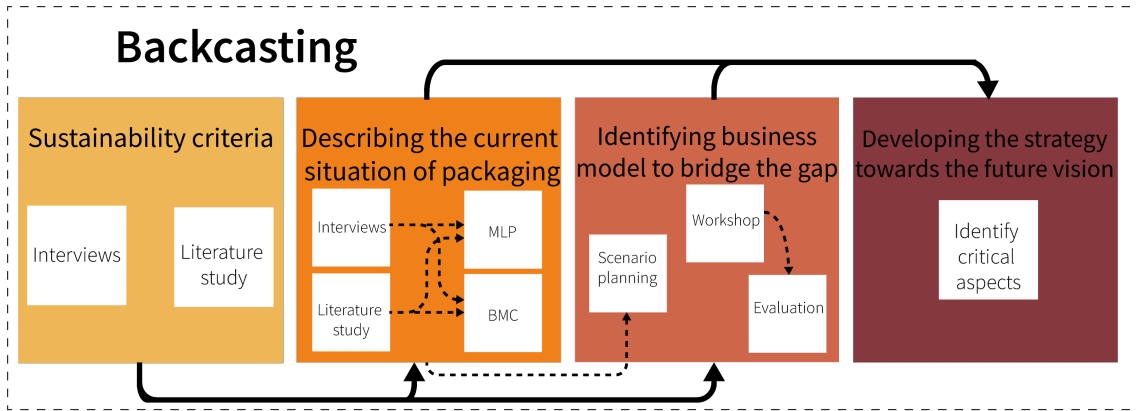
# 3

## Methodology & Methods

### 3.1 Backcasting

The chosen methodology for this thesis is backcasting based on the version of backcasting suggested by Holmberg and Robèrt[44, 51]. The steps in Holmberg and Robèrt’s version of backcasting are as previously mentioned:

1. Defining criteria for sustainability
2. Describing the current situation in relation to the criteria for sustainability
3. Envisaging and discussing the future
4. Finding strategies for sustainability



**Figure 3.1:** The methodological framework with tools included.

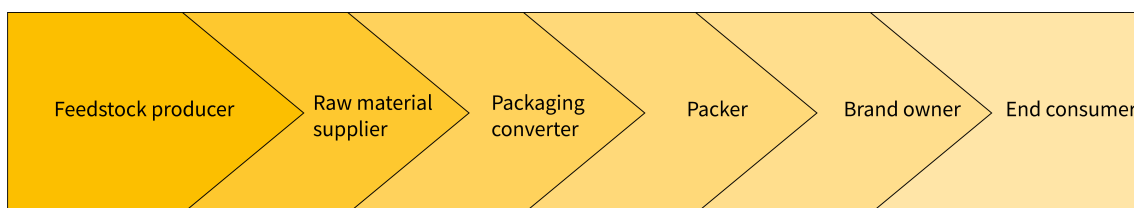
Backcasting is, as mentioned in section 2.2, a useful framework for long-term sustainable development when faced with complex problems that calls for change, where external factors have a strong influence and the problem is based on dominant trends[51]. Today, the packaging system is heavily dominated by single-use packaging, which are recycled or disposed after use[14]. Reusables are hence not dominating at the moment, and it is very complicated to say how to proceed for making such solutions play a bigger role<sup>1</sup>. Hence, backcasting is a suitable approach for the complex and long-term change that need to take place in the packaging system. The

<sup>1</sup>According to employees at Stora Enso



backcasting approach suggested by Holmberg, described in section 2.2, is adopted in the thesis due to the ambition of investigating the long-term transformation from a single-use to a reusable packaging system. But Holmberg's approach is also chosen because of the criteria for a sustainable and desirable future which is often lacking in other types of backcasting approaches. An overview of the backcasting done in this thesis, with tools incorporated in each step, is visualised in figure 3.1.

The packaging system is in many ways complex due its many involved actors, their functions, and other external factors that can disrupt the system. See figure 3.2 for the value chain of the packaging system. The system is built up by many different actors, also called segments, with various functions<sup>2</sup>. Logistics companies could be one such example, which transports packaged goods to retailers or directly to the customer's doorstep. A segment could also be retailers, such as for example grocery-, furniture-, or clothing stores. Converters, i.e. companies transforming raw material to the finished packaging, are another important segment. The converters are in turn dependent on the companies providing them with raw material. And the list goes on. The consumer segment is also an important building block which affects the other segments to a large extent[31]. Consumer demand is, of course, something that affects other segments, regardless of if we talk about retailers, the company producing raw material or the packaging in its final shape. If consumers indirectly demand a lot of packaging when e-sales or general consumption are increasing in society, this demand will naturally result in a larger pressure on companies producing packaging. Environmental awareness is another aspect by which consumers influence the packaging system. If consumers show, by their consuming habits or opinions, that they value sustainable packaging, this will of course affect segments further up in the supply-chain. Another aspect which contribute to the complexity of the packaging system is legislation. Policies could control which materials that are most profitable for companies to produce, e.g. by putting taxes on a specific material such as plastic, or completely prohibiting a certain concept such as single-use packaging[30]. Which policies will be introduced in the future is difficult to predict. One can only make qualified guesses on how legislation on e.g. country- or EU-level will play out in the long term. In addition, there are, of course, other aspects complicating the packaging system. How the different segments collaborate and interplay are crucial. Strategic moves by big players on the market or revolutionary innovations could also have impact on how the packaging system develop.



**Figure 3.2:** The value chain of the packaging system.

<sup>2</sup>According to employees at Stora Enso

The project has been limited to look at the European market, as legislation and regulations can differ significantly between different parts of the world, and in order to evaluate business models against future legislation, this limitation has been made. The time perspective for the project is set to a 10-year period. The motivation behind the decision is that a 10-year frame would be suitable for the packaging problem. It is short enough to remain relatable and relevant in time but long enough for having the chance to disrupt the system[68]. Therefore, even if the time perspective is 10 years, the action plan will naturally mean activities and actions in the years leading up to that. Thus, the chosen business model will have to achieve the sustainability criteria within 10 years, around 2030, the same year as the UN's global sustainability goals are set.

To create a sustainable business model for Stora Enso, business model proposals need to be evaluated based on sustainability potential and future scenarios. Using the version of backcasting proposed by Holmberg and Robèrt, concrete sustainability criteria are developed based on current knowledge of what is sustainable and the company's own goals and strategies. Stora Enso has in some way been involved in all parts of the project. This choice was made because it is important that Stora Enso feels ownership of the issue so that they can continue to drive the change even after the project has ended. The project has thus facilitated Stora Enso's development of the reusable packaging offering rather than given outside expertise. For this reason, the company's involvement in the different parts of the project has been of great importance.

#### 3.1.1 Sustainability criteria

The process of finding criteria for a sustainable future was initiated by a literature study in order to gather information about what criteria that could apply for achieving a sustainable future, i.e. which are the conditions to be fulfilled. Information about Stora Enso's environmental guidelines were studied to first get an insight in what policies and objectives that the company has regarding sustainability[31]. The UN SDGs were also reviewed to see whether some of the goals and their targets could be used as criteria for the study[43, 69–71]. Other frameworks such as the doughnut model by Raworth[41], the planetary boundaries by Rockström et. al.[72] and the four system conditions by Holmberg[44] were also used as inspiration.

Thereafter, interviews with relevant employees at Stora Enso were carried out, in order to make sure that the final criteria were in line with the view of employees at Stora Enso. The purpose of these interviews were to find out how employees with different roles, perspectives, and backgrounds within the division of Packaging Solutions view sustainability and perceive what is needed to reach a sustainable future. The questions asked were regarding criteria needed for reaching a sustainable future. The interview guide with questions in exact wording is available in appendix A. These questions were based on approaching the issue from the perspective of the three dimensions of sustainability[73], namely ecological, economic and social sustainability, see section 2.1. In this step, three employees were contacted. One

employee working with sustainability as a general focus, one focusing on innovation and business development in packaging, and one working specifically with reusable packaging. By interviewing these three specific employees, the perspective about ecological, economic, and social sustainability within the packaging system were all considered to be covered in broad terms.

Interviews were conducted remotely by using video-calls. Questions for the interviews were prepared by using lessons from the book *Business Research Methods*[74] and its content on interviewing in research. The interview style used in this step was semi-structured interviewing which allows the interviewee to quite freely answer questions and the interviewer to deviate from the questionnaire depending on the answers[74]. The choice of interviewing method was explained by the qualitative nature of what information that was sought for. Semi-structured interviewing is also explained to have advantages when more than one person are conducting interviews which was the case. At every interview, one of the authors asked the questions while the other author wrote down the answers from the interviewee.

Criteria was then set based on both relevant insights from the literature study and the conducted interviews. A table was constructed in the online tool Miro, a visual collaboration platform, to collect possible criteria to use in the study. The table presented criteria in four different categories which arose from various sources. The categories were: findings from literature, findings from Stora Enso's written guidelines, findings from the interviews, and own personal insights and suggestions. The different categories gave hence rise to various suggestions of criteria. See table 3.1 for visualisation.

**Table 3.1:** Visualisation of the table presenting criteria in the different categories.

Sustainability criteria				
Category	Literature	Stora Enso	Interviews	Own suggestions
Criterion	.....	.....	.....	.....
Criterion	.....	.....	.....	.....
Criterion	.....	.....	.....	.....

Thereafter, criteria in all categories were grouped based on their content, either as environmental, social, or economic significance. See table 3.2 for visualisation. An appropriate number of criteria were chosen as relevant for the specific project.

The final goal was to achieve around six to twelve criteria, with a balance between ecological, economic, and social criteria. The selected criteria were then grouped once again, but this time based on similarities within the environmental, social, and economic dimensions. One such example could be related to *restriction of emissions* in the environmental dimension, where pollution both from waste and production could be included. Another example could be about *responsibly sourced materials* in the social dimension, which could include both to support human rights and to prevent corruption. The different resulting groups were hence aggregated in a collective name such as *responsibly sourced materials*, which represented one final criterion. The original criteria resulting in the final criterion were however kept as explanations on what the final criteria could include. Lastly, before proceeding to next step of the method, the formulations of the criteria were slightly or remarkably changed to best explain the meaning of them. Hence, nine criteria in total were obtained, i.e., three criteria per sustainability dimension.

**Table 3.2:** Visualisation of the table presenting criteria after grouping based on content.

Sustainability criteria			
Dimension	Environmental	Social	Economic
Criterion	.....	.....	.....
Criterion	.....	.....	.....
Criterion	.....	.....	.....

The criteria were formulated as goals rather than actions. The thought behind formulating goals is that the sustainability work will be an ongoing process for Stora Enso. If the criteria would be formulated as actions, there would not be the same incentive or reason to continue improving once these actions were taken. One example could be related to *restrict emissions of greenhouse gases*. If the criterion instead was formulated in a way that greenhouse gases should be decreased, that could imply that the goal would be fulfilled only after a negligible decrease. Formulation of goals is hence a conscious strategy.

### 3.1.2 Describing the current situation of packaging

The mapping of the current packaging system was primarily performed by using two different approaches: the *multi-level perspective* (MLP)[59], see Step 2 in section 2.2, and the *business model canvas* (BMC), see section 2.4. However, information about consumer preferences was gathered by conducting a consumer survey. The multi-level perspective was chosen as a tool since this gives a good overview without too much details. BMC is used for describing Stora Enso's current business model since it gives a good overview of current situation.

Mapping with the MLP approach was performed by collecting information in three different ways. The information sought for were anything of relevance when it came to the so called rules of the game (see section 2.3) in the five different categories for the sociotechnical regime. The information searched for related to the rules of the game was found by conducting a literature study, and by interviewing employees at Stora Enso. Information sought for was also related to the landscape level in the sociotechnical system. Information regarding the landscape level was primarily found by a literature study. Information regarding the niches (see Step 2 in section 2.2) in the sociotechnical system was also requested. The niche-information was however ordered by Stora Enso and conducted by an outside tech and innovation field research company, named Catapult. To sum up, different information used in the mapping process were obtained by performing a literature study, conducting interviews, and by retrieving information from Catapult.

The literature study was partly performed by looking through reports on reusable packaging[75]. Databases such as google scholar were used to search for information about the different categories in the regime connected to the packaging system. Example of search words used are: *policy + packaging system*, *infrastructure + packaging system* or *norms + packaging system*.

The interviews in this stage were conducted with four employees at Stora Enso. The first employee had a role focusing on sustainability at large, the second focusing on innovation and business development in packaging, the third working specifically with reusable packaging, and the fourth specialised on legislation affecting packaging. They were selected due to their competence in a broad range of areas. By interviewing mentioned employees, all categories of the sociotechnical regime were considered to be covered. The interview question hence focused on the five different categories in a sociotechnical regime:

1. Policy
2. Users, markets & distribution networks
3. Technology & product
4. Science
5. Socio-cultural

The exact wording of the questions asked during the interviews can be found in appendix A.

The information ordered from an outside consultant firm was about the niche level in the sociotechnical packaging system. Catapult was hired by Stora Enso to do tech market research on the topic reusable packaging. The research was performed to find already existing reusable packaging models, focusing on companies founded after 2005, i.e. niches on the area. However, the information from the Catapult research was not mainly intended to work as a base for the master thesis, but for Stora Enso's knowledge regarding the issue. The result from the consultancy work was to find the existing start ups and actors with a reusable packaging business model. The investigation searched for B2B, B2C as well as B2B2C solutions. Fibre-based containers were the main focus but other materials was not excluded in their research. The geographical boundaries for the consultancy work were Europe and North America.

Information for creating the business model canvas was found by using different sources provided by Stora Enso, such as the annual report of 2020. Information was also obtained by conducting interviews with employees at Stora Enso with good knowledge about the company's business model. Semi-structured interviewing and video-calls were used to conduct the interviews. The questions were related to channels by which the company operates, customer relationships, revenue streams, key activities of Stora Enso, key partnerships, and cost structure of the company. Exact wording of the questions that were asked during interviews can be found in appendix B.

After the mapping of the system had been conducted, the elements of the sociotechnical regime that can be considered as challenges for achieving a sustainable future were identified. This was done by qualitatively analysing the results in each category with respect to the sustainability criteria developed in the previous step.

#### **Consumer survey**

In addition to the MLP and BMC, information was collected by sending out a consumer survey. The survey was conducted to better understand the consumer segment and the potential interest that consumers could have in reusable packaging, with the purpose to identify potential success factors. Success factors can be explained as aspects important to succeed with a specific solution, in this case reusable packaging. For example, it could be well-functioning and smooth logistics when it comes to the returning of packaging, or increased convenience for customers.

Questions were asked regarding what aspects that would make one consider using reusable packaging, which applications that one would consider using reusable packaging in, and if there is any material of preference. The reason for using a survey instead of interviews was to reach a maximum number of individuals and to save time. The surveys were shared on the social-media channels Facebook and LinkedIn. The exact wording of the survey questions could be found in appendix D.

The results from the consumer survey were then analysed by compiling the informa-

tion from different questions into pie charts and bar charts, depending on what was most suitable. Pie charts were selected for the yes-no questions whether bar charts were used when multiple answers were possible. Then, the charts were analysed by checking which clear trends were visible. The analysed result were used in the recommendations and strategy for further development of reusable packaging business models in section 4.4.

### 3.1.3 Identifying business model to bridge the gap

The identification of a business model, the company's plan for making profit, to continue with to the next step of the process, strategy development, was mainly done in three parts: conducting a workshop, developing scenarios and evaluation of business models with respect to sustainability criteria and future scenarios. The workshop was performed to create and develop potential business models in reusable packaging by using *business model canvases* (BMC). The scenarios were developed to test the business models from the workshop in relation to possible futures, where the time perspective was 10 years in the future. The validation was performed to ensure that the business models can work in many likely future scenarios. The result from the workshop and three business models from the mapping of niches, conducted by Catapult, were then analysed with respect to both the developed scenarios and the sustainability criteria. See 3.1.2 for more information about Catapult.

#### Workshop

About 20 employees at Stora Enso, as well as a few external stakeholders were invited to the workshop where the goal was to come up with potential business models for reusable packaging at Stora Enso. The participants were selected based on their knowledge about the company, the packaging system, and innovation on the topic. Selection was hence performed in such way that people with different competences could take part in the workshop. This included everything from designers, business developers, sustainability specialists and top management, to mention a few.

The workshop was executed online, by using the video-software programme Zoom and lasted for two full hours. The workshop was initiated with a short introduction of the workshop and a introduction of the first workshop exercises to come in a joint zoom-call. Then, the participants were sent to breakout-rooms together with their group members. However, at every new exercise, the breakout-rooms were closed for everyone to get back into the main zoom-call for new instructions. The participants were split into groups of five. It was decided that groups of five would be an appropriate number of people working together since it is not too big for everyone to be able to make themselves heard. The size still results in the possibility for a wide range of competences participating in the same group. Group constellations were hence decided beforehand to ensure diverse groups. During the workshop, it was possible for the participants to digitally send out a request to ask for help from the organisers of the workshop (the authors of this thesis). The organisers could hence visit the

breakout-rooms if the participants wanted to raise any concerns or ask any questions.

The schedule of the two hour long workshop were as followed:

1. Introduction
2. Warm up (in breakout room)
3. Brainwriting instruction
4. Brainwriting (in breakout room)
5. Voting (in breakout room)
6. Short break
7. Idea dashboard instruction
8. Idea dashboard individually (in breakout room)
9. Concept development in groups (in breakout room)
10. 30-60 seconds pitch & feedback
11. Refine & develop from feedback (in breakout room)

The online tool Miro was used for the participants to put down ideas etc. in written text. A tab in Miro was prepared before the workshop for every group so all groups had a separate tab to work in undisturbed. Each tab contained a schedule for the workshop, and virtual post-its for the participants to write down their thoughts and ideas in each exercise. In the idea dashboard exercise and conceptual development, empty *business model canvases* (BMC) were prepared for the participants to fill in.

The workshop started with an introduction of the thesis, the aim and plan for the workshop, and technicalities related to the use of Zoom and Miro. However, the participants were already briefed about the project and workshop plan since a PM was sent out a couple of weeks in advance. The PM included the most essential information about the thesis and workshop.

A warm up exercise was performed for the participants to get into a creative mindset. The concept of the warm up was to come up with really bad ideas. One example could be candy that tastes like mud. The next step was for the participants to share the ideas with their group. Thereafter, one of the bad ideas was chosen for further development. Next step was to come up with selling points for the bad idea. Continuing with the mud-tasting candy example, such selling point could hence be to make society consume less sugar and in this way improve dental health. The last step of the warm up was then to share the selling points with the group.

The second exercise, called brainwriting, was performed to generate ideas for reusable packaging business models to proceed with in next exercise. The brainwriting exercise was initiated by letting the participants individually write down three ideas related to reusable packaging. It was presented to the participants by asking the question: How can Stora Enso engage with reusable packaging? An idea could hence be a weekly prescription on groceries in reusable packaging or a collaboration with restaurants where Stora Enso could provide reusable take-away boxes. The time



was out after three minutes. The next step was performed by rotating the ideas clockwise within the groups. Thus, Participant 5 gave their ideas to participant 1, participant 1 gave their ideas to participant 2, etc. When a participant received another person's ideas, they had three minutes to either develop them or write three new ideas. When the time was out, a new clockwise rotation was done. The same procedure was repeated. The writing was performed the same number of times as there were people in the group, so that everyone had the chance to continue on all participants' initial ideas. When the brainwriting session was over, voting was performed in the group. Each produced idea got a sticker presenting the quality of the idea. A star represented a great idea, a plus represented an idea worth considering, and a minus represented an idea that should be rejected. All participants voted for every idea, one idea hence got the same number of stickers as participants in the group. The stickers were primarily used to indicate which ideas that the participants wanted to proceed with. Thus, no criteria regarding what implied a great idea etc. was presented to the participants.

If the participants found the brainwriting exercise hard in terms of creativity and coming up with ideas, assistance was provided in form of written tips prepared beforehand. The tips were both tools to help creativity and inspiration from already existing business models. The creativity tools were for example negative brainstorming, and user perspective. Negative brainstorming is performed in such way that one should come up with a really bad idea and then invert it. User perspective is done by coming up with ideas related to a specific user. One could hence ask oneself the question how a good reusable packaging look and function for e.g. your grandma, or a single toddler mum. The inspiration from already existing business models were prepared from material provided by the consultancy firm Catapult (see section 3.1.2). The material provided was in form of examples of start ups in Europe and North America providing a reusable packaging service. The written tips was a short sentence summary each of the service the start ups are providing.

After a short break, the idea dashboard exercise was performed. The purpose of the dashboard exercise was to develop the business models generated in the brainwriting exercise by using BMCs. From the voted ideas in the brainwriting exercise, every participant chose one idea they wanted to develop further, based on which ideas they liked personally. No other criteria were set. Participants were free to choose any idea, regardless if another person had already picked it or not. The ideas marked with stars and pluses were favoured. The exercise was performed individually on a BMC. The participants were instructed to fill in the BMCs as much as they could, but it was emphasised that they did not have to be very detailed. They were also instructed to not yet consider if the business models would be feasible in real life. After twenty minutes, the time was out for the idea dashboard exercise.

In the idea dashboard exercise, help was provided in form of an already existing BMCs with examples of elements in the nine different building blocks. It could for instance be examples on key partners such as restaurants, grocery stores, logistics companies, etc. On customer relationships, elements could be regular subscriptions,

personal assistance, or on demand.

After the idea dashboard exercise, one idea was collectively chosen by the group for further development. The group could also agree on combining two different ideas in the concept development depending on where they saw the greatest potential. Potential could be regarding whatever the group considered interesting to work further on, e.g. based on what they believed would be a suitable business model for Stora Enso to engage with. The groups had 25 minutes to jointly further develop the chosen idea and continue to fill in the BMC with further details. During the allocated time, the group also had to prepare a pitch for about 30 to 60 seconds about their proposed business model. They were free to use aids such as PowerPoint if they preferred.

The pitches from all four groups were then presented in the main zoom-call where all participants were present. Hence, four pitches in total were executed. Thereafter, the participants had a chance to give feedback on the other groups' suggestions. The groups had then around ten minutes to refine and develop their idea before the workshop session ended and they had to hand over their finished BMC.

After the realisation of the workshop, the developed business models were analysed based on the four future scenarios and the sustainability criteria.

#### **Scenario development**

Scenario analysis has been chosen as a tool in this research to ensure that any chosen business model is resilient and can operate in multiple future scenarios. The scenarios were developed based on the theory of scenario planning[76]. The scenario development was performed by the following steps:

1. Collect information about risks and uncertainties
2. Decide upon the two most critical risks
3. Create a scenario matrix
4. Exploring factors important in the matrix
5. Write descriptions telling the story of each scenario

The first step in the creation of scenarios was to collect information on uncertainties and risks affecting the packaging system in the near future, more specifically the coming 10 years. What is meant by risks and uncertainties in this case is factors that likely will effect the future of reusable packaging depending on how they play out. Examples could be legislation or extent of consumer awareness. The information was gathered to later be used in the creation of the scenario matrix, when the two most critical uncertainties were translated into one axis each. The axes were then used to explore factors that could affect the uncertainties, and later also used when writing stories about the future scenarios. The matrix hence resulted in four quadrants, representing one scenario each.

The search for information about risks and uncertainties was partly done by interviewing individuals from different segments in the packaging system (see appendix C) and partly by reading Stora Enso's 2020 Annual Report[77], which presented the most important risks from 2020 that could affect Stora Enso's financial results and future performance. The risks ranged from low to high impact, from short-term to long-term and from low to high level of possible management impact. The risks with a high level of potential management impact were rejected because the company has the ability to prevent the risk from affecting the future of packaging. Hence, the focus was to include factors beyond the company's control.

Another report used for inspiration and fact-finding was *Rethinking the Packaging System* by RISE[78]. The reason for not using RISE's scenarios as they were and instead constructing new ones, was to not focus on the future of reusable packaging. In RISE's scenarios, the scenarios are more focusing on the future of the packaging system at large. In the RISE report, four scenarios for the future packaging system were presented with degree of *social stakeholder pressure* being one axis and extent of *value-creating innovation* being the other axis. Year 2030 is the year the scenarios play out. The RISE scenarios were named *Stuck in the mud*, *The Blame Game*, *The Cold Shoulder*, and *A circular Dawn*. Apart from gaining inspiration from RISE's scenarios, they were compared to the scenarios developed in this project. A comparison was done to give a hint regarding the relevance and credibility of our scenarios. In the *Stuck in the mud* scenario, the future is predicted to remain in many ways like the situation today. Investments related to circular economy have not been a priority. The *Blame game* scenario explains that impulsive and unconsidered packaging legislation have been introduced by pressured policy makers. However, the policies demonstrates no effectiveness regarding a circular transformation of the packaging system. The *Cold shoulder* scenario describes a 2030 when innovations by packaging industry are relatively high. However, the majority of consumers are not adopting these innovations and policy makers are not presenting much new legislation in favour of circular solutions. A *Circular dawn* scenario portrays a future of effective environmental legislation, high innovation, and engaged consumers.

The risks and uncertainties of stakeholder pressure, used in RISE's scenarios, were considered to be relevant also in this project. Stakeholder pressure, on one axis, was in the RISE report explained as combining the issues of legislation, change in consumer behaviour, and change in demographics. Risks and uncertainties connected to the extent of value-creating innovation, representing the second axis, as RISE propose in its scenarios, were also considered relevant in our scenarios. In this context, innovation are explained as technical improvements within or outside the packaging value-chain, as well as strategic interventions.

Since our project considers the future of how Stora Enso will be affected and not only the packaging system itself, as in the scenarios developed by RISE[78], it was decided that the stakeholder axis should also consider competitors and the paper industry's moves since they unquestionably affect Stora Enso one way or another. Competitors and market demand was presented as a key risk with low level of management

influence in the annual report by Stora Enso, which supports this reasoning[77].

In this thesis, it was reasoned that *demand* and *ability to meet demand* were the two most critical uncertainties to consider. The reason for choosing these formulations in particular is due to their very broad meaning. *Demand* could include everything from legislation to consumer behaviour, similar to RISE's scenarios. If a policy such as ban on single-use packaging would come into force, an increased demand of reusable packaging would be a likely consequence. Similar, if consumers would become increasingly environmentally aware, demand of reusable packaging could increase. Unlike in RISE's scenarios, competitors moves are as mentioned integrated here. Competitors moves could affect the demand in such ways that the demand for Stora Enso's reusable packaging could go down if competitors can offer better reusable packaging. *Ability to meet demand* is also a formulation covering a broad range of issues. Just as in RISE's scenarios, the extent of value-creating innovation was considered important here since innovation clearly affect Stora Enso's ability to meet demand. If innovation related to reusable packaging is high at the company, this will naturally result in a higher ability to meet a demand for reusable packaging. Strategic interventions will affect the ability in the same way. If Stora Enso make thoughtful and wise strategic interventions regarding the reusable packaging offering it will boost the ability to meet the demand in the long run. The y-axis was hence named *Demand*, and the x-axis was assigned the title *Ability to meet demand*. The four quadrants represented a scenario each, see figure 4.8.

After deciding on the axes, the scenarios were developed. The online-tool Miro was used for the purpose. The two axes were drawn in Miro. Thereafter, each axis was filled with post-its with written factors that could have an impact on the *demand* and *ability to meet demand*. The factors were brainstormed based on the mapping of the current system, see section 4.2. Some of the factors used in the scenarios were:

- High or low innovation
- Lack or no lack of competence
- Failed or succeeded investments
- Bad or good reputation
- Low or high possibilities to expand
- Low or high collaboration between segments
- Good or bad deals for customers
- Cheap or expensive reusable solutions
- Troublesome or well-functioning return services
- Mostly focus on recyclability
- Level of environmental awareness
- Single-use bans
- Plastic bans
- Other regulatory changes
- Global warming
- Macroeconomy

- Digitalisation
- Sourcing

The factors were placed along the y-axis based on whether they contributed to an increase or decrease in demand, or the x-axis based on whether they resulted in a high or low *ability to meet demand*. When the axes were combined, the factors ended up in any of the four quadrants, after which the scenarios were written.

The four scenarios were written as stories all imagining an alternative future. Based on the factors, e.g. single-use packaging ban, increased consumer awareness, high innovation, a narrative were played out. When the stories were written, the essence of them were captured by naming them in a way that described the four different situations well. The fully developed scenarios could be found in section 4.3.1.

## Interviews

Information regarding risks and uncertainties was also collected by conducting interviews with individuals from different segments in the packaging system. The purpose of the interviews was also to understand success factors for reusable packaging. In this step, seven interviews were conducted and who should be contacted was decided in consultation with Stora Enso. The segments contacted in this step were:

- Packaging suppliers
- Brand owners
- Logistics companies
- Retailers
- Experts/Researchers

The interview guide with questions in exact wording can be found in appendix C. The interviews were conducted by using semi-structured interviewing. Interviews were performed to validate the already constructed scenarios, but also to find success factors regarding reusable packaging. The success factors were later used in the recommendations and strategy for further development of reusable packaging business models presented in section 4.4.

## Evaluation of the business models

A number of business models of reusable packaging were finally analysed in relation to the sustainability criteria and the four developed scenarios. The business models that were analysed was the four business models developed by Stora Enso's employees during the workshop, but also three business models that Catapult had mapped during their tech market research (see section 3.1.2). The three business models found by Catapult were one B2B2C, B2C, and B2B business model each. Out of all

business models Catapult presented in their result, the final business models analysed in this thesis were chosen based on their relevance to Stora Enso. The choice was made in dialogue with the supervisor at Stora Enso to ensure that they in fact were relevant. The choice was also made in such way that the three business models did not operate in the same business segment (e.g. restaurants, grocery stores, transport etc) to get a diverse distribution of companies. B2B, B2C and B2B2C are all relevant groups of business models and therefore one business model from each of these overall groups was selected. A total of seven business models in reusable packaging were analysed.

The evaluation of the seven business models against the sustainability criteria was done by constructing a table with all business models on the y-axis and all criteria on the x-axis, creating a square pattern, see table 4.5. Then, a grading system based on the colours red, yellow, and green were used for all combinations of business models and criteria. The colour grading system was used to perform the evaluation on a qualitative level. A square was assigned the colour red if it was assessed that the business model would not be able fulfill the criterion. A yellow square meant that it was not sure if the criterion would be fulfilled with the business model, and that further investigation would be necessary. Lastly, a green square represented the fact that the criterion most likely would be fulfilled with the business model.

The evaluation of the seven business models against the developed scenarios was performed in a very similar way to the evaluation against the sustainability criteria. A table was constructed with the seven business models on the y-axis and the four scenarios on the x-axis, see table 4.6. One square hence presented one business model operating in one specific future scenario. The square patterned table was then filled with red, yellow, and green colours. In this evaluation, the colour of the square represented whether the business model would operate well in a specific future scenario or not. The colour red hence represented a business model that would not work in a specific future. The yellow colour indicated that the business model might work in the specific future, but some adjustments or further investigations are needed to say for sure. A green coloured square represented a business model that most likely would work in the developed scenario. No recommendations on which business models should be investigated further were made, but only this decision support was provided together with recommendations for each business model, in case Stora Enso chooses to proceed with any of these.

#### **3.1.4 Developing the strategy towards the future vision**

The last step of the backcasting was to develop a strategy for the future vision. It was done by two major steps: to identify critical aspects for a number of chosen reusable packaging business models, and to formulate general recommendations about Stora Enso's future reusable packaging offering.

As no business model both met all criteria and worked in all future scenarios, there was a need to address and act on the challenges for each business model if one wants

to move on with a business model. To illustrate these critical aspects for each business model, a table was constructed. On the y-axis, the seven business models were presented. On the x-axis, all critical aspects (in table 4.7 called recommendations) that had been seen when evaluating the business models against the sustainability criteria and scenarios was demonstrated. With other words, factors that affected whether a criterion for a business model was rated yellow or red, was considered critical aspects. When the table was constructed, all business models were evaluated against the critical aspects. If a critical aspect was relevant to address or take action on in relation to a specific business model the square was filled. Based on the final result of evaluating the seven business models against critical aspects, recommendations regarding the business models with highest potential could be done. What is meant with high potential is mainly business models displaying very few critical aspects. Few critical aspects most likely means that the challenge to implement the business model, or a similar one, is smaller than for those with many critical aspects. Recommendations based on the results from this step were then written.

The last step was to formulate general recommendations for Stora Enso. These recommendations was based on general finding during the process of conducting the backcasting. It could both be things unrelated to the critical aspects explained in the last step, but also critical aspects in common for all business models and hence not included in the table.

# 4

## Results

The results to be presented in this chapter are the developed sustainability criteria, the current state of packaging, business models in reusable packaging, and a strategy towards the future vision. Included is also an evaluation of the business models with respect to the sustainability criteria and four future scenarios. Some criteria are not met in all business models, nor do all business models work in all scenarios. In the strategy towards the future vision there are therefore proposed measures to address this.

### 4.1 Sustainability criteria

**Table 4.1:** Criteria for a sustainable future.

Sustainability criteria		
Environmental	Social	Economic
<i>Respect the forest environment</i>	<i>Responsibly sourced materials</i>	<i>Meet consumer choice and expectations</i>
<i>Restrict emissions of greenhouse gases</i>	<i>Responsible production</i>	<i>Reasonable cost for infrastructure</i>
<i>Restrict the emissions and accumulation of substances produced by society</i>	<i>A good working environment</i>	<i>Preserve resources for current and future generations</i>

The criteria for a sustainable future are presented in table 4.1. They cover all Stora Enso's activities, including suppliers and subcontractors. This means that it is also Stora Enso's responsibility to control that these criteria are respected



throughout the whole value chain. The criteria are sorted into the three dimensions of sustainability. The environmental criteria emphasises the need to live in harmony with nature and not contribute to a negative impact on the environment. The three social sustainability criteria all include supporting human rights[79] and not having any corruption throughout the whole value chain. This is especially supported by Stora Enso's environmental guidelines, where human rights are incorporated in all three dimensions[31]. All economic criteria are broadly about being able to make money without having a negative impact on current or future generations, mainly supported by the fact that Stora Enso is doing business and is in need of making money while sustainability, as defined in the *Brundtland report*, is addressing intergenerational justice[39].

#### **4.1.1 Respect the forest environment**

Respecting the forest environment is mainly based on the fifteenth sustainable development goal[71] and includes stop deforestation, increase afforestation, and increase reforestation in order to preserve the natural ecosystems. However, what is best for the environment in certain countries or regions are difficult to say. Best forest management practice in a country like Sweden could differ tremendously from best forest management practice in a country like China. Planting more trees is not per se better for the environment depending on numerous factors, such as what the land area would be used for instead. Therefore, the criterion also includes maintaining biodiversity and minimise undesirable disturbance of the forest ecosystem, which is also supported by specific targets in SDG 15[71] and the third principle for sustainability in section 2.1.3[49]. Sustainably managed forests is also something that is of high importance to Stora Enso, according to the environmental guidelines[31].

#### **4.1.2 Restrict emissions of greenhouse gases**

Restriction of emissions of greenhouse gases is of high importance since an increasing amount of greenhouse gases in the atmosphere contributes towards global warming, disrupting ecosystems[70]. Example of greenhouse gases could be carbon dioxide, ozone, and methane. The restriction of greenhouse gases is also supported by the first and second principles for sustainability presented in section 2.1.3 and developed by Holmberg, Rob  rt and Eriksson[49]. The criterion is related to the whole product-chain, i.e. the full life cycle of the product. Regulation of the emissions are important in processes such as harvesting of trees, production, transports, and end-of-life treatment. According to a study on U.S. industry-average corrugated products, the production phase is the part with most greenhouse gas impact in the life cycle[80]. Therefore, it is especially important to address this part of the product's life cycle. In line with this criterion, the choice of material is important. The fact that Stora Enso's products are made from renewable and not fossil-based material, is positive when restricting emissions of greenhouse gases.

### 4.1.3 Restrict the emissions and accumulation of substances produced by society

Restriction of emissions and accumulation of substances is connected to all processes in the product-chain. Substances in this criteria refers to any kind of substance which is not regarded as a greenhouse gas. Hence, examples of substances can be chemicals used in the production of pulp in paper mills, and particles from fuel combustion in trucks used for distribution of products. The reason for addressing other substances that are not greenhouse gases is because they may have a negative impact on the environment as well. Sustainable development goal 12 especially addresses the generation of hazardous waste as something that have to be managed in a more sustainable way[69]. Pollution with substances from society is also addressed in other sustainable development goals, such as goal 6 and 14[81, 82]. This criterion is also based on the second sustainability principle presented in section 2.1.3[49].

### 4.1.4 Responsibly sourced materials

The criterion of responsibly sourced materials means that human rights should not be compromised. The rights of indigenous people are extra crucial to consider working with forests in different parts of the world. This is also something that Stora Enso emphasises in their environmental guidelines[31]. If not considering indigenous rights, there could be a risk that the rights are compromised in various ways. The rights of native people are particularly important when cutting down forest. Therefore, it is important to acknowledge the monetary as well as cultural rights of native people in all regions. This is also backed up by the first sustainable development goal, target 1.4 which lifts the importance of land and resource rights in order to end poverty[83]. Human rights in this setting also includes no forced labour, modern slavery or child labour, supported by target 8.7 in the sustainable development goals[84]. Another important aspect is also to handle seasonal labour in a sustainable way with fair wages. No corruption involved in the sourcing of materials is also of utmost importance<sup>1</sup>. This aspect is very important for Stora Enso and something that the company works with continuously, and it is also included in sustainable development goal 16[77, 85].

### 4.1.5 Responsible production

A responsible production requires the support for human rights. Assuring fair wages and other decent working benefits for the workers throughout the whole product chain is important here and is supported by the eighth sustainable development goal[84]. As in the criterion above, it includes no forced labour, modern slavery or child labour. The absence of corruption in production is also vital, as it is important for Stora Enso as company[77]. Another important thing in this social context is that people working within the production is aware of the environmental impacts and is provided with education in these issues[70].

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<sup>1</sup>According to interviews with employees at Packaging Solutions

#### **4.1.6 A good working environment**

A good working environment is also this connected to human rights. The working environment refers to the situation of workers throughout the whole product chain. For instance, working environments could be at the paper mills, in the forestry stands, and in a factory producing reusable packaging. A good working environment could mean that conditions are safe for the workers and is especially supported by target 8.8 in the sustainable development goals[84]. Safe conditions could include for example chemical safety, proper protective equipment or that the environment should be free from harmful noise[31].

#### **4.1.7 Meet consumer choice and expectations**

The criteria related to consumer expectation mean that certain aspects need to be met for consumers being satisfied[77]. This is important in order to be able to do business as a company<sup>2</sup>. Consumer expectations could be basic aspects such as the ability of the packaging to protect the good inside or that the service connected to the product is smooth and convenient. The criterion also means fulfilment of needs that many customers are willing to pay for and fulfilment of basic needs that are affordable by most. The consumer must be willing to pay for the product or service in the long term, or else it would not be economically sustainable since consumers would reject it.

#### **4.1.8 Reasonable cost for infrastructure**

Reasonable cost for infrastructure is related to the cost for the company. If the infrastructure related to a business model is not reasonable even in a long perspective, it would not be economically sustainable for the company. Infrastructure could for example be a logistic system to manage reusable containers, such as a deposit-refund machine. If such investments should be made, it is important to mitigate the costs and collaborate with other actors.

#### **4.1.9 Preserve resources for current and future generations**

To preserve resources for current and future generations is related to efficient material and resource use, and is addressed in e.g. sustainable development goal nine, twelve, fourteen and fifteen[69, 71, 82, 86]. Efficient material use means that material used in a product should be no more or less than what is actually needed to fulfil its purpose. With other words, excessive amounts of materials should not be used in a packaging or in the reuse system, which could mean e.g. that the packaging wall should be as thin and light as possible. Efficient resource use is instead related to how much of the resources that is extracted or harvested to begin with. Resources could for example be logged trees used in fibre-based packaging. But efficient use of resources could also be related to human and economic resources. The available human resources, e.g. specialist competences, also have to be used in an efficient

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<sup>2</sup>According to interviewed employee at Stora Enso packaging solutions and interviews with representatives from logistics, retailers, competitors and the research field.

way. Economic resources could be investments in for example infrastructure or simply monetary capital. According to the fourth principle for sustainability, presented in section 2.1.3, efficient use of resources is of utmost importance for a sustainable society[49].

## 4.2 The current state of packaging

The current packaging system is not very stable, that is, a lot of changes are about or could happen at the moment or in the near future. Trends have been identified where the system is under pressure from the landscape and niches, which is weakening the system and opening it up to new solutions. The cause is mainly broad political agreements linked to human interaction with the environment, such as the EU circular economy action plan, and changing behaviour of the world's people due to things like the covid-19 pandemic.

### 4.2.1 The sociotechnical regime

The current state of the packaging system is divided into the five categories presented by Geels[59], see table 4.2.

**Table 4.2:** The multi-level perspective covering the regime level of the current packaging system.

The socio-technical regime					
Categories	<i>Policy</i>	<i>Users, market &amp; Distribution Networks</i>	<i>Technological &amp; Product</i>	<i>Science</i>	<i>Socio-cultural</i>
Rules of the game	ISO standards Safety regulations Extended producer responsibility Waste framework directive Policies focusing on food-related packaging Company sustainability policies Company environmental guidelines Plastic taxes	Plastic crates Recycling centres Landfills Incineration facilities Deposit-refund systems Fibre-based packaging have higher recycling rates than plastic packaging Garbage disposal systems Consumer compliance dissonance Laziness among consumers Cheap option is chosen Younger people more prone towards taking action	Plastic barriers Multimaterial Black plastic for food packaging Focus on reducing material in packaging Single-use dominates Hygiene demands Life cycle assessments Recycled materials Plastic protecting food product ISO standards Transport packaging usually tertiary packaging	Low cooperation between organisations Rather low knowledge among consumers Knowledge is stuck at companies and institutions Trial and error Life cycle assessments Patents Packaging design research Environmental impact assessments	Environmental attitude Awareness Personal values Perceived effectiveness of recycling Digital presence Medial information should be interesting for the public Behaviour of family and friends Motivation Low environmental knowledge Difference in culture between countries Descriptive norms

Starting with the policies, there are several directives and regulations regarding packaging and packaging materials on EU level. Examples are the directive on packaging and packaging waste[87] and the circular economy action plan[75]. There are also ISO standards[17, 88–91], safety regulations and policies within companies. It was also identified that the individualistic world view might influence how companies view the regulative actions from authorities and the will to take the lead<sup>3</sup>. Companies are more willing to take the lead if it is their own initiative, compared to if it is forced upon them.

Moving on to the category *users, markets & distribution networks* the rules of the game (see section 2.3.) is strongly focused on recycling and the infrastructure and perceptions connected to that. Common transport packaging are pallets, rigid containers, crates, plastic-corrugated boxes whereof most are made out of plastic[75]. The end of life of the packaging is largely dependent on the local waste disposal system, whether there are infrastructure for collecting and recycling packaging or if packaging waste is put on landfill[1]. It is also affected by the end users will to sort the waste, which might in turn be dependent on how easy it is<sup>3</sup>. If a packaging consists of several materials that need to be separated, there is a risk that the sorting rate is lower than for a monomaterial packaging<sup>3</sup>. Regarding recycling rates, fibre-based materials have higher recycling rates than plastics[2].

The rules of the game regarding *technological and product* includes properties of the packaging. The packaging must be able to protect the goods inside. Today, this often means that multiple material are mixed in the packaging in order to get the combined properties from different materials. The single-use packaging is dominating the market and life cycle assessments are often used to assess the environmental impact of the packaging. In order to improve the environmental performance of a packaging, focus is often put on reducing the material, which is in line with the 3R's presented in section 2.1.1.<sup>3</sup>

The category *science* includes the creation and management of knowledge where it was identified that there are rather low levels of cooperation between organisations and created knowledge tend to stay within an organisation. The knowledge is mainly created through trial and error in product development, life cycle assessments and formal research programmes. Patents are not very important in this industry, which makes organisations to focus less on this.<sup>3</sup>

The *socio-cultural* category shows that the behaviour of end use packaging consumers are dependent on the behaviour of family of friends. If people around you behave in a certain way, you tend to act in the same way[92]. This part of the regime consists mainly of descriptive norms[93] such as choosing paper over plastic, less material is better and recycling<sup>3</sup>. The perceived effectiveness of recycling is both high and low depending on which segment is explored<sup>3</sup>. For companies and organisation it seems to be of high importance to be present digitally and build relationships with

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<sup>3</sup>According to interviewed employee at Stora Enso packaging solutions

consumers on social media, especially considering raising environmental awareness<sup>4</sup>.

4.2.2 The sociotechnical landscape

The socio-technical landscape is made up of external factors that cannot be controlled by the prevailing regime, see table 4.3. These include political trends such as xenophobia, environmental activism and feminism, as well as physical changes in the world and its demographics in the form of climate change and increased pressure on the environment, an ageing population, globalisation and urbanisation[77, 94]. Digitalisation and changes in the stock market are also factors that may affect the current packaging regime[77]. The external factors that make up the landscape also include overarching policy decisions that do not directly affect packaging, such as the European green deal, and the covid-19 pandemic that has changed people’s behaviour to a large extent[29, 30].

Table 4.3: Multi-level perspective covering the landscape level.

The sociotechnical landscape		
EU Circular Economy Action Plan		European Green Deal
	Xenophobia	
Covid-19		
	Increasing environmental pressure	Globalisation
Feminism		
	Packaging legislation	Climate change
Political conflicts		
	Urbanisation	
	Competitor’s moves	
Digitalisation	Macroeconomics	Environmental movements
	Stock market	Sociodemographic characteristics

4.2.3 The sociotechnical niches

The sociotechnical niches, see table 4.4, were mapped by the external consultancy firm, Catapult. The niches are start-up companies engaging in reusable packaging

<sup>4</sup>According to interviewed employee at Stora Enso packaging solutions

and one example from each market segment is analysed in section 4.3.3. These niches might put pressure on the current rules of the game in the packaging system and disrupt it.

**Table 4.4:** Multi-level perspective covering the niche level.

Market segments	Niche companies
B2B2C	
B2C	
B2B	

#### 4.2.4 The current business model of Stora Enso Packaging Solutions

Information about the current business model of Stora Enso Packaging Solutions are presented by using Osterwalder's model, see section 2.4. The building blocks covered are: customer segments, value propositions, channels, customer relationships, revenue streams, key resources, key activities, key partnerships, and cost structure. The information presented in following sections about the building blocks are exclusively based on information discovered in interviews with employees at Stora Enso, if not noted otherwise.

Stora Enso's value proposition is to provide fibre-based solutions with renewable and recyclable material that are low carbon alternatives to products based on finite resources[77]. Revenue streams are today primarily based on the volume. However, Stora Enso strives to be a value-driven organisation instead of focusing on selling volumes. Whether the company is value-driven or cost-driven today depends largely

on region and the product. The different costs that emerge in Packaging Solutions are e.g. cost for labour, cost for material, and costs for research and development. The costs are mostly connected to the key activities for the business.

Key activities include managing land, manufacturing and maintenance of machines. But it also includes activities such as material development, product design, innovation, strategic plan, quality assurance and research. Related to customers, activities like sales, customer dialogue, marketing, and creating solutions for customers exist. Climate compensation is also a key activity. The CarbonZero initiative is one activity related to the current value proposition. The CarbonZero service provides so called carbon offsetting for unavoidable emissions caused in the packaging life-cycle. In order to perform the key activities, resources are needed. Key resources of Stora Enso are in form of e.g. physical resources such as production machines, manufacturing facilities, wood, fibre, and chemicals[77]. Human resources are also found at the company in form of employees with relevant competence and the innovation that is created. Intellectual property such as patents are another type of key resources. Financial resources are a fourth type.

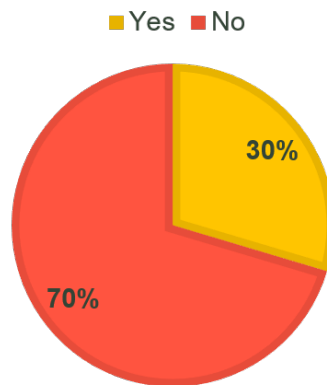
Customer segments include brand owners, retailers, packaging manufacturing, joinery and construction companies, converters, and paper and board producers. How Stora Enso reach different customer segments varies region by region. Sales force is one large share. It is also managed through web-marketing. In countries such as Sweden wholesalers have a big role but it is not the case in all regions where Stora Enso operates. The company raise awareness about their products and services in their web-site, in press releases and in social media. LinkedIn is the social media channel that is primarily used. Awareness can also be raised locally, through sales force, case by case. Sales force and personal contact is also how Stora Enso help customers evaluate the value proposition. Customers are allowed to buy specific products and services by sales force, wholesalers and by web-sales. The products from Packaging Solutions are delivered mainly by road transport. Delivery is often handled directly between the company and customer, but in Sweden many times via wholesalers. Stora Enso provide post-purchase support to customer by customer service units that provide help for e.g. complaints and questions.

The customer relationships established between the company and its customers is to a high extent personal assistance. Customers buying smaller volume or not buying very frequently are rather handled by web or e-mail. However, how customer relationships are managed often vary region by region and it also depends on if the customer is a strategic customer or not. This is also true for Stora Enso's partnerships, where some are strategic. Stora Enso has 20 000 suppliers and 21 000 private forest owners as key partners [77]. But partners are also 112 000 shareholders, other producers and customers[77]. CarbonZero service is an example on a partnership where Stora Enso sells more than the actual product. The company is also a part of a fibre packaging alliance - CEPI (Confederation of European Paper Industries). Stora Enso also has cooperation with a few start-ups as a part of the company's accelerator programme.

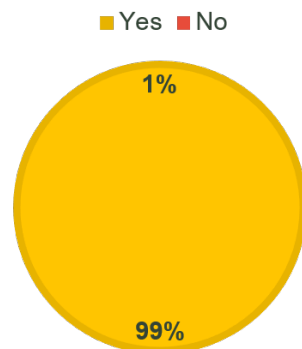


### 4.2.5 Consumer preferences in reusable packaging

The survey was conducted to better understand the consumer perspective related to reusable packaging. 226 consumers participated in the survey. As demonstrated in figure 4.1, the results showed that about 30% of the respondents are using a reusable packaging service today, whereas the remaining 70% do not. However, as presented in figure 4.2, 99% of the respondents answers that they are willing to use reusable packaging services in the future. The other 1% are unwilling due to lack of convenience and an uncertainty whether it would be better for the environment to use reusable packaging.



**Figure 4.1:** Respondents using a reusable packaging service today.

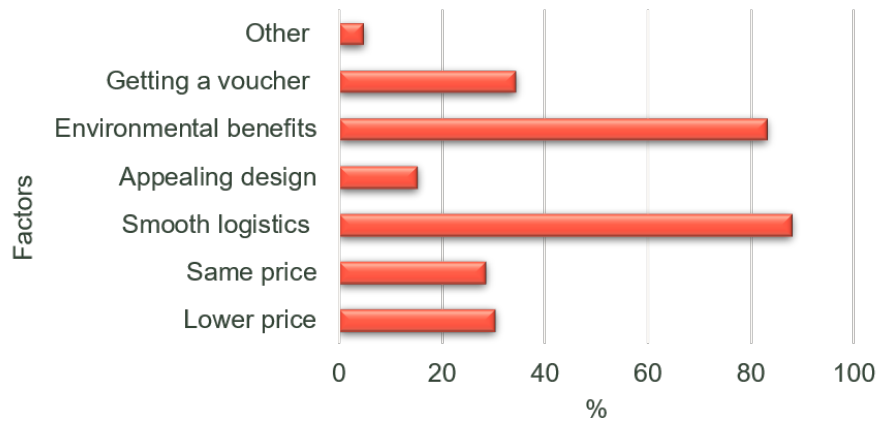


**Figure 4.2:** Respondents willing to consider reusable packaging in the future.

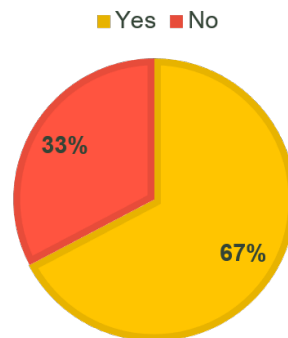
As displayed in figure 4.3, the results show that smooth logistics and environmental benefits are the factors which make the respondents most prone to choose a reusable packaging over a single-use packaging. The wish for smooth logistics corresponded to about 90% of the respondents and 80% were interested in an environmentally friendly solution. About 30% of respondents would be interested to buy a reusable packaging if it would be cheaper than a single-use solution, and about the same

## 4. Results

percent would be interested also if the prices for the two products are on the same level. 35% of the respondents would pick a reusable alternative if they would get a voucher for returning it. However, if the packaging would have an appealing design, it would only get 15% of the respondents to rethink their choice. As shown in figure 4.4, about 70% of the respondents are willing to pay more for a reusable packaging if it would be proven to be more environmentally friendly than a single-use packaging. The other 30% remains unwilling.



**Figure 4.3:** Factors that would make respondents choose reusable packaging before single-use packaging.

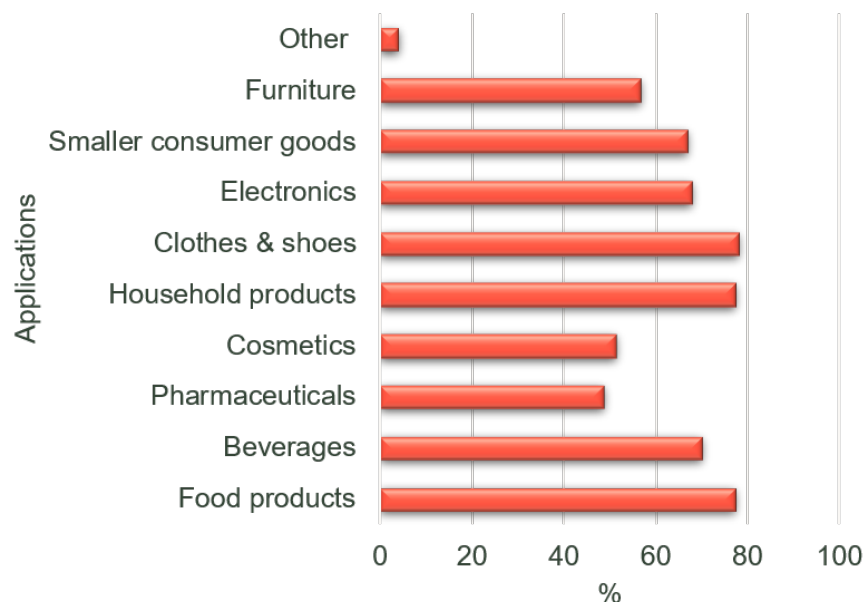


**Figure 4.4:** Respondents willing to pay extra money for a reusable packaging service if it is more environmentally friendly.

The result shown in figure 4.5, indicates that the respondents are prone to use reusable services in many of the presented options. Food products, beverages household products, clothes and shoes, electronics, and smaller consumers goods did all display that about 70% or more of the respondents would consider them. Respondents displayed a slightly lower interest for reusable packaging for furniture, which corresponded to about 60% of the respondents. Pharmaceuticals and cosmetics were the least preferred options when it came to applications for reusable packaging, both

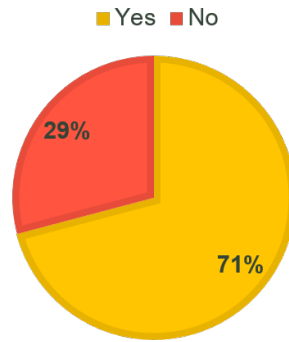
corresponding to about 50%.

An apparent result was that pharmaceuticals and cosmetics are applications where respondents are not as prone to use reusable packaging as in other proposed applications. The answers might be due to hygiene reasons, since one would not want pharmaceuticals or cosmetics to be contaminated with old residues. Another reason could be suspected inconvenience. Furniture was also undesirable in reusable packaging. The reason for this result could be that new furniture is not bought as often as e.g. clothes or food products. The perceived inconvenience of returning a packaging or retain it until next furniture shopping might therefore be too large.

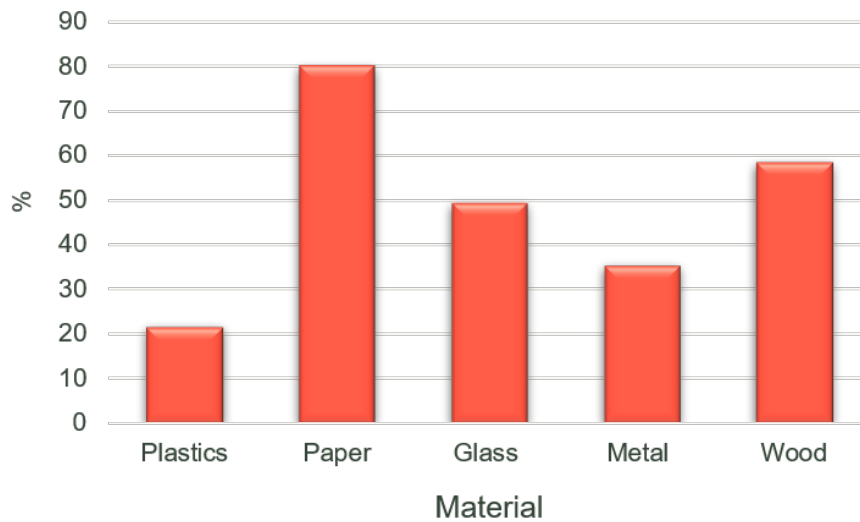


**Figure 4.5:** Applications where respondents would consider using reusable packaging.

About 70% of respondents had a preference related to the material used in a reusable packaging whereas the other 30% remained neutral, according to figure 4.6. The result, which can be seen in figure 4.7, shows that paper is the material most people preferred, corresponding to 80% of the respondents. The second and third most preferred materials were wood and glass corresponding to about 60% and 50% respectively. Metal and plastics was the least wanted materials for reusable packaging, corresponding to about 35% and 20% each. However, about 30% of the respondents claimed that they did not have any preference at all. Therefore, only 56% of the total number of participating respondents claimed that they prefer paper in a reusable packaging.



**Figure 4.6:** Respondents preferring a specific material in a reusable packaging.



**Figure 4.7:** Material of preference amongst respondents.

#### 4.2.6 Sustainability challenges in the current rules of the game

The current system was evaluated towards the sustainability criteria from step 1 in backcasting. This section will describe sustainability challenges in the current system, based on the evaluation made. The challenges can be seen as things that need to be addressed in order to move towards the desirable sustainable future represented by the nine sustainability criteria, see section 4.1. This evaluation of the packaging system is in no way exhaustive, but it is rather the most important things that has been identified. All the five categories of the sociotechnical regime, see section 4.2.1, were evaluated with respect to the nine sustainability criteria.

In the current system of packaging, different actors are all affected by broad environmental legislation, one example being the prices put on carbon emissions. In a sustainable future, we must restrict the emissions of carbon (see section 4.1). Policymakers try to do this by e.g. implementing cap-and-trade schemes for carbon emissions. Although the policy instrument is effective in theory, it does not do

much in reality. A great challenge of today is that the price on carbon emissions is too low to be used as an effective policy instrument to lower the carbon emissions[95].

Challenges connected to users and the packaging market is mainly due to consumer behaviour. It includes the low collection rates of used packaging[11], which is a challenge that need to be addressed if we are going to create a sustainable society where we allocate resources in a just way between current and future generations. At the moment, a lot of the material in the packaging is lost. Another challenge is the consumer society we live in, where we buy new things and consume way above the planetary boundaries and the economic growth is coupled to increased environmental burden[94].

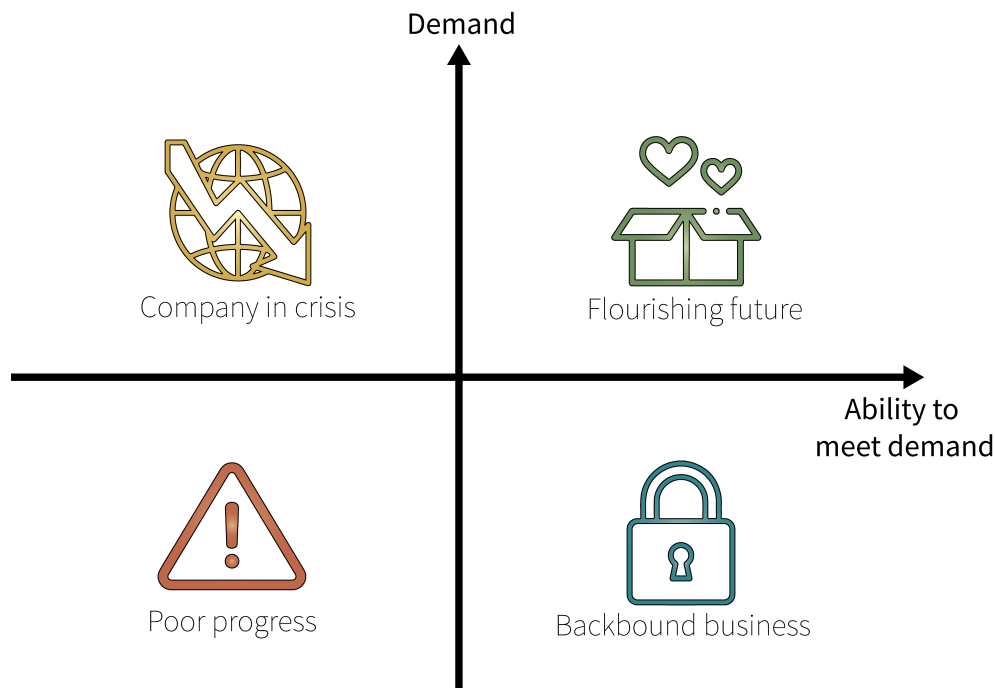
Regarding the challenges in technologies, products and creation and spread of knowledge it is seen that one of these is that some packaging materials can not be recycled. Out of the material collected, only a part is recycled, especially when it comes to plastics[11], see chapter 1. The interviews in this step also revealed that knowledge created within an organisation or institution often gets stuck there and is not disseminated in society. This makes it hard for consumers to make informed choices, but also for organisations to develop sustainable solutions, since the cooperation between organisations and institutions is too low. Another thing mentioned in interviews is that LCA studies are often performed to sell a product and not improve its environmental performance. To turn this around and instead improve the product might also be a challenge. To summarise, the challenges seen in the current packaging system is mainly connected to economic growth of companies, the comfort and convenience of consumers and lack of cooperation between different organisations.

### 4.3 Business model to bridge the gap

This section presents the four future scenarios that are seen as likely in 10 years, followed by the business models from the workshop with Stora Enso. The analyses of the business models from the workshop and the niche mapping, conducted by an Catapult and presented in table 4.4, with respect to sustainability criteria and future scenarios are also presented here.

#### 4.3.1 Scenarios for 2031

The scenarios developed to validate the proposed business models from the workshop led to four diverse futures. The axes are, as presented in figure 4.8, *Demand* and *Ability to meet demand*. The time frame for the scenarios is set to 10 years and they are described to apply to the future situation for Stora Enso and its future prospects for entering the market of reusable packaging. The scenarios are below presented as *Poor progress*, *Company in crisis*, *Backbound business*, and *Flourishing future*.



**Figure 4.8:** The four future scenarios

### Poor progress

Global temperature continues to rise over the world leading to unfortunate events. Storms, wildfires, droughts, heavy rainfalls, and insect outbreaks are occasionally damaging forests in certain areas and result in an increasingly limited ability for paper companies to meet the demand. Conflicts in various regions also complicates the company's business. On top of that, there is a tougher economic climate affecting both individuals and companies. People are in general less prone to invest in reusable packaging solutions if companies cannot offer good deals. Companies in the packaging business have anyhow low possibilities to expand. The efforts that have been taken by the industry to implement a reusable packaging offering has been mildly successful. For instance, the returning services are in ways troublesome which make a quite large share of consumers reject them. These unfortunate issues have also led to a declining reputation of the forest industry amongst consumers. There is also a low degree of collaboration between different segments such as suppliers, brand owners and logistic companies. The forest industry has trouble to find the right competence and innovation remains rather low. The focus from policymakers remains on improving recycling. The competition for the material become tougher e.g. because of increasing interest in biofuels. Digitalisation is high in society.

### Company in crisis

Regulatory measures like plastic ban and single-use ban opens business opportunities for packaging companies to enter the market of reusable packaging. The economy is flourishing, and environmental awareness is high amongst the public. People are staying at home more due to the aftermaths of the covid-19 pandemic and its effect

on how we organise our work. Digitalisation is high in society and becomes even more important due to an increased amount of people working from home. The pandemic hence leads to a changed consumer behaviour, more e-commerce, and hence an opportunity for packaging companies to implement reusable packaging services and the related logistics. The fact that environmental awareness is rising in society makes consumers more prone to choose reusable alternatives. Different players in the field have managed to find promising solutions related to reusable packaging, which also can provide customers with cheap reusable solutions with good deals. However, despite the aspects resulting in high demand, the packaging companies have trouble meeting it. The climate crisis and its effects on forests results in limited material availability and there is competition of the available material. The paper industry struggles to find the right competence, innovation remains rather low, investments fail, and the reputation is not as high as it has been. Collaboration between segments in the packaging system is low. These aspects result in the fact that the fibre-based packaging industry have trouble to take advantage of the business opportunity of providing reusable packaging.

### **Backbound business**

The environmental activism is declining among consumers and most efforts from policy-makers are put on recycling solutions. Global warming affects the environment and forests negatively which leads to wildfires, and bark beetle outbreaks. Fossil-based plastics are being replaced by bio-based plastics due to climate mitigation efforts, but cartons and other plastic-free solutions are not catching on. The society is being heavily digitalised and the right digital, business and scientific competence are available while the level of innovation in the society is high. The consumers have low trust in companies in general since several companies have been green-washing their business and reusable solutions are expensive and cumbersome due to the lack of interest from users. The world is entering a financial crisis and purchasing power is low.

### **Flourishing future**

Decision-makers no longer allow single-use packaging and environmental awareness among consumers is very high. The global warming leads to more intensive wild fires and bark beetle outbreaks in the forests while the economy is booming and purchasing power is high and the digital era is here to stay. There is room for thoughtful and strategic investments with good prospects of expanding businesses and reaching the market with new innovations. The right digital, business and scientific competence are available while the level of innovation in the society is high. Customers and consumers generally have high trust in companies. Additionally, there is good collaboration between different segments of the market and the focus is on creating a sustainable society. Due to the good cooperation and good availability of raw materials, prices for sustainable solutions can be pushed down, as demand is also very high. Reusable packaging and transport solutions offer a good deal for the customers and consumers and the level of innovation and smart, sustainable solutions are unevenly distributed between companies.

### 4.3.2 Business model ideas from workshop

The first four business model ideas presented in this section were developed during the workshop described in section 3.1.3. The last three are business models of operating startups in the U.S. and France, found in Catapult's research.

#### **Reusable packaging with specific features for unique industry (B2B)**

The product in focus for this business model is a reusable packaging with specific features to be used in transports. The value for the customer is that they can use the specific features of the packaging while reducing the environmental footprint (from e.g. expanded polystyrene) and saving storage space. Key partners for this model are logistics companies and developer of technologies for the specific features. The regulations connected to the products to be transported need to be understood and followed before starting a pilot with existing customers. The customers are in a unique industry and they should be reached through a web platform. The revenue comes from leasing fees and product sales.

#### **Deposit-refund for corrugated packaging (B2B2C)**

The idea behind this business model is to implement a deposit-refund scheme for corrugated packaging to make it easy to return packaging for reuse. Key partners are actors with packaging collection points, such as grocery stores, and manufacturer of collection machines and logistic companies. Activities that are of high importance include marketing, establishment of partner network, building awareness for the consumer, design the service and do market research. A mobile app should be developed and resources for that is needed. Consumers will experience a more sustainable living while, for brand owners, packaging use will be reduced and the sustainability level increased. The customers are brand owners, store owners and end users. They will all be reached via a mobile app and the collection machines. The revenue comes from a %-fee based on how much is collected/reused.

#### **Take-back service for reusable food packaging (B2B2C)**

This business model provides a take-back service for reusable food packaging made out of bio-composite (e.g. cutlery or cups). The products are used in closed environment such as festivals which will make it easier to monitor the flow of the food packaging. Key partners could be app developer, logistic companies, restaurants and converters selling single-use today. Stora Enso needs to develop high-performing bio-composite material for the purpose and supply it. It also needs to be ensured that end-of-life recycling of products works well. Resources that is needed is cleaning technology, logistic services and recycling. The key value is that the material is provided for the customer and handled at the end-of-life and the customer can demonstrate low environmental impact. The packaging is returned on demand via an app. The customers could be food service providers/restaurants in a closed system such as festivals. The customers should be reached through personal contact from sales representatives, advertisement and social media. RFID tags on the packaging should be used to manage the flows within the closed system. Revenue comes



from leasing of material and charging for lost material that is not returned for recycling and selling user data. The costs are marketing, manufacturing, R&D, logistics, raw material and cleaning of the product.

### **Logistics network for brand owners (B2B)**

The idea behind this business model is to create a logistics network with competitors, where brand owners can return the packaging and pick up new to make it easy and smooth to reuse packaging. The value for the customer is that it is problem free since the customer does not have to think what to do with the packaging, how to dispose it and how to clean it or return it. Key partners are corrugated packaging companies, logistics companies, packaging producers with different material and specialised cleaning companies. Brand owners and retailers must be engaged and packaging should somehow be standardised. A network need to be established as well as development of smart logistic routing software. Resources that are key in this model are logistic centres, truck fleets, developers for logistics, sourcing and app development and packaging design competence. The greenhouse gas emissions are reduced since less packaging need to be produced and the supply chain cost is lowered. The customers are retailers, e-commerce companies and brand owners. They should be reached through an app and packaging solutions delivery and contacts. Contact with the customer is made in each order/return. Revenue comes from fee payed by customer for the logistics service. The costs are mainly from the truck fleet.

### **E-commerce platform with reusable packaging as a service (B2B2C)**

The business model is built on partnerships with brand owners that use the reusable packaging provided by the company. The consumer then places an order at a retailer with these products, pays a deposit and the products are delivered to the consumer in a reusable tote. When the packaging is empty it can be returned in the next delivery, through a scheduled pick-up or at a drop-off location. When this is done, the consumer gets the deposit back. The company then cleans the packaging and return it to the brand owner that can refill it.

### **Delivery service with reusable packaging (B2C)**

This business model works as a grocery store with reusable packaging. The company buys products in bulk and package everything in smaller reusable packaging. The goods are then delivered to the consumer who leaves the emptied packaging at the doorstep to be picked up in the next delivery. The returned packaging is then cleaned and refilled with new product.

### **Reusable packaging as a service for companies (B2B)**

Business model which allows companies to rent reusable transport packaging made of durable and sturdy plastic. The company providing the business model handles cleaning of containers. Their customers are also permitted to monitor the containers by using QR-codes and RFID technology.

### 4.3.3 Evaluation of business models

The evaluation of the business models was done by assessing each business model against the sustainability criteria, see section 4.1 and the four future scenarios, see section 4.3.1. For a business model to be considered viable in its current form, the sustainability criteria need to be met and the model needs to be able to function in all four future scenarios. Critical aspects to consider based on this evaluation are presented in next section, 4.4.

#### Evaluation against sustainability criteria

**Table 4.5:** An overview of how each business model stacks up against the sustainability criteria

Business models	Sustainability criteria								
	Respect the forest environment	Restrict the emissions of GHGs	Restrict the emissions and accumulation of substances produced by society	Responsibly sourced materials	Responsible production	A good working environment	Meet consumer choice and expectations	Reasonable cost for infrastructure	Preserve resources for current and future generations
Reusable packaging with specific features for unique industry	Green	Green	Red	Green	Green	Green	Green	Green	Green
Deposit-refund for corrugated packaging	Green	Green	Green	Green	Green	Green	Yellow	Red	Green
Take-back service for reusable food packaging	Green	Yellow	Red	Green	Green	Green	Green	Green	Green
Logistics network for brand owners	Green	Yellow	Yellow	Green	Green	Green	Green	Green	Green
E-commerce platform with reusable packaging as a service	Green	Yellow	Yellow	Green	Green	Green	Green	Green	Green
Delivery service with reusable packaging	Green	Yellow	Yellow	Green	Green	Green	Green	Green	Green
Reusable packaging as a service for companies	Green	Yellow	Yellow	Green	Green	Green	Green	Green	Green

The business models from step 3 was qualitatively evaluated against the sustainability criteria developed in step 1, see section 4.1. An overview of how each business model performed is presented in table 4.5, where green means that provided that Stora Enso follows their own guidelines and commitments, this criterion will be met within this business model. Yellow means that there is a high degree of uncertainty and some measures might have to be taken, while red means that the criterion will not be fulfilled unless something is changed. The sustainability criteria were not weighted, and further ahead, Stora Enso will need to determine which trade-offs that they can or cannot do. A red marking for a specific criteria does not have to mean that the business model is directly unsuitable, but that measures has to be

taken if one wants to achieve sustainability.

In table 4.5 it is seen that there is no business model which fulfils all of the criteria. The *reusable packaging with specific features* business model however, is only missing one criteria, while the others are missing two. This is mainly due to uncertainties in the environmental performance of the products and services and especially regarding the choice of material. The business model with *deposit-refund for corrugated packaging* stands out in the sense that the economic sustainability is not fulfilled. This is due to the uncertainty regarding consumer experience in relation to collection points and the cost of the collection and sorting machines.

### Evaluation against the four future scenarios

Each business model was also evaluated against the four future scenarios, see section 4.3.1. The outcome of the evaluation is presented in table 4.6, where green means that the business model fits well into that future. Yellow means that there is a high degree of uncertainty and some measures might have to be taken, while red means that the business model do not fit into that future scenario.

As seen in table 4.6, there are two business models that seem to fit into all four futures very well. This is due to the fact that these business models do not rely on the end-user's purchasing power and will to try new things, nor do they require major collaborations between segments and competitors or large investments. The other business models require, among other things, a high degree of interaction between segments, or the end consumer's own drive to test reusable packaging and related services. This can make it difficult to operate in an environment where both interaction and purchasing power are low, as in the case of *Poor progress* and *Backbound business*. Some business models require major investments that cannot be considered sustainable without extensive collaboration with other actors. Since this aspect is rather low in the *Company in crisis* scenario, they are not considered to be good choices in this scenario. However, it is up to the company to decide whether they would consider to proceed also with business models that are not fitting very well into some future scenarios, as long as they are aware that it would entail a risk.

## 4.4 Strategy towards the future vision

In table 4.7 the critical aspects for each business model are presented. A filled square means that the stated critical aspect is of relevance to the business model. For the *reusable packaging with specific features in unique industry*, it is shown that the choice of material is critical and needs to be reviewed, but no other aspects are assessed as critical. For the *deposit-refund for corrugated packaging* a lot more critical aspects are of relevance. End user convenience needs to be ensured, choice of material need to be looked over, and a stakeholder analysis should be performed. But lobbying for a reusable packaging legislation, spreading of knowledge, as well

**Table 4.6:** An overview of how each business model stacks up against the future scenarios.

Business models	Scenarios			
	Poor progress	Company in crisis	Backbound business	Flourishing future
Reusable packaging with specific features for unique industry				
Deposit-refund for corrugated packaging				
Take-back service for reusable food packaging				
Logistics network for brand owners				
E-commerce platform with reusable packaging as a service				
Delivery service with reusable packaging				
Reusable packaging as a service for companies				

as ensuring that the company is transparent, are also important aspects. For the *take back service for reusable food packaging*, choice of material and convenience for end users need to be assessed. Emissions that come as a result of cleaning of the packaging need to be further examined. In the *logistics network for brand owners*, the choice of transport and emissions from cleaning needs to be reviewed.

Regarding the *e-commerce platform with reusable packaging as a service*, the choice of material is a critical aspect. Other important aspects are to perform a stakeholder analysis, review emissions from cleaning, and lobbying for reusable packaging legislation. It is also vital to disseminate knowledge to consumers and remain transparent. The *delivery service with reusable packaging* need to consider choice of transport and material. Emissions from cleaning, reusable packaging legislation, and spreading of knowledge are also critical aspects. Lastly, the *reusable packaging as a service for companies* only have choice of material and emissions from cleaning as critical aspects.

During the interviews, literature study and through the survey, a few critical success factors for reusable packaging have been identified:

**Table 4.7:** Identified critical aspects for each business model

Business models	Recommendations							
	Review the choice of transport	Review choice of materials: recyclability, non-dissipative and restricted GHG emissions	Investigate and ensure end user convenience	Investigate the need of new and changed infrastructure	Stakeholder analysis and collaboration between segments	Review emissions from cleaning	Lobby for reusable packaging legislation	Disseminate knowledge to consumers and be transparent
Reusable packaging with specific features for unique industry								
Deposit-refund for corrugated packaging								
Take-back service for reusable food packaging								
Logistics network for brand owners								
E-commerce platform with reusable packaging as a service								
Delivery service with reusable packaging								
Reusable packaging as a service for companies								

**B2C**

- A convenient and seamless experience for the consumer
- Reusable packaging should be more sustainable (in all dimensions) compared to single-use packaging
- Easily accessible (e.g. integrate into an existing system and not make it necessary to download an additional app)

### General

- Commitment from the top management in the company
- High quality performance from the packaging
- Co-create with innovation partners
- Establishment of collaborative partnerships
- Start small and experiment in densely populated urban areas
- Centralised reverse logistics process
- Perform LCA to ensure that the reusable packaging is actually better for the environment

General recommendations that have emerged from the process of conducting the project are regarding different types of analyses. One type of critical analyses is stakeholder analysis. Analysing the stakeholders is of relevance to see which stakeholders that have power, legitimacy, and urgency [47]. Understanding stakeholders in that way is important to keep in mind if Stora Enso would like to proceed with one of the reusable packaging business models in the future. It is of high relevance to know and understand which stakeholders possess power when it comes to reusable packaging issues, which are legitimate, and which are viewing the issues as urgent.

Another general recommendation is to perform a market opportunity analysis [96]. A market opportunity analysis can be performed to among other things, figure out factors surrounding a market opportunity. These factors could be e.g, how customers fulfill the need today and if there is another player on the market that already satisfies the need. Then, an analyse is performed to see what social, technical, economic, ecological, and political factors need to be taken into account.

Performing a feasibility analysis is also of relevance. A feasibility analysis is done to transfer an idea to a concrete and operating business model. The analysis is done by examining if an idea is viable, and in that case how one should implement it in practice [97]. Analysing the feasibility is hence important to perform before testing a small scale pilot.

Another recommendation is for Stora Enso to not be too afraid to take on a new project on reusable packaging. Testing a pilot on a small scale can be the way to go when first trying out a concept of reusable packaging. Using the concept *trial and error* is hence the recommendation.

Other issues important to keep in mind when implementing a business model are aspects important regardless of which model. Following internal policies, ensuring that products are FSC certified, and producing products in countries with an energy mix as renewable as possible are such aspects.

Performing life cycle assessments (LCA) on products is another recommendation. However, it is important to perform them in a transparent way. LCAs can be a good way of mapping the environmental impact of a product, but they should be done to do so, and not solely with the purpose of making the product look environmentally

friendly. It could be of interest to do a comparative LCA, to further examine how single-use and reusable packaging perform in specific pilots.

Mapping the customer journey is also a recommendation [98]. The mapping is performed to see how a customer experience a brand. The customer journey is connected to all steps related to the interaction between customers and a brand. It is hence not only about the purchase itself but about everything from becoming aware of the brand through e.g. an ad to the use-phase the product.

# 5

## Discussion

In this chapter, the different parts of the results will be discussed separately. This will be followed by a discussion of the methodology, process and ethical aspects related to the thesis.

### 5.1 Sustainability criteria

The research question regarding which sustainability criteria that could guide Stora Enso in development of a reusable packaging business model, is answered well in the thesis. A good range of ecological, social, and economic criteria has been developed to evaluate business models against. The number of criteria, which were nine in total, was considered a good amount to evaluate against. The project had enough criteria to cover many aspects of sustainability but it still remained concise. The criteria were sometimes experienced as a bit vague and hard to evaluate but is probably more due to uncertainties in the business models than the criteria themselves. For example, it is difficult to say whether a business model will lead to restricted emission of greenhouse gases or not when not having a detailed plan regarding production, transports, etc.

The sustainability criteria are based upon the UN global sustainability goals, the four system conditions, the doughnout model, publicly available reports and policies from Stora Enso as well as interviews and dialogues with employees at Stora Enso. In order to have as comprehensive criteria as possible, three criteria were developed for each dimension of sustainability. However, this does not necessarily mean that all aspects are included. As the concept of sustainable development is very broad, it may well be that something has been missed in the development of the criteria. This means that even though the criteria are met, the packaging system might not be fully sustainable. An example could be that we did not include the selection and control of customers. For example, suppliers are included in all criteria, but there is no aspect about who Stora Enso choose to sell their products and services to. A question that may need to be asked is whether to sell to and work with customers who do not themselves meet these criteria. For example, the customer in question may not fully respect human rights. May Stora Enso still consider them self to have met the criteria if they choose to sell to this customer?



## 5.2 The current state of packaging

The research question asking about the current state of packaging in the European and US market and its sustainability challenges has successfully been answered. The multi-level perspective has given a broad understanding whereas the business model canvas for Stora Enso's current business model has given more specific knowledge about the situation at Packaging Solutions at Stora Enso.

### 5.2.1 Multi-level perspective

Mapping with the multi-level perspective gave a broad overview of the five categories of the sociotechnical system. However, the results were highly based on interviews conducted with a few employees at Stora Enso. The mapping will hence largely be based on the perceptions of these individuals. If the interviews had been conducted with another selection of individuals, or solely on literature, the result would likely have another outcome. How large this potential difference would be is however hard to say.

The individuals that contributed to this mapping were also rather few. To get a more reliable and comprehensive result, a larger group of people with different roles in the packaging system, such as producers, retailers, consumers and end-of-life treatment representatives, would probably need to be consulted. The reason that few people were involved was the time limitation and that the overall focus was put on other things. It was assumed that the representatives from Stora Enso Packaging Solutions have a good understanding of the packaging system in Europe.

### 5.2.2 Business model canvas

The mapping of Stora Enso's current business model is largely based on a few interviews. However, the interviews were done with people with good knowledge about the business model, but they are still individuals that will have an affect on the result. What was worth noting when conducting the interviews was that certain things that was brought up, that was found in the annual report, was not known from the employees' side. It was also experienced a bit difficult to find information about the current business model when searching for information. Therefore, the interviews were valuable in this step.

This result was not as useful for the following steps as we first thought. Since the method changed throughout the thesis, this step was not necessary in the end. However, the result may be useful in itself for Stora Enso, to see how external people interpret their business. For Stora Enso it might be a good idea to ask if this is how they interpret their own business or if something differs. In that case it might be a good idea to communicate their business in a different way, to show external people how and why they do the business.

### 5.2.3 Consumer preference in reusable packaging

Due to the large amount of participants in the consumer survey, clear trends can be seen in the result. However, the result might be biased. When the survey was shared on social media platforms such as Facebook and LinkedIn, it most likely reached primarily the networks of the authors. People in the authors' networks are more likely to have similar backgrounds in form of e.g. education and socio-cultural background. A bias could therefore occur related to the degree of environmental awareness. When the survey was shared on LinkedIn, it was also further shared by employees of Stora Enso which indicates that many of the participants might have connections to either the company or the paper industry at large. These connections might result in a bias that participants prefer e.g. paper before plastics in packaging. It is also likely that the majority of the participants in the survey have a high level of education, similar to the authors and the employees at Stora Enso. Therefore, the result needs to be evaluated by keeping the possible biases in mind. Even though a majority of consumers did not use any reusable packaging today, almost every participant in the survey said that they would consider doing so in the future. This almost unanimous answer might be a indication of a bias.

Regarding the preferred material of a reusable packaging, the result showed clear trends in respondents preferring paper packaging. About 80% of the respondents with a preference answered that they prefer paper. One reason for this clear preference towards paper could be that people from Stora Enso and the paper industry answered the survey. Another reason could be due to consumer's general environmental awareness, since paper might appear more sustainable than a packaging made from non-renewable material such as plastics and metal.

Important to remember is that consumers do not always act as they communicate. According to studies, there is a difference between what consumers say that they do and which decision they actually make[99]. For example, consumers say that they want to make ethical choices but what they actually buy might not go in line with that claim. The reasoning behind this inconsistency might partly be due to budget reasons, since consumers want to buy the cheapest option as presented in the result in table 4.2.

Improvement potential for the survey could have been to include some initiating questions regarding the demographics of the customers. Age, gender, and education level could have been factors interesting and relevant to weigh into the result.

The results from the consumer survey was interesting and could be relevant for Stora Enso as they proceed with business models in reusable packaging in the future. The results contributed to find success factors regarding reusable packaging.

### 5.3 Business model to bridge the gap

The research question regarding if there are any business models in reusable packaging that are suitable for a fibre-based packaging company is answered. The business model *reusable packaging with specific features for unique industry* were meeting all but one criterion and fitted into all future scenarios. There are also other business models that meets most criteria and fits into most scenarios, but not at the extent as *reusable packaging with specific features for unique industry*. The business model is thus the most promising.

Another aspect that is shown when evaluating the business model ideas are that B2B solutions are generally more viable than the B2C and B2B2C solutions. The reason is that the uncertainty in the end-users behaviour can be avoided by only targeting other businesses. A scenarios where consumers do not return used packaging is hence prevented.

#### 5.3.1 Workshop

The workshop was conducted as a part of identifying business models to bridge the gap. Whether it was the best possible way to find new business models in reusable packaging is hard to know, but it is safe to say that people with good background knowledge was brought together. Even though none of the developed business models was assessed to meet all sustainability criteria or seamless fit into all scenarios, some of them was still on a good way. The outcome of the workshop was not only the generated business models but also the opportunity for the employers to learn and come together to co-create solutions for the reusable packaging offering at Stora Enso. The opportunity to co-create and learn might be as valuable if not more, than the business models that was developed.

#### 5.3.2 Future scenarios

Constructing of future scenarios can be done in multiple ways. The final scenarios are based on e.g. what risks and uncertainties that are considered most relevant. There are indefinitely combinations and variations on how the axes can be constructed, which will hence result in different scenarios. It will unavoidably exist factors used in the creation and of the stories explaining the different futures, that was not considered in the thesis. However, the point with constructing scenarios is to make sure that all possible outcomes will be considered. Therefore, the constructed scenarios can still give a sufficient picture of how the future will play out.

From the companies side, when deciding whether a business model should be implemented or not, scenarios can be a good aspect to consider. However, even though only one business model from the workshop fits into all scenarios, it does not mean that no other option can be considered. If choosing a business model that do not fit in one or more scenarios, one could first of all take actions regrading the critical

aspects presented in figure 4.7. The company could hence choose a business model that does not fit into scenarios, but they should be aware of the risk it poses.

### 5.3.3 Evaluation of business models

The evaluation of business models were performed by using a qualitative grading approach, using the colours red, yellow, and green to indicate if the criteria are met or the business models fit into the scenarios. No weighting of criteria was hence performed. The choice to not use any weighting was to let Stora Enso themselves decide what trade-offs to do further ahead. Another reason why the criteria were not weighted is that all aspects of sustainable development are equally important on a general level. On the other hand, some criteria may be more or less important for Stora Enso in particular, and therefore the weighting is up to them.

Since no single business model ended up meeting all criteria or fit into the future scenarios one must ask the question how to proceed. Should all business models be rejected or could Stora Enso proceed with them anyway? In the recommendations, the advice has only been to look over which aspects to improve or further investigate in each and every case. The recommendation has hence not explicitly been to proceed with or reject any certain business model. However, when looking at table 4.5 and 4.6 it is obvious that some business model might be better suited than others, such as the *reusable packaging with specific features for unique industry*.

There is also an uncertainty in the business models in reusable packaging developed during the workshop. Since they just have been very briefly described in the BMCs provided during the workshop, it is hard to evaluate them against criteria and future scenarios. Therefore, the business models would need to be further refined and developed to gain a better understanding about them. In developing a suitable business model in reusable packaging for Stora Enso, the business models presented here can be used as a basis and the recommendations and actions to achieve sustainability and for the models to fit in all scenarios, see table 4.7, can also be used to produce a business model that responds well to the requirements set out in this thesis.

## 5.4 Strategy towards future vision

The research question regarding the critical success factors in sustainable reusable packaging is answered, mainly by conducting interviews with different segments in the packaging system and by analysing the survey. In the result, critical success factors both regarding B2C solutions and general aspects were listed in section 4.3.3. A general trend among them is that consumer perspective is vital for a successful business model. Success factors are also related to collaboration between segments, testing projects in small scales, and perform LCAs to prove or test if reusable packaging is in fact better than single-use packaging, to mention a few examples.

The last research question is related to the next steps to be taken for Stora Enso if they proceed with any of the business models. The question is answered by giving general recommendations presented in section 4.3.3, and describes what critical aspects are needed to be further investigated or reviewed.

The recommendations that come as an outcome of this project are, of course, simply just recommendations. There might be other ways of coming up with relevant business models in reusable packaging, and also other ways of analysing them. In this thesis the focus has been on analysing business models towards sustainability criteria. The outcome will hence depend on which criteria that is decided on. Depending on how the scenarios were developed, the outcome will also play out in a certain way. In addition, it can be other ways of evaluating business models other than based on sustainability criteria and scenarios. Recommendations are also done based on the authors knowledge about the packaging system, etc., which also will affect the results. The mapping of the packaging system could also be executed in multiple ways. Therefore, recommendation should be read with above aspects in mind.

The aim of the thesis is to explore what is needed to be successful in reusable packaging which is accomplished by examining success factors and how well potential business models correspond to sustainability criteria and future scenarios. New innovation in reusable packaging was also found by taking part in the result developed by Catapult as well as the business models generated during the workshop. Finally, measures needed for proceeding with business models in reusable packaging are proposed by the recommendations presented in section 4.3.3.

## 5.5 Discussion of methodology

In general, the choice of methodology and methods was well suited for the project since all research questions could be answered with the results from the project. However, perhaps not all elements played an equal role in the final outcome and something that may not even have been necessary was the mapping of the current packaging system. On the other hand, the multi-level perspective was a good choice of tool to do this because it helped consider a breadth in the system. The business model canvas was especially a good choice in the workshop as it supported the participants in the development of business models. It would probably have been difficult to develop a business model without having a template to work from and relate to. As for the workshop, it was probably the one that contributed most to the final outcome, as it provided us with business models to evaluate, which were also developed by people with a good understanding of the current packaging system and Stora Enso. However, a larger share of the result from the external consultancy firm Catapult could have been evaluated as well if Stora Enso wanted to focus more on joining already existing businesses. However, this would probably had been difficult because of the limited amount of time.

The evaluation of the business models were made in a qualitative way, based on the

overall learnings throughout the thesis work. If the evaluation had been quantitative, it might have been more transparent and easier for others to follow the reasoning. On the other hand, due to time limitations, it was not possible to quantify the business models and their performance in sustainability criteria fulfilment and future scenarios. However, we could have involved Stora Enso more in the evaluation and had a discussion together. It would also have been easier if the business models had been more developed, as they were sometimes difficult to interpret in the context of the sustainability criteria and the future scenarios. The outcome of the evaluation is largely based on our own interpretations of the business models and how they might perform. However, if Stora Enso prefers, they have the chance to further develop the business models and thereafter evaluate them against sustainability criteria as an iterative process.

In the interviews conducted in the thesis, semi-structured interviewing was used, i.e. interviews when the interviewer has the possibility to slightly deviate from the questionnaire. The interviews were remembered by writing down general notes. They were hence not written down word-for-word, nor recorded. For the purpose of the thesis, the semi-structured interviewing and taking general notes worked well. The thought was in most cases to more get the broad and overall sense of what the interviewees wanted to have said. Since the thesis has rather had a qualitative than quantitative approach, general notes and semi-structured interviews were considered suitable. However, there is always a risk that the initial meaning or message of the interviewee is tweaked or misunderstood when not noted down word-for-word.

Not stating any names or general information about the interviewees was a conscious strategy. The choice to anonymise the interviews is advantageously for the interviewees since they will not have to worry about e.g. how their words are tweaked or presented. It is hence an ethical consideration. Because of the choice of methodology we have throughout the thesis evaluated business models and the current system against sustainability criteria and included in this are also the ethical aspects of the effect of our work. We stress that the use of this thesis in the future respects the social criteria and considers the ethical aspects included in them.

### 5.5.1 The use of backcasting

The overarching method for the thesis was backcasting. However, the thesis could have been performed by not using backcasting as well. What has become clear during the process, is that it might not be the actual result that is the most important outcome of a backcasting process, but the learning during the work. This is in line also with previous studies such as the article written by Arm et al[57]. Since the thesis did not result in a specific business model that perfectly fitted into all scenarios or met all sustainability criteria the recommendation was not to pursue with a specific business model, but rather ideas on how to proceed. However, some of the business models fitted quite well into the scenarios and met most sustainability criteria. Therefore, it is likely that certain business models could potentially be

interesting for Stora Enso to proceed with. It is hence the more general recommendations and the learning itself that is most interesting with the outcome. To take the workshop as an example, the learning of the employees and the opportunity for them to come together to work with reusable packaging as a concept, might have been as rewarding as the business models that was finally generated. The reason for stating this is because many of the participants expressed that they were very happy with getting a chance to jointly brainstorm around the concept of reusable packaging.

The time perspective used in the thesis was set to ten years in consultation with Stora Enso. However, the time period is rather short compared to other backcasting projects and as mentioned in section 2.2, backcasting is suitable when there is a long enough time horizon so that major changes can be made to disrupt the unsustainable system. One could hence discuss if the time frame was too short for such a project. Even though ten years is more than enough to implement a new business model, it might not be long enough to bring about comprehensive systemic change.

Another potential issue in using backcasting in this project is that the scope of the thesis might be a bit too narrow or specific. It was decided from the start that the focus should be on reusable packaging specifically, not the packaging system at large. Even though the research questions also opened up to the possibility that there might be no suitable business model in reusable packaging for Stora Enso, the focus was still on finding how the company could engage in reusable packaging. The scope hence gives limited leeway of exploring other alternatives to today's situation, which the backcasting approach is commonly used for. A more open and wide scope would possibly have been better if the aim for Stora Enso is to have a truly sustainable business.

Backcasting is usually regarded as an overall philosophical approach to the issue of sustainable development and systemic change. In this thesis however, it has been used more as a strict step-by-step method. With hindsight, not all steps might have been necessary and clearer result might have been achieved by including other methods and tools. Certain steps used in the thesis, such as the mapping of the current system with the MLP approach, might not have been so important to the final result and outcome.

# 6

## Conclusion

From the evaluated business model ideas, the ones related to B2B were assessed to be more promising than the B2C, or the B2B2C ideas. The reason is that the end-users behaviour regarding returning of packaging could be avoided. A general conclusion is therefore that B2B business models in reusable packaging could be of most relevance for Stora Enso. In the result, it became clear that the *reusable packaging with specific features for unique industry* was the most promising business model idea out of the ones developed during the workshop. The business model is assessed to work in all developed scenarios. The only critical aspect is the one related to the choice of material, which is recommended to further investigate. However, whether Stora Enso should proceed with this business model idea, another, or none of the evaluated business model ideas, is up to them.

A general conclusion that can be drawn from the project is that issues regarding implementation of business models in reusable packaging need to be viewed with a holistic approach. The economic aspects are vital for a company before actualising a business model because it is necessary to be able to make profits in a long-term perspective. At the same time, the social and ecological factors are important to remain relevant from a consumer perspective as well as to follow internal company policies and guidelines. However, it is important to remember that not all important aspects regarding a sustainable future is necessary included in this project. Regarding the future scenarios, it is also difficult to say whether all aspects are included as well as which scenario that will be the most likely in the future. Therefore, recommendations should be considered merely as recommendations since they are based on these sustainability criteria and potential scenarios. If Stora Enso would want to proceed with a business model that does not fit into one or few scenarios, it is up to them. What is important to remember is only that it can imply a certain risk to proceed with such a business model. In the end, it will be up to Stora Enso to decide which trade-offs to make and which risks to take, with respect to the sustainability criteria and future scenarios.



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# A

## Interview guide on criteria & current situation

Some of the below listed interview guides where in certain cases performed during the same occasion/ with the same person.

### A.1 Interview guide: Criteria

1. What is your background?
2. What is your role at Stora Enso?
3. What insights and knowledge do you have about reusable packaging?
4. What criteria do you think need to be fulfilled for Stora Enso's business model should be sustainable?
  - Ecological
  - Social
  - Economic
5. What criteria (generally) do you think need to be fulfilled for reusable packaging to be considered sustainable?

### A.2 Interview guide: Current situation

1. How would you describe the current packaging system based on following categories? Answer based on what you think.
  - Infrastructure
  - Market
  - Knowledge
  - Laws & regulations
  - Technology
  - Culture

# B

## Interview guide on current business model

1. Channels
  - Through which channels does Stora Enso reach different customer segments? E.g. sales force, web sales, own stores, partner stores, wholesaler etc.
  - How does Stora Enso raise awareness about the products/services?
  - How does Stora Enso help customers evaluate the value proposition?
  - How does Stora Enso allow customers to purchase specific products/services?
  - How does Stora Enso deliver the product/service to customers?
  - How does Stora Enso provide post-purchase customer support?
2. Customer relationships
  - What type of relationships are established between Stora Enso and different customer segments? E.g. personal assistance, self-service, automated service, communities, co-creation etc.
3. Revenue streams
  - What type of pricing mechanism is used, fixed or dynamic?
4. Key activities
  - What key activities are required for the current value proposition "low carbon alternatives to products based on finite resources"?
    - Production (related to designing, making and delivering)
    - Problem solving (related to coming up with new solutions to individual customer problems)
    - Platform/network (related to platform management etc if there is a platform)
5. Key partnerships
  - Strategic alliances with non-competitors
  - Cooperation: strategic partnerships with competitors
  - Joint ventures
  - Buyer-supplier relationships
6. Cost structure
  - Would you say that Stora Enso is cost-driven or value-driven?

# C

## Interview guide on the future of packaging

1. What is the main purpose of packaging according to you?

### C.1 Future scenario

1. What are the positive/negative trends impacting packaging in your opinion?
2. What do you think are the biggest risks/uncertainties when it comes to the future of packaging? (legislation, consumer expectations, cost of raw material, global warming etc)
  - How do you think these risks/uncertainties will impact packaging?
  - Which of these risks/uncertainties do you see as the most important ones to manage/keep track on and why?
  - How would you address them?

### C.2 Reusable packaging

Introduce the definition of reusable packaging: “packaging or packaging component which has been designed to accomplish or proves its ability to accomplish a minimum number of trips or rotations in a system for reuse” (from ISO)

1. What do you see as trends/possibilities impacting reusable packaging/transport solutions?
2. What do you expect from reusable packaging and related services such as transport, cleaning, service, benefits etc?
3. What would make you choose reusable packaging instead of single-use packaging if you had the choice? (price, easy to use etc) As a business representative?  
As a consumer?
  - What is necessary vs nice to have?

### C.3 Business

1. Do you have any suggestions/ideas on how reusable packaging could be used in your specific business?
2. Which material would you choose for reusable packaging and why?

# D

## Consumer survey

1. Are you using any reusable packaging service today?
  - Yes
  - No
2. If so, which one?
  - Room for written answer
3. Would you consider to use reusable packaging services in the future?
  - Yes
  - No
4. If your answer was no, why?
  - Room for written answer
5. What would make you choose reusable packaging instead of single-use packaging if you had the choice? (Multiple answers possible)
  - Lower price
  - Same price
  - Smooth logistics (easy to return/refill)
  - Appealing design
  - Environmental benefits
  - Getting a voucher when returning the packaging
6. Are you willing to pay extra money for a reusable packaging service if it is more environmentally friendly?
  - Yes
  - No
7. In which applications would you consider using reusable packaging? (Multiple answers possible)
  - Food products
  - Beverages
  - Pharmaceuticals
  - Cosmetics
  - Household products
  - Clothes & shoes
  - Electronics
  - Smaller consumer goods
  - Furniture
  - Other: Room for written answer
8. Would you prefer any specific material for a reusable packaging?
  - Yes
  - No

9. If your answer was yes, which material?

- Plastics
- Paper
- Glass
- Metal
- Wood
- Other: Room for written answer

# E

## Contribution report

In this master thesis, the two contributors have jointly authored all chapters and subsections. The texts has continously been written, elaborated, and refined by both authors. Therefore, it is not possible to individually describe who has written what.

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