Project ID: KKO-1902

Circular Economy in Small Companies Within Amager

An Interactive Qualifying Project submitted to the Faculty of
WORCESTER POLYTECHNIC INSTITUTE
in partial fulfilment of the requirements for the Bachelor of Science

By:
Karly Bigham
Brian Ferrarotti
Andrew Gray
Jack Procaccini

Date:

29 April 2019

Dorte Grastrup-Hansen
Project Sponsor
Miljøpunkt Amager

Karen Oates, Co-Advisor
Guillermo Salazar, Co-Advisor
Worcester Polytechnic Institute

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MILJØPUNKT AMAGER

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Abstract

A circular economy is a sustainable framework focused on the continuous use of materials in a regenerative loop. Through analysis of product resource flows, this project assisted Miljøpunkt Amager in developing circular economy practices applicable to small food companies in Amager. The results show that best practices are unique for each business, suggesting the necessity to standardize the process of obtaining these best practices rather than generalizing them across the entire food industry.

Acknowledgements

This project would not have been possible without the assistance of many people.

- Our advisors, Professors Karen K. Oates and Guillermo F. Salazar, for their support that enabled us to create a meaningful Interactive Qualifying Project.
- Our sponsor, Miljøpunkt Amager, for giving us a problem to help solve. In particular, we would like to thank Director Dorte Grastrup-Hansen, whose insight and assistance kept our project on track.
- Our preparatory term instructor, Professor Nicola Bulled, for guiding us through what it took to manage the social science components of an Interactive Qualifying Project.
- Professor Joseph Sarkis of Worcester Polytechnic Institute, for agreeing to interview with us and provide his expertise on the circular economy that helped guide our work in its early stages.
- The circular economy experts who provided us with their invaluable insight: Tina Oleson, Troels, Tanja, and Reza from TinkerTank; Professor Michael Søgaard Jørgensen of Aalborg University, and Stine Hansen from VÅR Design.
- The representatives of the businesses we interviewed, who took time out of their busy schedules to tell us more about their businesses: Christer Bredgaard from Il Buco, Anders Barsøe from Letz Sushi, Mette Heerulf Christensen from Broders, and Mona Isabel Andersen from Ø-helse.
- Our university, Worcester Polytechnic Institute, for providing us the opportunity to complete our Interactive Qualifying Project abroad.

Executive Summary

In response to the growing problem of waste, the concept of the circular economy has been developed. A circular economy involves keeping resources continuously circulating in a useful form, whereas a linear economy refers to traditional business practices where waste is disposed of permanently. Awareness of the circular economy has been increasing over the past years, leading to the publishing of numerous initiatives both in Europe and the City of Copenhagen. Many of these initiatives have been directed at improving current waste management methods. Even in countries with high recycling rates such as Denmark, there is room for improvement in regards to keeping valuable resources in the economy, particularly in the food industry. To this end, organizations in Amager, a district of Copenhagen, have made progress advancing sustainability at the local level. However, work can still be done towards determining how to implement a circular economy at the business level.

This project aimed to assist Miljøpunkt Amager through the development of effective circular economy practices that could be implemented by small food companies in Amager in an effort to improve business sustainability. Through case study assessments of four different food businesses, focusing on 2-3 of their products, this project addressed the following research questions:

1. What motivations do food businesses have to implement strategies for a circular economy?
2. What are the challenges to implementing a circular economy within food businesses?
3. What information is necessary to assist food businesses in the implementation of circular economy practices?

Case studies of product resource flows within small food businesses were used to conduct the research for this project. For the purpose of this research, a case study was defined as in-depth analysis of a product resource flow within a business. Four methods were conducted to accomplish this goal.

First, case study criteria were obtained through an interview with sustainability expert Professor Joseph Sarkis from Worcester Polytechnic Institute in order to provide a numerical scoring system as detailed in the multi-criteria analysis below. The identified criteria consisted of:

1. Cost Savings
2. New Revenue Generation
3. Social
4. Resiliency

Next, interviews with three circular economy experts in Copenhagen were conducted to gain a conceptual understanding of how to implement a circular economy within small food businesses in Amager. These interviews led to the third method of semi-structured interviews with representatives from four small food businesses. For each business, 2-3 waste-producing product resource flows were chosen by the business to be studied in detail. The representatives from the companies also ranked the importance of the case study criteria for their businesses from 0 to 100, with 0 being the least important and 100 being the most important.

Finally, the information obtained from the interviews with circular economy experts and business representatives was utilized to perform a multi-criteria analysis for each product resource flow. This analysis was used to offer circular economy solutions for each individual resource flow, focusing on waste managed least effectively. The steps taken to conduct the multi-criteria analysis for each resource flow are listed below:

1. Highlight waste products and corresponding waste management methods.
2. Evaluate effectiveness of each waste management method.
3. Apply concepts of implementing a circular economy suggested by local circular economy experts in order to determine possible solutions for better managing waste.
4. Identify best circular economy practice for better managing waste using the business criteria rankings.

The four methods, starting with obtaining the criteria and ending with the multi-criteria analysis compose the case studies.

One of the 10 product resource flows is presented in Figure 1 regarding Il Buco's vegetables. The Il Buco vegetable product resource flow enabled the identification of waste products and corresponding waste management methods. Using the outline of the multi-criteria analysis, the best circular economy practice was identified for better managing waste in the vegetable resource flow.

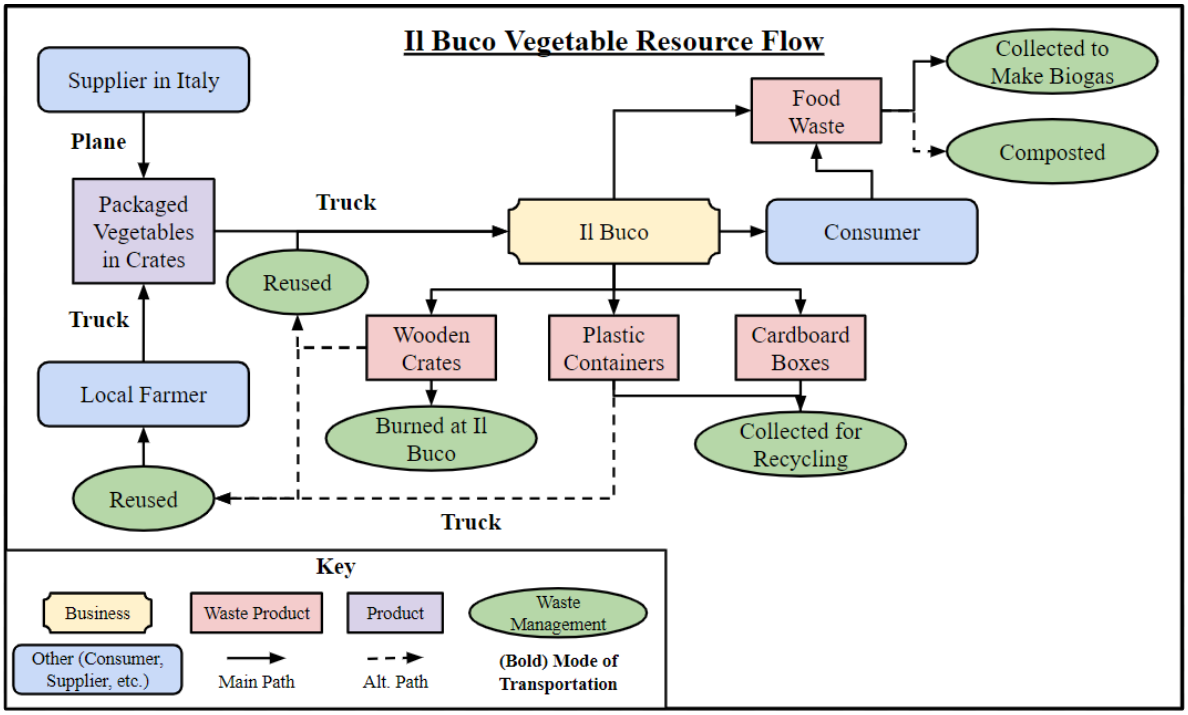

Figure 1: Il Buco Vegetable Resource Flow

In the case of Il Buco, it was determined that the best circular economy practice for better managing waste in the vegetable resource flow was for the restaurant to grow their own vegetables in a greenhouse or garden. The benefits of doing this include reduced packaging during transportation, an area offering the opportunity to compost food waste from Il Buco, and potential long-term cost savings.

After analyzing 10 product resource flows from four different food businesses using the previously detailed procedure, 10 unique best practices were developed. It was concluded that implementation of a circular economy within small food businesses first

requires an understanding of the motivations, challenges and information related to implementing a circular economy before identifying the best practices for better managing waste.

It is essential that each business identifies its own values in order to understand the motivations for implementing sustainable business practices. Given that these values can vary for each business, identification of them is critical in order to determine the best practices for better managing waste that align with each company's needs. Additionally, small food businesses must understand the challenges involved with implementing a circular economy in order to understand the feasibility of a solution. Limited resources and a lack of cooperation between a business and supplier can impede the implementation of circular economy business practices. Furthermore, in order to successfully implement a circular economy model for any business including the food services studied, knowledge and understanding of how to construct, interpret and intervene in the product resource flows are essential.

Based on these conclusions, it is recommended that small food businesses use the same process as outlined in the multi-criteria analysis for this project in order to identify best circular economy practices for better managing waste. The best circular economy practices are unique for each food business due to their varying criteria rankings and different products. Therefore, it is useful to standardize the process of obtaining the best practices instead of generalizing individual solutions across the entire food industry.

Additionally, it is recommended that Miljøpunkt Amager conduct future work on understanding the viability of implementing circular economy practices in small food businesses. Many solutions identified in this project had potential cost savings or at the same time, increased expenses. This project was limited by an inability to collect financial information from the small food businesses interviewed due to confidentiality concerns. For this reason, it is recommended that a business implementing circular economy practices conduct their own cost-benefit analysis in order to decide if these financial effects would benefit the company. In addition, it is recommended that a business conducts a feasibility study in order to determine the practicality of implementing circular economy solutions. For example, implementing a greenhouse or

garden in Il Buco would require a feasibility study in order to identify factors that affect this best practice such as technological and legal restrictions.

Finally, it is recommended to Miljøpunkt Amager that more research be conducted on a greater variety of businesses. This research was limited due to the fact that the businesses used in the case studies were chosen based on their preexisting relationship with Miljøpunkt Amager and therefore have all previously implemented sustainable practices. This potentially biased their values and criteria rankings in comparison to businesses that have not yet taken steps towards sustainability. To address this, less sustainable businesses should be studied. Furthermore, it would be of value to gain more insight on an industry other than food. Although the process of analyzing resource flows was standardized to be applied to any business, investigating other industries would ensure the usability of the resource flow analysis process. These recommendations were made possible through the case study method conducted in this project.

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Authorship

Karly Bigham 	Mechanical Engineering Westford, MA	**Andrew Gray** 	Mechanical Engineering Irvington, NY
Brian Ferrarotti 	Aerospace Engineering New Hartford, CT	**Jack Procaccini** 	Aerospace Engineering Newtown, CT

The table below lists the primary contributors to each section of this report. All team members were involved with revisions of every section as well as the creation of presentations for this project.

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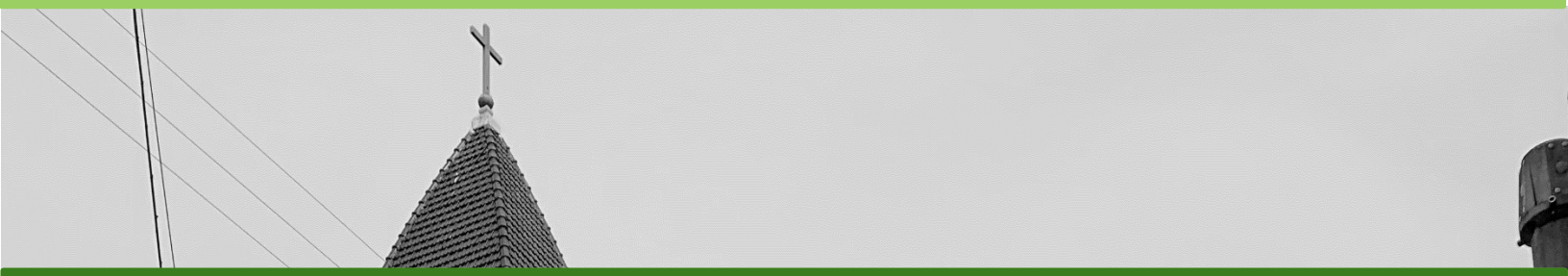

CHAPTER 1
INTRODUCTION

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1. Introduction

Waste has become an ever-growing issue in the modern world. Valuable materials are disposed of with no valid option for reusability or recycling. As a result, 21 billion tons of raw material were disposed of as waste during the production of all products in the European Union during 2014 (Sustainable Europe Research Institute, 2014). Much of this is mainly due to poor practices in storage and inefficient production processes focused on poorly made mass produced products rather than eco-effective methods which promote sustainability (Sustainable Europe Research Institute, 2014). The current model of linear economy supports these poor practices. A linear economy system involves developing a product whose life-cycle involves a single use. The item and its packaging are then disposed of as unusable waste (Ministerie van Infrastructuur en Waterstatt, 2016). As industries continue to rapidly use more resources, material shortages will result in drastic price fluctuations in what were previously affordable products. Without these vital resources, the functionality of certain nations will be severely inhibited (Furkan Sariatil, 2017). The abundance of inexpensive materials and cheap labor have allowed for the short-term financial success of businesses, but have failed to address the long-term problems posed by sustainability.

Following the 2008 financial crisis, the European Commission acknowledged the need for an economic change through its publication of the *Europe 2020 Strategy* (European Commission, 2010). The strategy emphasized the importance and necessity of sustainable growth and an efficient use of resources. In response, the Danish government published the reports *Denmark without Waste: Recycle More-Incinerate Less* (The Danish Government, 2013) and *Denmark without Waste II: A Waste Prevention Strategy* (The Danish Government, 2015). Both of these reports placed an emphasis on an increase in recycling. Most recently, the government published *Strategy for Circular Economy* which contains direct government initiatives promoting the transition to a regenerative system formally known as a circular economy (The Danish Government, 2018). Through this sequence of publications, the Danish government has made it clear that developing a self-contained economic system is a top priority.

Although these initiatives have brought progress in dealing with effective ways of treating waste, much work can still be done. Despite the percentage of waste being recycled in Denmark increasing from 2013 to 2015, total waste generation in the country has essentially remained constant over the same time period, with a substantial share of waste still landfilled or incinerated (Danish Environmental Protection Agency, 2017). The current waste treatment processes are not enough to ensure long term sustainability.

The push for a more sustainable society has given rise to the concept of a circular economy. A circular economy is an economic system that aims to redefine growth by gradually decoupling economic activity from the consumption of finite resources (The Ellen MacArthur Foundation, 2017). The three main principles supporting the foundation's system are designing out waste, keeping products in continuous use, and utilizing regenerative systems in nature. As a result of these efforts, a closed loop of consumer products will ensure that discarded waste is placed back into the economy in some form. This system requires a great deal of cooperation on the part of manufacturers and consumers. In order to satisfy the circular economy, all goods need to be manufactured with reusability or recycling in mind, ensuring that any waste producing components be eliminated. Businesses have recently become aware of circular economy practices, but have taken little action to practically implement these steps into their daily operations (Liu & Bai, 2014). A structured and well thought out plan could be the driving force needed to take the circular economy from a theoretical process to a practical application that promotes effective strategies for implementing this system.

Miljøpunkt Amager is a non-profit company whose work revolves around sustainability projects in Amager, a district of Copenhagen. Miljøpunkt has conducted several sustainability workshops to educate the community on environmental practices and now hopes to better understand circular economy applications for small businesses in Amager (Miljøpunkt Amager, 2018). Miljøpunkt has previously collaborated with Monika Most, a graduate student conducting her master thesis dissertation at Aalborg University in Copenhagen to investigate circular economy at the household level (Most,

2018). While this work provided valuable insight for implementing a circular economy in the community, there has not been in-depth research of how a circular economy could specifically be implemented in small businesses within Amager. If Miljøpunkt Amager can better understand the best circular economy practices for small businesses, this would help the organization take action in reducing the waste produced within Amager.

This project aimed to assist Miljøpunkt Amager through the development of effective circular economy practices that could be implemented by small food companies in Amager in an effort to improve sustainable businesses practices. Through case study assessments of four different food businesses, focusing on 2-3 of their products, this project addressed the following research questions:

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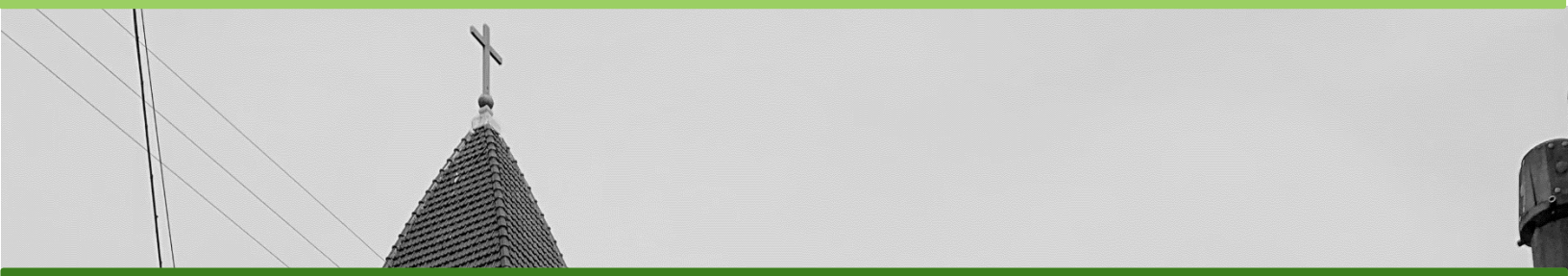

CHAPTER 2
BACKGROUND

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2. Background

In this chapter, the model of the circular economy is described as well as initiatives within Denmark which aim to implement circular economy. An overview is provided on how Denmark currently manages its waste, justifying this project's focus on the food industry. Finally, the previous work done by this projects sponsor, Miljøpunkt Amager, and others is discussed regarding circular economy in Amager.

2.1 Implementing Circular Economy Practices

Circular economy (CE) can be defined as a sustainable framework focused on the continuous use of materials in a regenerative loop. As previously mentioned, three main principles of this system include designing out waste, keeping products in continuous use, and utilizing regenerative systems in nature (The Ellen MacArthur Foundation, 2017). Figure 2 depicts the main practices of a circular economy system (Stahel, 2016).

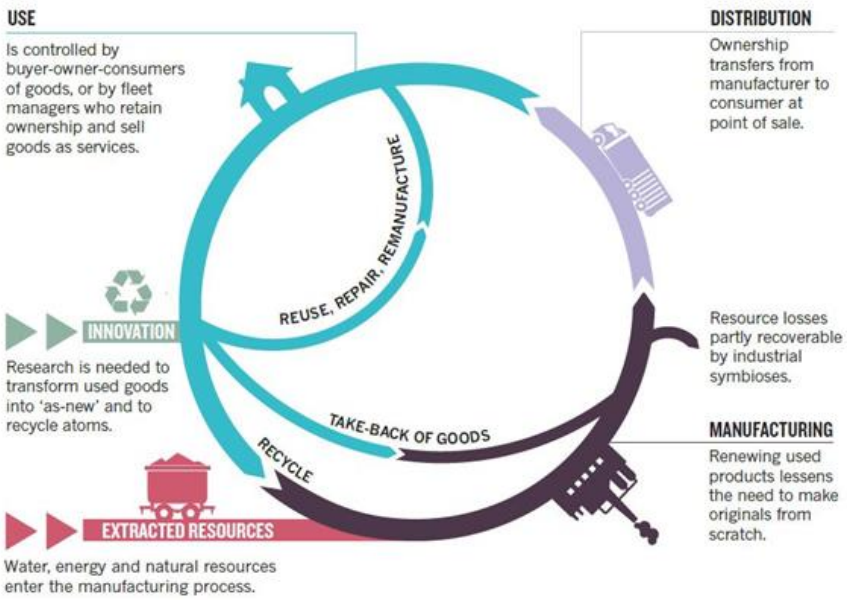


Figure 2: Visual Depiction of Circular Economy Loops (Stahel, 2016)

Each loop originates from an item that was designed with sustainability in mind. The small loop includes the reuse, repair and remanufacturing of items. In this smallest loop,

a product is repaired or refurbished, and given directly back to the consumer without third party intervention. The middle loop involving the take back of goods describes a process in which a company would receive lightly used items, remanufacture them in their factory, and then ship the item back out to consumers for use. Unlike the small loop, this process includes the use of additional resources in a factory, and a means of transport to put the item back into circulation. The large loop involves the practice of recycling. In this loop, a product has its useful resources extracted, remanufactured in a factory, and then shipped out to consumers. Examples of this process are the creation of biogas and the composting of food waste. This is the largest loop and least effective loop, and involves the use of the most resources in order to keep material in the regenerative loop. Additionally, resources are lost throughout the recycling process as materials must be broken down into smaller elements. Though all of these regenerative cycles promote sustainable practices, closing the loop and keeping the loop as small as possible are the most effective ways to support a circular economy and limit the total amount of resources used.

Certain business practices for promoting a circular economy can be undertaken by companies in order to adapt their current business model to one that is more grounded in sustainable initiatives. These business practices include a sharing or rental system, repairing, reusing, parts harvesting and recycling.

A sharing or rental system involves making better use of materials and resources already available to the population of an area (The Ellen MacArthur Foundation, 2019). This can include the sharing of household items, work spaces, modes of transport, and food. These practices can work to make a more sustainable environment where businesses and people share a greater connection among each other.

The practice of repair or reuse involves citizens or businesses collaborating with the community to repair and distribute items. For example, electronic products that could have potentially been discarded as waste can now be put back into the loop by following these practices. This allows the community to take an active part in a sustainable lifestyle, while also circumventing the use of unnecessary resources by companies (The Ellen MacArthur Foundation, 2019).

Parts harvesting can be defined as recovering reusable parts from an old product in order to create a new product (World Economic Forum, 2013). A current example of this practice would be an automotive junkyard, where old vehicles are brought to be destroyed and disposed of. Before this occurs, valuable parts such as engine components are taken out to then be sold for reuse (Most, 2018).

Finally, recycling occurs when resources are manipulated into material that can then be turned into a new product (World Economic Forum, 2013). Common examples of this can include returning waste products to a local recycling center or sorting a business's waste to be picked up by a recycling company (Most, 2018). Together, these five businesses practices allow for businesses to better manage waste.

2.1.1 Positive Outcomes of a Circular Economy

Incorporating a circular economy into business practices and society yields many positive outcomes for the company and the consumer. If a business does not need to manufacture or collect more of a specific material, they will in turn save money, as manufacturing costs will be significantly reduced. Additionally, community involvement will allow the companies and community to work together in order to form a more sustainable environment. Currently, it is estimated that the European Union may save 400-600 billion dollars in material costs across a multitude of industries such as automotive and machinery (The Ellen MacArthur Foundation, 2017). The fear of unpredictable and extreme price fluctuations resulting from a linear economy are greatly reduced if companies can self-sustain while manufacturing their existing product. Additionally, the introduction of a circular economy would increase the job market (The Ellen MacArthur Foundation, 2017). Implementing a circular economy in a company requires new quality control positions in order to ensure that the recycle or reused product is up to acceptable standards and appropriate for consumption. In this case, a sustainably developed product will hold more value throughout the entirety of its life-cycle as it is built for continuous use (The Ellen MacArthur Foundation, 2017). New research and development positions will also be in demand as there is now an even greater incentive to innovate and explore new ideas in all affected industries (The Green Brain, 2016).

The process of creating products that can be incorporated in a circular economy model will have a tremendous impact on the environment. The philosophy of designing out waste will significantly reduce the amount of trash collected in landfills while also eliminating the need for the harvesting and refinement of raw materials (Stahel, 2016). As a consequence, harmful resource collection practices will no longer be needed, which in turn would allow the land and soil to become nutrient rich and facilitate plant growth. The reliance on renewable energy sources rather than fossil fuels would also lower carbon dioxide levels in the air and subsequently reduce pollution created by immense manufacturing plants.

2.1.2 Challenges to Implementing a Circular Economy

Attaining a local or global circular economy has a multitude of challenges. Cooperation at all stages of a product life cycle is required for the system to function (Hoibye & Sands, 2018). The lack of an international authority that regulates sustainable practices would require each individual company and industry to research the effects that transitioning to this new system would have (Sariatil, 2017). Prior research has estimated the amount of money that could be saved on material costs at 400-600 billion, but the effectiveness would vary individually from industry to industry (The Ellen MacArthur Foundation, 2017). Upfront costs required to make the change could be unnerving to businesses, and it is doubtful that the effects would be evenly spread across all industries involved in the manufacturing of a product (The Green Brain, 2016). Industry specific research would have to be undertaken and then applied to the specific sector in order to ensure that a circular economy benefits everyone involved in the life-cycle of a product.

2.1.3 Awareness of Circular Economy

Citizens of Europe, particularly in countries close to Denmark such as Poland, favor the implementation of circular economy principles. A recent study indicated that the majority of Polish residents were in support of regularly taking responsibility for their waste and purchasing recycled goods (Smol et al., 2018). With the cooperation of both the citizens and industries of Poland, 80% of those who were surveyed see a circular economy in

the future of the country. The study finds the importance for the government to present goals and guidelines to be followed as the concept transitions into a reality. With the public attitude towards this greener lifestyle being quite popular, the primary driver to bringing about this change is large industrial sectors with support from the community. Thus, these policies and guidelines would need to be centrally focused on molding these corporations into more sustainable entities by addressing the numerous stages of their manufacturing and waste management processes.

Looking into the Nordic region specifically would additionally show that circular economy is a major factor in the operation of businesses. The initiatives necessary for the adoption of sustainable practices in construction businesses of Nordic countries, such as Denmark, Finland, Norway and Sweden, were warmly accepted by the construction industry (Hoibye & Sands, 2018). Though there may be a challenging transition phase in order to adopt new policies and regulations, the overall effects, specifically the environmental impacts, will be positive. The saving of resources and recycling of construction materials in the long run will reduce the amount of resources harvested and save capital. The final effects of these initiatives will be a reduction of 20% compared to current resource use and subsequently an elimination of 10 million tons of gas emissions (Hoibye & Sands, 2018). Though the strategies may be complicated to implement, a well laid out plan has allowed companies to welcome this change.

2.2 Denmark's Transition to a Circular Economy

On September 1, 2018, the Danish government published *Strategy for Circular Economy*, outlining the country's transition to a circular economy (The Danish Government, 2018). The strategy is directed predominantly at Danish enterprises and encourages all businesses to consider making the transition to a more circular economy (The Danish Government, 2018). One of the problems facing small and medium-sized enterprises (SMEs) is not having the financial resources to develop and implement a circular system within their business. Financial cost is a major challenge impeding a business from implementing sustainable practices (Rizos et al., 2015). However, *Strategy for Circular Economy* stated that there will be a government program which

offers 50% co-financing for any Danish enterprise that obtains consultancy from a private expert (The Danish Government, 2018). This consultancy can be anything pertaining to how a business may develop, implement or upscale to a circular business model. In addition, the government may also co-finance the purchasing of any machinery and equipment that will be used to support a circular system (The Danish Government, 2018). An example of equipment supporting a circular economy could be an automated waste sorter making the process of separating different types of waste simpler and more time efficient (Hopewell et al., 2009). The financing of consultancy and equipment from the government is a valuable incentive for SMEs to consider transitioning to a circular economy.

In response to the circular economy initiatives provided by the Danish government, the City of Copenhagen has developed its own waste management plan, Circular Copenhagen: Resource and Waste Management Plan 2024 (København Kommune, 2019). The primary focus of this plan is on the development of waste and resource management in order to promote circular economy practices within Copenhagen. The plan highlights three specific goals for completion by the end of 2024 (København Kommune, 2019):

1. Recycle 70% of household and commercial waste
2. Reduce 59,000 tons of CO_2
3. Recycle 6,000 tons of waste

In order to reach these goals, Copenhagen has identified the use of sustainable methods as the framework of a regenerative system. The basis of these methods lies in the idea of reusing and recycling waste. Implementation of these regenerative methods will result in creating the foundation of a circular economy.

Through the publication of these professional documents and outlines of specific initiatives, the Danish government, and more specifically the City of Copenhagen, have made it clear that transitioning to a circular economy is a main priority. The sequence of proposed strategies indicates an increasing urgency to create a more sustainable economic environment in Denmark.

2.3 Current Waste Management Strategies in Denmark

Denmark employs several strategies to manage its waste. In recycling, companies extract valuable materials from waste. Dansk Retursystem, a non-profit company, recycles beverage containers made of glass, plastic and aluminum. It encourages recycling by placing a deposit on its containers, a highly favorable system among customers (Dansk Retursystem, 2016). Containers are kept separate from other recycled material to adhere to stringent health and safety requirements, allowing for the recycling of high-quality materials with minimal waste (Dansk Retursystem, 2019). A circular economy necessitates that toxins be kept out so that resources remain useful, which Dansk Retursystem has made progress towards.

Similarly, Danish companies make waste useful in the incineration industry, despite its spectrum of positive and negative outcomes. In addition to diverting waste from landfills, waste incineration generates a significant share of Danish electricity and district heating, with lower carbon dioxide emissions than burning coal (Danish Ministry of the Environment: Environmental Protection Agency, 2013). However, incinerators require a constant flow of waste, putting them at odds with efforts to increase recycling or reduce waste generation. Additionally, the electricity gained from burning many kinds of waste is estimated to be far lower than the energy saved through recycling these materials, even if sorting and transportation costs are accounted for (Morris, 1996). Overall, for a country that prides itself on sustainability, incineration has many unsustainable consequences.

Although landfills are still a component of Danish waste management, the passage of a 1997 law prevented waste from going to a landfill if it was able to be incinerated (International Solid Waste Association, 2012). Landfills represent the worst elements of a linear economy, given that they entail the permanent burial of waste, thus transitioning away from them is an important step towards a circular economy.

As with any developed country, Denmark generates a significant amount of waste, over 11.3 million tons in 2015 (Danish Environmental Protection Agency, 2017). The breakdown of how this waste was managed, along with the management of waste of

two relevant business sectors, is seen in Figure 3. Of the three management methods seen in Figure 3 (recycling, incineration and landfilling), recycling is the one that most closely follows a circular economy. Therefore, it is the preferred method of the three. Because of this, retail and restaurants have work to do towards a circular economy. Both of these business sectors overlap in the food industry, justifying the focus of this study on food.

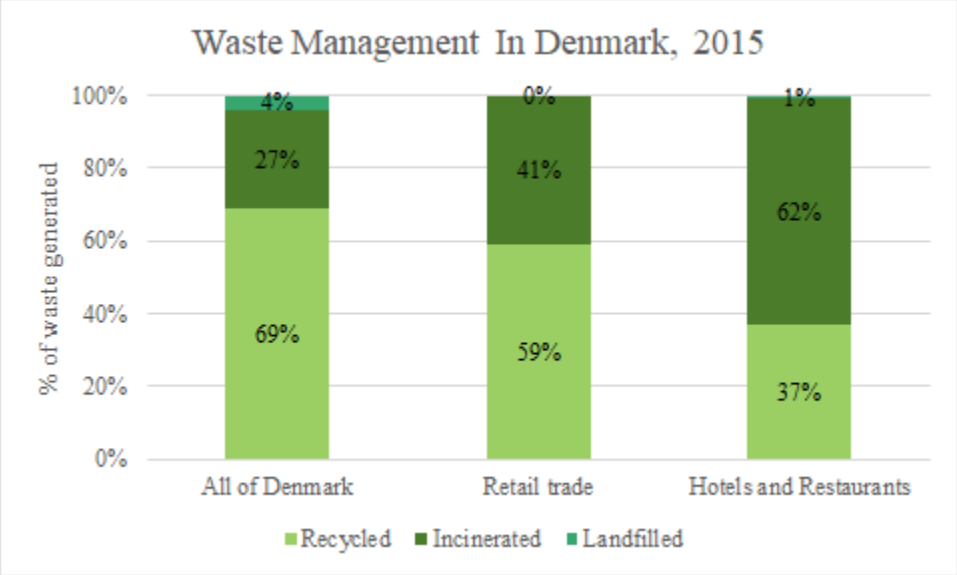


Figure 3: Breakdown of Danish Waste Management in 2015. From left to right: All Danish Waste, Waste from Retail, Waste from Hotels and Restaurants (Danish Environmental Protection Agency, 2017)

Specifically in Copenhagen, non-construction businesses produced 218,000 tons of waste in 2015, of which only 38% was recycled (København Kommune, 2019). Although the quantity of waste is only a small share of total waste generated in Denmark, the low recycling rate is a significant deviation from the much higher nationwide recycling rates discussed previously. It is clear that the region has much to gain from a transition to a circular economy.

2.4 Implementing a Circular Economy in Amager

Amager is a large island part of Copenhagen, which contains the Kastrup international airport, making Amager the first place that people see when visiting Denmark (Zoomdojo, 2019). There are two Copenhagen districts located on the island of Amager:

Amager Øst [East] and Amager Vest [West]. The districts can be seen in the map in Figure 4. Amager Øst is 9.11 km^2, with a population that has increased from 50,900 in 2011 to 57,673 in 2018, which is a +1.80% average increase in population per year. Amager Vest has an even larger rate of increase in population from 58,174 in 2011 to 71,755 in 2018, which is a +3.04% average increase per year (København Kommune, 2018). With this increase in population, there is also an increase in the use of resources and waste production in Amager, signifying the importance of transitioning to a circular economy.

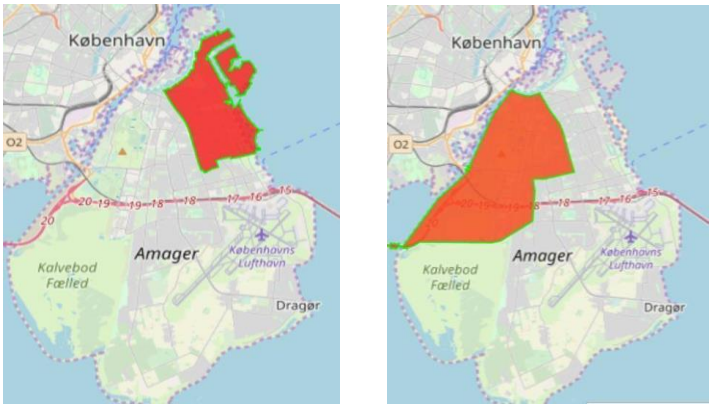


Figure 4: Map of Amager Øst (left) and Amager Vest (right) (København Kommune, 2018)

Amager was not always so densely populated. The island used to be a farming area until the mid-1900s. The city sewerage and landfills were located on Amager until the 1970s because of the small island population (Days, 2017). The island has undergone urban renewal during the late 20th century, pushing an increase in population. In Amager Vest, there are several award-winning modern buildings designed by the Bjarke Ingels Group, a famous architect company in Denmark. Ørestad is an urban part of Amager Vest containing concert halls, shopping centers, offices, green residences and many more attractions that increase the appeal of the district. Additionally, the main campus of Copenhagen University is also located in Amager Vest, and as a result the district hosts many students in the residential areas (Visitcopenhagen, 2019). Amager Øst is just across the harbor from central Copenhagen with many green spaces offered to the community, such as Amager Beach, Kastrup Sea Bath, and Copenhagen Cable Park. With such a large expansion in urbanization, the residences, businesses and attractions in Amager are using more resources, and at the same time generating more

waste. Implementing a circular economy in the small Amager businesses will allow for the better management of waste.

2.5 Miljøpunkt Amager Advocates for a Circular Economy

The company sponsoring this project, Miljøpunkt Amager, is a private, non-profit company located in Amager, Denmark. It was founded on August 1st, 2003 by the business council, Amager Erhvervsråd, and the local council, Sundby Lokalråd (Miljøpunkt Amager, 2019). The company's goal is to promote environmental awareness and sustainable development at a local and global level while inspiring citizens and businesses to participate in these outreach initiatives (Miljøpunkt Amager, 2019). In order to achieve its goal, Miljøpunkt Amager works with citizens to develop environmental projects and ideas. It uses its knowledge of environmentalism and sustainability to encourage citizens to positively contribute towards overcoming environmental challenges. The company also organizes different community events that aim to educate citizens on how to live an eco-friendly life. Miljøpunkt Amager has an electronic newsletter that citizens can sign up for, and is active on Facebook and Instagram (Miljøpunkt Amager, 2019).

Miljøpunkt Amager is involved in various citizen engagement events to promote sustainable living. A major project undertaken by Miljøpunkt Amager is its collaboration with Plastic bag-free Amager. In an effort to replace disposable plastic bags, participants sewed old fabrics into canvas bags that are then distributed to Amager stores (Miljøpunkt Amager, 2019). Another project includes bringing awareness to homeowners on how to save energy and efficiently consume resources within their homes. Over the past year, the company has held community outreach events such as an "Electronics Workshop" which taught citizens how to repair electronics, such as speakers and vacuums, themselves instead of throwing them away (Miljøpunkt Amager, 2019). The workshop also taught citizens the proper approach for recycling electronic devices which could not be fixed (Miljøpunkt Amager, 2019).

A graduate student at Aalborg University in Copenhagen, Monika Most, worked with Miljøpunkt Amager from March to August of 2018 to implement a circular economy in

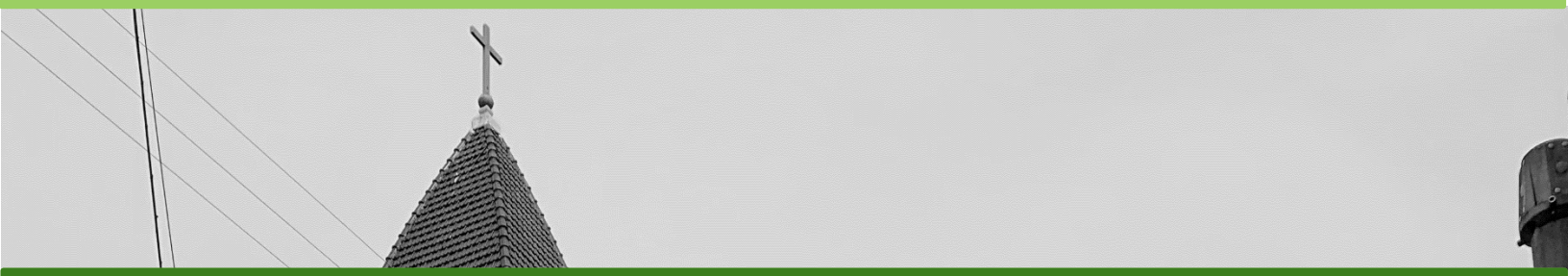
the Amager community as part of her master thesis dissertation in service system design. The project was the Green Loop City Project, established by Miljøpunkt Amager in 2018. The goal of the project was “to investigate and initiate new initiatives for how Amager East can optimize the use of resources by re-using and circulating local resources” (Most, 2018, pg. 3). Through a case study approach, Most discovered that residents throw their waste away in a waste room located in several residential housings because it is more convenient than recycling centers (Most, 2018).

Based on the findings from the case study, Most devised a service system called GenSkab, or “Recreate.” In this process, the waste from the residential housings would be taken to a GenSkab location to be sorted into separate categories. Waste that can be directly reused would be sent to GenSkab’s swapping room, in which residents can take them for free and leave their own unwanted items. Waste that can be repaired or upcycled (rebuilt to give the product higher quality) would be sent to a GenSkab workspace to be repaired, then later sold in the GenSkab store. Waste that needs to be recycled or have parts harvested would be sent to the recycling stations. While the GenSkab system would encourage circular economy practices in the region, there were problems with logistics since it would be costly and difficult to pursue (Most, 2018).

Although the GenSkab system may not have been implemented, the research and insights gathered from Most’s case study provided Miljøpunkt Amager with a strong understanding for future work on the subject. While the study focused on community based circular economy in general, Most addressed the possibility of implementation within companies noting that “The transition [to a circular economy] can happen in nearly any industry and with any resource in a company’s production process, as an independent innovative new solution or as co-creation among companies, organizations and communities” (Most, 2018, pg. 96-97). The process of implementing a circular economy would be different in each industry, but a circular economy is possible for all industries, given that the companies are willing to make the effort to create a change. This case study conducted by Monika Most focused primarily on implementing a circular economy at the household level to benefit the general community of Amager. Our project will be expanding on the work of Monika Most in collaboration with Miljøpunkt

Amager to analyze circular economy practices of small food businesses in the area of Amager using case studies.

Case studies have been a popular approach for sociology and anthropology studies throughout the 1900s (Hamel, Dufour, & Fortin, 1993). In-depth assessments of cases give rise to generalized solutions applicable across a broader scope of problems (Gerring, 2004). For this project, a case study was defined as in-depth research of specific components within a business. In the case studies conducted for this project, the resource flows of two to three products within a food business were identified and analyzed based on the amount of waste they produce.



CHAPTER 3
METHODOLOGY

MILJØPUNKT AMAGER

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3. Methodology

This project aimed to assist Miljøpunkt Amager through the development of effective circular economy practices that could be implemented by small food companies in Amager in an effort to improve business sustainability. Through case study assessments of four different food businesses, focusing on a 2-3 of their products, this project addressed the following research questions:

1. What motivations do food businesses have to implement strategies for a circular economy?
2. What are the challenges to implementing a circular economy within food businesses?
3. What information is necessary to assist food businesses in the implementation of circular economy practices?

Figure 5 provides an overview of the flow and progression for conducting this project. Through gaining background insight, research methods were developed in order to address the mission statement and research questions. By obtaining case study criteria, interviewing circular economy experts, interviewing representatives from four small food businesses, and conducting a multi-criteria analysis of product resource flows, case studies were outlined in order to develop the best practices for implementing a circular economy. These best practices would take the form of solutions businesses could implement, in addition to their current behaviors, in order to better manage waste in a specific product resource flow.

The timeline for all of the methods that were conducted in this project can be seen in Figure 12, which can be found in Appendix I.

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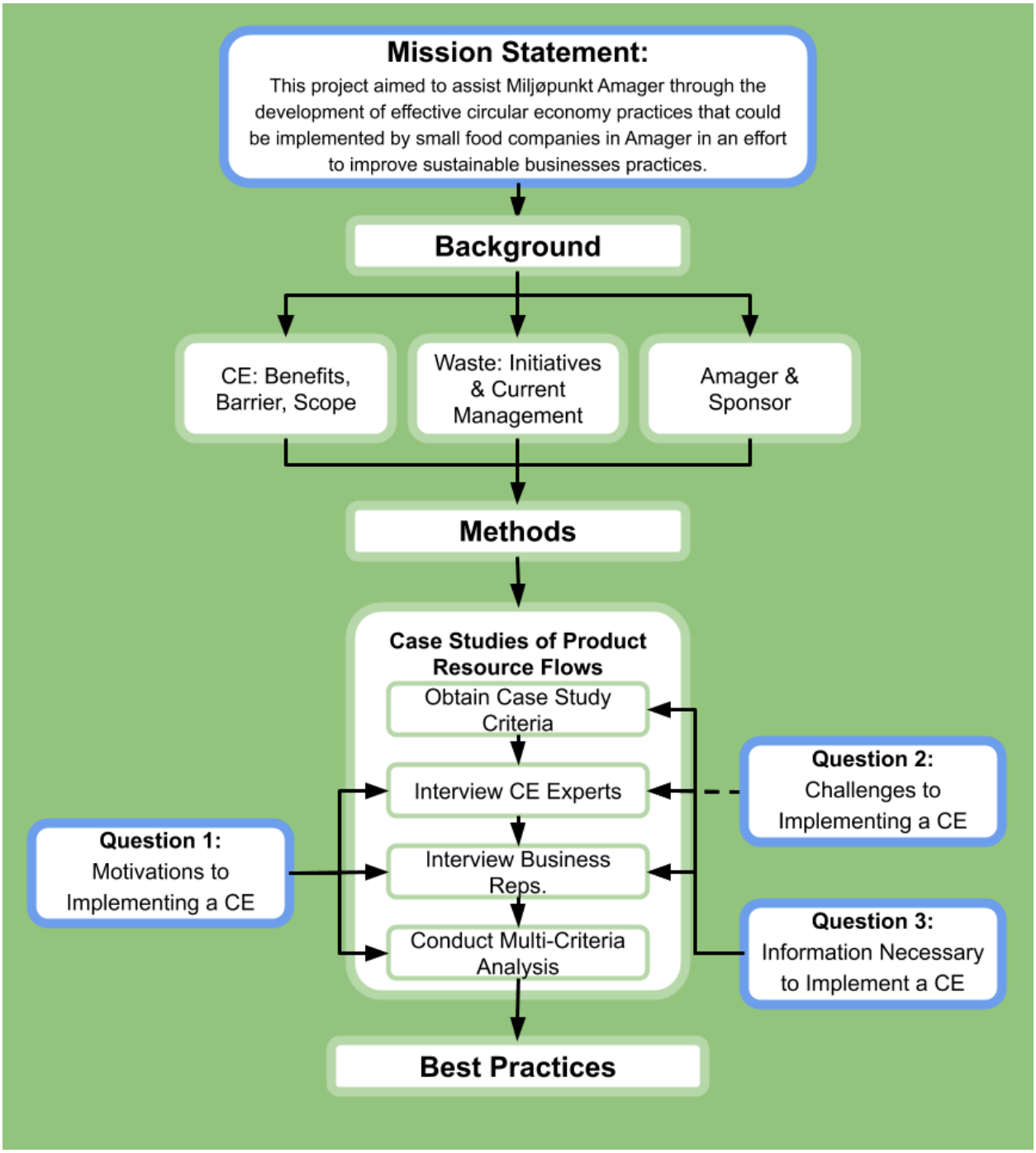


Figure 5: Flow Chart of Project

3.1 Case Studies of Product Resource Flows in Small Food Businesses in Amager

Within the food sector, two types of food businesses were selected: shops and restaurants. By not limiting the scope to one business type, this study hoped to provide insight for managing waste within a product resource flow more broadly useful to the industry. The food industry was selected due to research detailing the amount of waste handled unsustainably. A detailed justification on the focus of food is found in Appendix II. A list of food businesses to contact in Amager, which can be found in Appendix III, was offered by the director of Miljøpunkt Amager, Dorte Grastrup-Hansen. These potential businesses were selected based on their preexisting relationship with Miljøpunkt Amager and their willingness to cooperate with the study by providing information about their specific product resource flows and business practices.

3.1.1 Obtaining Case Study Criteria

The best practices for managing waste in a product resource flow was identified through the use of a numerical scoring system as detailed in chapter 3.1.4. In order to provide a numerical score for each identified solution, defined criteria were first required to equally evaluate each solution. This method addressed research question 3. An interview was conducted with sustainability expert Professor Joseph Sarkis to identify these criteria. Dr. Sarkis is the author or co-author of over 400 publications and is the Associate Editor of Sustainable Supply Chains for *Resources, Conservation and Recycling* (Sarkis, 2019). He has conducted specific work on the food industry and provided the criteria listed below:

1. Cost savings: This can be identified as any costs generated by waste, production materials, and process infrastructure (Sarkis & Cordeiro, 2009). Cost savings are a driving force that motivates financially-limited SMEs to consider the transition to a circular economy (Triquero et al, 2013).

2. New revenue generation: This can be defined as any new product, process or material usage that is a result of implementing a circular solution (Sarkis & Cordeiro,

2009). Oftentimes, circular economy solutions involve the recycling of material to create a new product. For example, a Danish company, Carlsberg Group, previously produced significant CO_2 emissions as a result of their packaging processes for beer (State of Green, 2017). To address these emissions, the company developed a biodegradable bottle. This new bottle, as well as the new processes and materials needed to create this product, would be considered part of a new revenue stream.

3. Social: This can refer to using methods that are appropriate and consistent with the values of the local community. As mentioned earlier, transitioning SMEs to a circular economy is a top priority of the Danish government. In one instance, while fulfilling the goals of the local area through a circular economy, an organization was also able to differentiate themselves from their competitors through the use of green products (Sarkis & Cordeiro, 2009). Products with an environmental designation tend to result in a premium market price (Reinhardt, 1998). Since there is a correlation between an environmental designation and market price, it is an important aspect that a business should consider.

4. Resiliency: This is evaluated based on a business's use of sustainable suppliers. This includes maintaining production of their product or service (Sarkis & Cordeiro, 2009). Having a supplier that gets shut down can be disastrous for a business (Spence, 2010). Having multiple suppliers is a good way for a company to protect themselves from this type of scenario. In addition, using local suppliers is a more sustainable and environmentally friendly alternative to foreign suppliers. Strong and steady relationships can be built between both parties if they are local.

3.1.2 Semi-Structured Interviews with Local Circular Economy Experts

Collecting data for the case studies began with semi-structured interviews of circular economy experts. The aim of interviewing the experts was to gain a conceptual understanding of how to implement a circular economy within small food businesses in Amager. These interviews addressed all three research questions and provided a theoretical understanding of the considerations, motivations and challenges involved

with implementing a circular economy in small food businesses. Conceptual knowledge from these interviews was used in the multi-criteria analysis.

Miljøpunkt Amager provided contact information for TinkerTank. This is an organization based in Amager that takes waste from the surrounding area and upcycles it into new useful products. Four business associates were interviewed from this organization.

In addition, Miljøpunkt Amager provided a list of individual circular economy experts to be interviewed based on their knowledge and research in the field. This list included Professor Michael Søgaard Jørgensen from Aalborg University, Stine Hansen from VÅR Design, and Pia Ratthsach of GoGreenDanmark. Professor Jørgensen and Stine Hansen were chosen for interviews based on their availability to be interviewed within our timeline. More information on these experts can be found in Appendix IV.

The experts were asked questions pertaining to their experience with circular economy, their current view and opinion on the matter, and the main problems they see in implementing a circular economy within small businesses in Amager. The set of specific questions asked in the interviews can be found in Appendix V. All interviews were voice recorded with an iPhone, given consent from the interviewee. Typed notes were taken as well. Each interview took between 45 minutes and 2 hours to complete. The locations were chosen at the interviewees' convenience.

The notes and the voice recordings were transcribed into Google Docs and then categorized by topic. This organizational system allowed for the observation of ideas and themes as they emerged from the data. Key factors to focus on were then identified. The results were split into three categories: considerations and suggestions for implementation, challenges to implementation, and past initiatives undertaken by small businesses. By focusing on these categories, it was easier to provide supporting evidence when justifying identified best practices for each product resource flow.

3.1.3 Semi-Structured Interviews with Representatives from Selected Businesses

Semi-structured interviews with representatives from the four selected food businesses provided the necessary data for the case studies. The four businesses were Ø-helse, Il Buco, Letz Sushi and Broders. This method addressed all three research questions.

One individual was interviewed within each business, either the director or owner. The directors and owners have the most knowledge about company processes and have the authority to implement a circular economy within their business. The questions asked were structured to provide relevant information for the case study criteria listed above. Examples of questions asked can be found below and a complete list of questions asked during the interviews is included in Appendix VI.

- What does your business do in relation to sustainability or circular economy?
- Do you have any future plans to implement sustainability in your business?
- Choose 3 products that produce the most waste and describe their resource flow.

The interviews took place at the company sites. Each interview took about one hour to complete. All interviews were voice recorded with an iPhone with the permission of the interviewee. Typed notes were also taken. The voice recording and notes obtained from the interviews were transcribed into a Google Doc.

The aim of interviewing small businesses was to identify how each managed the waste created by two to three product resource flows within their business. The resource flows took the form of a flow chart starting with the resource's supplier and ending at the consumer.

The business representatives were also asked to rank the case study criteria from section 3.1.1 a number ranging from 0 to 100. This number represented the importance of the criteria in relation to their business. Criteria was ranked from being not important (0) to extremely important (100). During the interviews, the business representatives were given a copy of the criteria in Table 15 which they were asked to rank. Table 15 can be found in Appendix VI.

3.1.4 Multi-Criteria Analysis of Product Resource Flows

In an effort to offer best practices towards implementing a circular economy in a business, a multi-criteria analysis was conducted on the resource flow of each product. The reasoning on why this method was chosen can be found in Appendix VII.

A step-by-step procedure for conducting the multi-criteria analysis is seen in Figure 6.

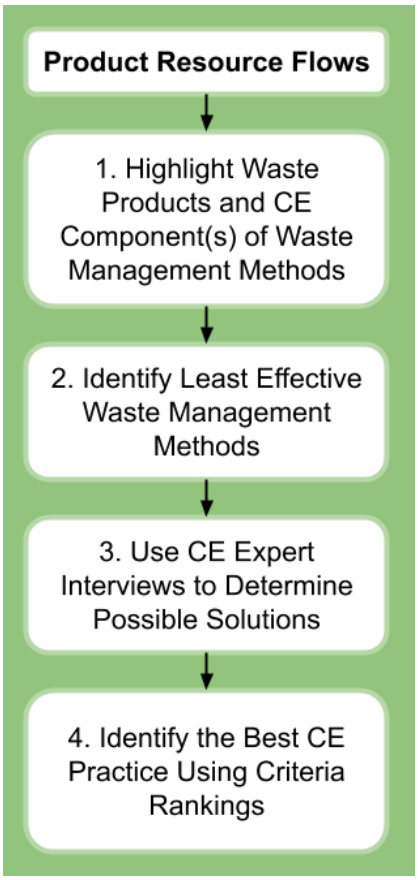


Figure 6: Multi-Criteria Analysis Flow Chart

1. Highlight waste products and corresponding waste management method.

Based on the resource flows, all waste products were identified, and the corresponding waste management methods were then categorized based on what component of a circular economy they fit into. Table 1 lists the component of circular economy.

Table 1: Components of a Circular Economy

Component	Description
Reuse	Used again
Repair	Damaged parts replaced to extend life
Parts Harvest	Useful parts of a product taken out for use elsewhere
Recycling	Broken down into raw materials
None	Landfilled or incinerated (linear economy)

2. Evaluate effectiveness of each waste management method.

The effectiveness of the waste disposal method was indicated using the components outlined in Table 1, which ranks each component in order of most effective to least effective with darker shades indicating more effective components. As discussed in section 2.1, reuse is the most effective waste management strategy, followed by repair, parts harvest and recycling. Finally, the component “None” corresponds to linear economy practices which return the least value back into the local economy, making it the least effective waste management method.

3. Apply concepts of implementing a circular economy suggested by circular economy experts in order to determine possible solutions for managing waste.

This part of the analysis focused on replacing the least effective waste management strategies with more effective ones based on a circular economy. The least effective strategies were focused on as they represented the areas where the most improvement was possible. The solutions were developed using the concepts of implementing a circular economy in small businesses offered by the circular economy experts. A list of possible solutions was made for each resource flow and formatted into a table in Chapter 4.

4. Identify best circular economy practice for managing waste using the business criteria rankings.

The criteria from section 3.1.1 were used to identify the best circular economy practice to be implemented in a resource flow to better manage waste. If a solution satisfies a criterion, then the business's ranking of that specific criteria was included in a sum representing the total numerical score for the solution. The highest scoring solution was then identified as a best practice. Below is an example of this step for a hypothetical business and product resource flow.

Business X, which sells Product Y, provided the following criteria rankings:

- Cost Savings = 50
- New Revenue Generation = 80
- Social = 25
- Resiliency = 10

Based on the resource flow for Product Y in Business X, two possible solutions were identified:

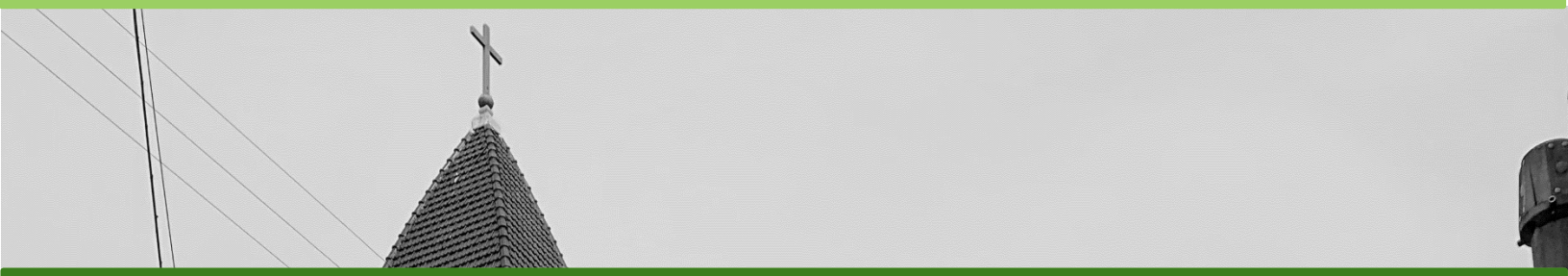
- Solution A, which satisfies Cost Savings and Resiliency. Thus, the score for Solution A is 60.

  50 (Cost Savings) + 10 (Resiliency) **= 60**

- Solution B, which satisfies New Revenue Generation. Thus, the score for Solution B is 80.

  80 (New Revenue Generation) **= 80**

As it has a higher score, Solution B is a best practice for the product resource flow for Product Y in Business X.



CHAPTER 4

RESULTS & ANALYSIS

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4. Results and Analysis

This chapter contains the results obtained from interviews with local circular economy experts Professor Michael Søgaard Jørgensen of Aalborg University, Stine Hansen of VÅR Design and TinkerTank. This chapter also contains the results from the interviews with the four businesses representatives chosen for case studies, consisting of their rankings of the case study criteria and a sample of a product resource flow from each business. Finally, the analysis that led to development of the best practice for each product resource flow, as well as the best practice itself, is included.

4.1 Semi-Structured Interviews with Local Circular Economy Experts

The following section describes the results of the interviews with circular economy experts Professor Michael Søgaard Jørgensen, Stine Hansen and TinkerTank. The information gathered from the interviews, as shown in each table, is independent of the other tables. A summary of each expert interview can be found in Appendix VIII.

4.1.1 Considerations and Suggestions for Implementation

The considerations and suggestions identified by the experts for implementing a circular economy within a business are summarized in Table 2. The content includes results from all of the experts.

Table 2: Considerations and Suggestions for Implementation of a Circular Economy

Consideration/ Suggestion	Expert Source	Why is it Useful?
Build a Local Identity	TinkerTank	Recruiting employees locally and collaborating with the community will help a business attract customers.
Educate About Biodegradable/ Reusable Packaging and Proper Waste Management	Stine Hansen	Education is necessary because some customers do not know the difference between reusable and non-reusable packaging and do not recycle correctly as a result.

Consideration/ Suggestion	Expert Source	Why is it Useful?
Green Profiles	Stine Hansen	Attracts customers due to societal demand for improving the environment.
Harvest Resources from Waste Products	TinkerTank	Valuable resources can be found in waste which can then be reused to make new products. For example, the wood from old furniture can be made into brand new consumer items.
Incentivize	TinkerTank	Recycling-based incentives, such as a deposit system with monetary rewards, will help promote sustainable practices.
Narrowing and Slowing Resource Flow	Michael Søgaard Jørgensen	Allows for less resources to be used in the production cycle and ensures that resources are used to their fullest extent.
Reuse and Sharing Instead of Recycling	Michael Søgaard Jørgensen	There are limited local recycling solution in the area of Amager and thus not all waste can be recycled fully. Reuse and sharing shrink the loop and cut out the middle-man. Furthermore, community members in Amager value used products over new products.
Shrinking Resource Loops	Michael Søgaard Jørgensen	It is advantageous for a business to keep as much of their waste within their business as possible. This ensures that they can control what happens to it and how it is recycled.
Tracking Resource Flow	Michael Søgaard Jørgensen	Businesses can see exactly what resources they are using and allows them to realize where in the cycle they produce waste.
Use of Biodegradable/ Reusable Packaging	Stine Hansen	Biodegradable packaging can significantly reduce a business's waste.
Vegetarian Options Over Meat	Michael Søgaard Jørgensen	Meat takes more resources to produce, and thus vegetables inherently create less waste.
Well-Designed Food Packaging	Michael Søgaard Jørgensen	Allows for the full amount of a resource to be used. Example could be a peanut butter jar that allows you to use 100% of product.

These considerations and suggestions were used as justification for the potential solutions developed in this project for each product resource flow.

4.1.2 Challenges for Implementation

The challenges identified by the experts for implementing a circular economy within a business are listed in Table 3. The content includes results from all of the experts.

Table 3: Challenges to Implementation of a Circular Economy

Challenge	Expert Source	Why is This a Challenge?
Different Priorities	TinkerTank	Businesses focus on their own economic needs over their environmental impact.
Established Companies	Stine Hansen	Amager has established businesses that do not want to change their mindset in managing their company and adopting sustainable practices.
Inconsistent Standards	Stine Hansen	Different regions in Denmark have different color codes for waste collection, making it hard for citizens to properly sort their waste.
Laws and Regulations	TinkerTank	Bureaucratic laws restrict businesses from making changes to their existing business practices.
Location	TinkerTank	Amager is a lower income area of Copenhagen, making it potentially unattractive area to outside customers.
Managing Waste Outside the Business	Michael Søgaard Jørgensen	Once customers take products, waste cannot be easily handled by the business. They do not know where it is or what the customer does with it.
Public Perception	Michael Søgaard Jørgensen	Long term customers could potentially be confused or taken aback if a business suddenly changes certain operations.
Recycling	Michael Søgaard Jørgensen	There are not many local recycling solutions in Amager, thus a business's ability to recycle its waste is limited.
Resources	Michael Søgaard Jørgensen, Stine Hansen	Small businesses do not have the time, money or labor required to plan out implementing CE practices.

These challenges were used to help develop potential solutions for each product resource flow.

4.1.3 Past Circular Economy Initiatives and Solutions in Denmark

The past initiatives and solutions identified by the experts for implementing a circular economy within a Danish food business are listed in Table 4 below.

Table 4: Past Initiatives and Solutions Previously Implemented for a Circular Economy

Initiative	Expert Source	Description	Benefits
Chocolate Factory Uses Metal Containers	Michael Søgaard Jørgensen	After chocolate is eaten, metal containers can be used by customer, or brought back to business for the organization's use.	Plastic containers are no longer introduced into the environment, and metal containers can be reused.
Coffee Company Rents and Repairs Coffee Machines	Michael Søgaard Jørgensen	Company sends coffee machines out to businesses that need them, and repairs them when necessary.	No resources need to be used to make new machines and the machines can be repaired and shared.
Company in Jutland Retrieves and Repairs Washing Machines	Michael Søgaard Jørgensen	Washing machines are taken in and necessary parts are harvested for later use in repairing other machines.	Resource intensive process of manufacturing a new washing machine was avoided, and the metal and steel assembly components of the machine would not be allowed to spread into the resource flow.
Dallevalle Buffet/Erik's Bakery	Stine Hansen	Leftover food is given away to the community at the end of the day.	Food waste is avoided.
Gasoline Grill	Stine Hansen	Company uses green packaging materials.	This reduces carbon footprint and contributes towards a green image for the business.

Initiative	Expert Source	Description	Benefits
GuldMinen (Gold Mine) Initiative	Michael Søgaard Jørgensen	People are allowed to inspect and retrieve items from trash containers that they deem usable.	Products that would typically go to waste unnoticed can now be reused.
Leather Coat Company in Jutland Repairs, Rents, and Takes Back Coats	Michael Søgaard Jørgensen	Old leather jackets are remanufactured or restored into a product, then are rented out for use. Repairs offered if needed.	Old leather jackets can be repaired, shared, or used to make new ones, thus closing the resource loop.
Leftover Food Sellers (WeFood, TooGoodToGo)	Stine Hansen	Excess food is sold for customers to purchase at a discount.	New product made from waste. Consumers can get cheaper food and help limit waste.
Local Bakery Makes Chips Out of Crust	Michael Søgaard Jørgensen	Business found use for crust they initially disposed of.	New product is sold and all of resource is used.
Plastic-Bag Free Amager	Stine Hansen	Old clothes are sent to an organization to be remanufactured into bags.	Old clothes are reused and avoid being landfilled or incinerated.
Pumpipumpe	Stine Hansen	Community members can put stickers on their mailbox indicating the items they own which they would be willing to share.	Maximize the use of an item through sharing. In regards to businesses, this idea could promote and encourage a symbiosis between businesses implementing circular economy practices.
Repair Cafes	Michael Søgaard Jørgensen	Experts volunteer to repair items such as tools and electronics for free.	Products that would initially be thrown out are able to have their life-cycle extended.
Upcycling by TinkerTank	Stine Hansen	Organization that takes in waste and upcycles materials to make new products.	Brings materials back into the loop and creates value from waste.

These past initiatives and solutions were used as justification for the potential solutions developed for this project for each product resource flow.

4.2 Semi-Structured Interviews with Representatives from Selected Businesses

This section includes the product resource flows in the food businesses interviewed. A total of 10 resource flows were developed and analyzed, with 2-3 from each company. A summary of these interviews and tables showing the current and prospective sustainability practices of each business can be found in Appendix IX and Appendix X, respectively.

4.2.1 Results of Business Criteria Rankings

The criteria rankings given by each business are in Table 5. As previously stated, these criteria were ranked on a scale of 0-100 with 0 being unessential to the business and 100 being essential.

Table 5: Business Criteria Rankings

Criteria	Ø-helse	Il Buco	Letz Sushi	Broders
Cost Savings	60	10	100	70
New Revenue Generation	70	60	100	60
Social	95	75	100	60
Resiliency	40	100	100	80

The rankings of the criteria demonstrate the variability in values for each business. There were no criteria that was consistently ranked as being essential. Conversely, there were no criteria consistently ranked as unessential. There was no identified pattern regarding the importance of each criteria between businesses.

4.2.2 Ø-helse Interview

After conducting interviews with one of the owners of Ø-helse, two product resource flows have been identified that produce waste, corresponding to soap and health supplements. The complete analysis for the soap resource flow is presented in this section. The summary of the best practice for the health supplements is also included in this section. The complete analysis for the health supplements is in Appendix XI.

Ø-helse Soap Resource Flow Results

Figure 7 identifies the Ø-helse soap resource flow. The soap originates at a large warehouse in Jutland. From there, cardboard boxes containing individual bottles of soap and large soap jugs are wrapped in plastic wrap and trucked on wooden pallets to Ø-helse. The store sells individual bottles of soap and also provides a filling station with large soap jugs to refill the consumer's own container. The plastic soap jugs from the filling station and plastic wrap are collected by a waste management service for recycling. The cardboard boxes are either given to local web shops in order to package and ship items or collected for recycling by a waste management service. Finally, the wooden pallets are shipped back to the supplier in Jutland. Upon purchasing the soap, the consumer has the option to either have the bottle recycled by a waste management service or refilled with soap at Ø-helse's filling station located in their store.

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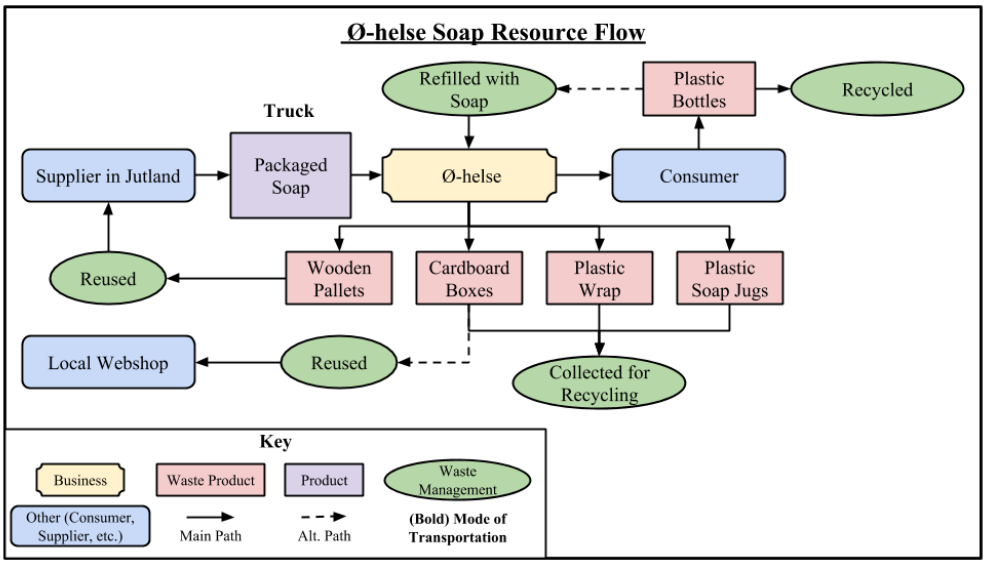

Figure 7: Ø-helse Soap Resource Flow

Figure 8 depicts the soap filling station. It includes a variety of different kinds of soap, such as shampoo, detergent, and hand soap.

Figure 8: Ø-helse Soap Filling Station

Ø-helse Soap Resource Flow Analysis

Table 6 provides the waste products generated through the resource flow of the soap. Based on the components of a circular economy provided in Table 1 in Section 3.1.3,

Ø-helse's current reuse of wooden pallets, cardboard boxes and plastic bottles is an effective method. However, since the cardboard boxes and plastic bottles are occasionally recycled instead of reused, this process can be improved. In addition, the recycling of plastic wrap and plastic soap jugs is a less effective waste management method and has been identified as an area for improvement.

Table 6: Waste Products and Waste Management Methods in Soap Resource Flow

Waste Product	CE Component(s) of Waste Management Method	
Wooden Pallets	Reuse	
Cardboard Boxes	Reuse	Recycle
Plastic Bottles	Reuse	Recycle
Plastic Wrap	Recycle	
Plastic Soap Jugs	Recycle	

Best Practice for Better Managing Waste in the Ø-helse Soap Resource Flow

Table 7 lists several potential solutions considered to improve the waste management associated with the soap resource flow. Selling soap pumps to make soap dispensers out of old containers was identified as a best practice. This solution satisfies 'New Revenue Generation' because the soap pumps are a new product that can be sold in the place of soap bottles, eliminating this waste from the flow. Additionally, 'Social' is satisfied because this practice encourages the consumers to reuse containers instead of sending them to be recycled or incinerated.

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Table 7: Potential Solutions to Better Manage Waste in Soap Resource Flow

Potential Solution	Justification from Expert Interviews	Benefits	Challenges	Criteria Satisfied	Score
Sell Soap Pumps to Make Soap Dispensers Out of Old Containers	**Reuse and Sharing Instead of Recycling**	**-Don't need soap bottles -Consumers can reuse other containers instead of recycling them**	**-Packaging to ship pumps -Pumps might only fit some containers -Could be expensive**	**New Revenue Generation (70), Social (95)**	**165**
Reusable Soap Jugs in Filling Station	Chocolate Factory Uses Metal Packaging Containers	-Can exchange jugs with supplier for reuse -Display green image	-Could be more expensive -Needs supplier cooperation	Resiliency (40), Social (95)	135
Give Plastic Wrap to Third Party to Use for Packaging	Reuse and Sharing Instead of Recycling	-Reuse instead of recycle -Pay less for recycling	-Might be difficult to find someone to take it	Cost savings (60)	60
Repurpose Jugs by Cutting Off Top	Harvest Resources from Waste Products	-Could use for storage -Save money instead of buying other containers -Pay less for recycling	-Need to cut tops off and clean out jugs	Cost Savings (60)	60

Summary of Best Practice for Better Managing Waste in the Ø-helse Health Supplements Resource Flow

An analysis of the resource flow for health supplements in Ø-helse was conducted. The corresponding resource flow, waste products, waste management methods and potential solutions can be found in Appendix XI. For the health supplements resource flow, it is suggested as a best practice that Ø-helse change to a local supplier that uses biodegradable packaging. This solution satisfies the 'Resiliency' criteria because it

would involve using a local, more sustainable supplier. Furthermore, ‘Social’ is satisfied because biodegradable packaging demonstrates a care for the environment that would help the green image of Ø-helse.

4.2.3 Il Buco Interview

After conducting an interview with the owner of Il Buco, three product resource flows have been identified that produce waste; vegetables, flour, and beer. The complete analysis for the vegetable resource flow is presented in this section. The summary of the best practice for flour and beer is also included in this section. The complete analysis for flour and beer is in Appendix XI.

Il Buco Vegetable Resource Flow Results

Figure 9 identifies the resource flow of vegetables used at Il Buco. During warmer months, Il Buco receives vegetables from local farmers near Copenhagen, which truck vegetables to Il Buco. In colder months, Il Buco relies on Italian suppliers, which ship vegetables by plane to Denmark and then by truck to Il Buco. In either case, these vegetables are packaged in wooden crates, plastic containers, or cardboard boxes. The wooden crates are mainly used as firewood in outdoor fire pits at Il Buco, but sometimes are either reused as storage at Il Buco, or returned to the local farmers to hold future vegetable shipments. Plastic containers sometimes are returned to the local farmers for the same purpose, but are mainly collected by a waste management service for recycling along with the cardboard boxes. The vegetables are then prepared to serve to consumers. Any food waste, whether in the form of scraps from preparation, leftovers not eaten by the consumer or food that was never sold, are usually collected by a waste management service to make biogas. However, sometimes this food waste is composted at a local garden.

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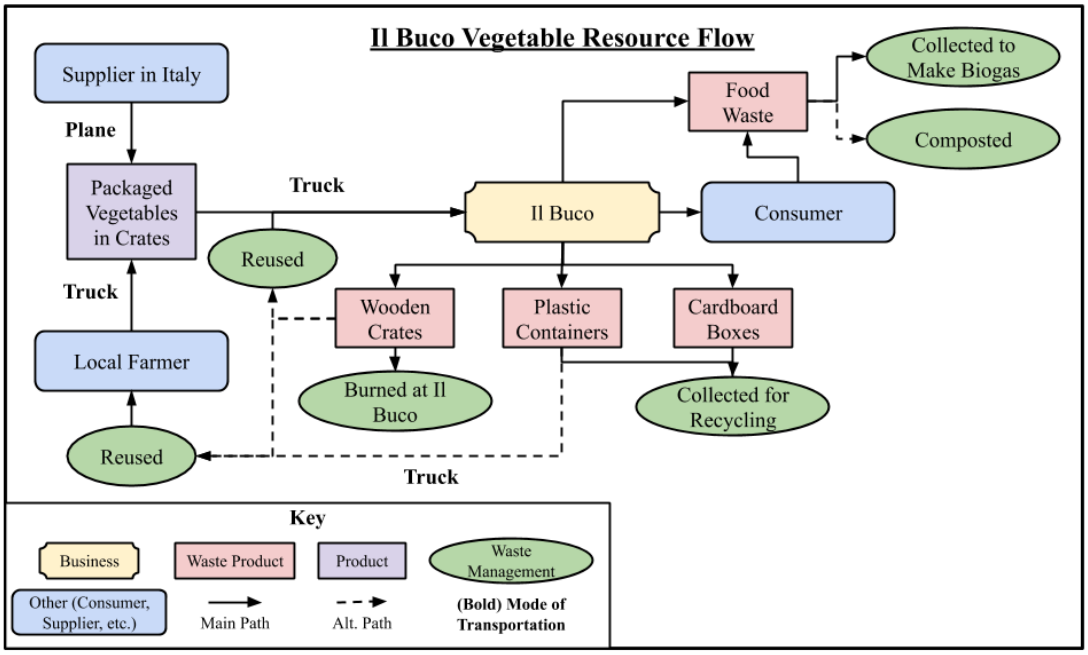

Figure 9: Il Buco Vegetable Resource Flow

Il Buco Vegetable Resource Flow Analysis

Table 8 provides the waste products generated through the resource flow of the vegetables. Based on the components of a circular economy provided in Table 1 in Section 3.1.3, Il Buco's current reuse of wooden crates and plastic containers is an effective method. However, since the plastic containers are occasionally recycled instead of reused, this process can be improved. In addition, the recycling of cardboard boxes and food waste is a less effective waste management method and has been identified as an area for improvement.

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Table 8: Waste Products and Waste Management Methods in Vegetable Resource Flow

Waste Product	CE Component(s) of Waste Management Method	
Wooden Crates	Reuse	
Plastic Containers	Reuse	Recycle
Cardboard Boxes	Recycle	
Food Waste	Recycle	

Best Practice for Better Managing Waste in the Il Buco Vegetable Resource Flow

Table 9 lists several potential solutions considered to improve the waste management associated with the vegetable resource flow. Growing Il Buco's own vegetables in a greenhouse or garden has been identified as a best practice. 'Social' is satisfied because the self-grown vegetables could be advertised to their consumers. Additionally, 'Resiliency' is satisfied because Il Buco would be controlling how the vegetables are grown and would not need to rely on outside suppliers.

Table 9: Potential Solutions to Better Manage Waste in Vegetable Resource Flow

Potential Solution	Justification from Expert Interviews	Benefits	Challenges	Criteria Satisfied	Score
Grow Own Vegetables in Greenhouse or Garden	**Green Profile**	**-Less packaging used in food transport -Could use food waste as compost -Potential long-term cost savings**	**-Large up-front costs -Need to pay someone to maintain garden -Need to find space**	**Social (75), Resiliency (100)**	**175**
Educate Consumer on Concept of Composting	Educate About Biodegradable/ Reusable Packaging and Proper Waste	-Allows consumer to compost food waste -Reduction of waste	-Consumers may be unwilling to compost	Social (75)	75

Potential Solution	Justification from Expert Interviews	Benefits	Challenges	Criteria Satisfied	Score
Compost Restaurant Food Waste and Sell to Local Businesses or Farms	Harvest Resources from Waste Products	-Save money on recycling -Sell former waste product	-Sanitary concerns -Limited space and resources	Cost Savings (10), New Revenue Generation (60)	70
Sell Uneaten Food on TooGoodToGo	Leftover Food Sellers	-Food that would be thrown out can be sold	-Listed food may go unsold -Cost of using service	New Revenue Generation (60)	60
Give Cardboard Boxes to Third Party to Use for Packaging	Reuse and Sharing Instead of Recycling	-Material is reused -Pay less for recycling	-Might be difficult to find someone to take them	Cost savings (10)	10

Summary of Best Practice for Better Managing Waste in the Il Buco Flour Resource Flow

An analysis of the resource flow for flour in Il Buco was conducted. The corresponding resource flow, waste products, waste management methods and potential solutions can be found in Appendix XI. For the flour resource flow, it is suggested as a best practice that Il Buco use canvas flour bags as an alternative to the paper bags. This satisfies the criteria of ‘Cost Savings’ since Il Buco would no longer have to pay for disposal of the paper bags. In addition, ‘Resiliency’ is satisfied because Il Buco is cooperating with their local supplier to reuse the bags.

Summary of Best Practice for Better Managing Waste in the Il Buco Beer Resource Flow

An analysis of the resource flow for beer in Il Buco was conducted. The corresponding resource flow, waste products, waste management methods and potential solutions can be found in Appendix XI. For the beer resource flow, it is suggested as a best practice that Il Buco use reusable kegs as an alternative to plastic kegs. This solution satisfies

the criteria ‘Cost Savings’ because there would be less money spent on recycling and packaging costs may potentially be reduced. ‘Resiliency’ would be satisfied since Il Buco would be able to control the sustainability of the beer resource flow by cooperating with their supplier.

4.2.4 Letz Sushi Interview

After conducting an interview with the CEO of Letz Sushi, three product resource flows have been identified that produce waste, corresponding to rice, takeout containers, and salmon. The complete analysis for the rice resource flow is presented in this section. The summary of the best practice for takeout containers and salmon is also included in this section. The complete analysis for takeout containers and salmon is in Appendix XI.

Letz Sushi Rice Resource Flow Results

Figure 10 identifies the resource flow of sushi rice as it pertains to Letz Sushi. The rice is originally purchased from Northern Italy. The product is then packaged in paper bags placed on wooden pallets, and shipped to Letz Sushi via a train and then a truck. The packaging here results in waste products such as wooden pallets, and paper bags. Both of these resources are disposed of and collected by a waste management service for recycling. Additionally, once Letz Sushi uses this rice, food waste consisting of leftover food that is not directly purchased by the customer becomes another waste product. This leftover rice is then listed on TooGoodToGo and purchased by consumers at a discounted price. The consumers then produce food waste which is either incinerated or collected to make biogas.

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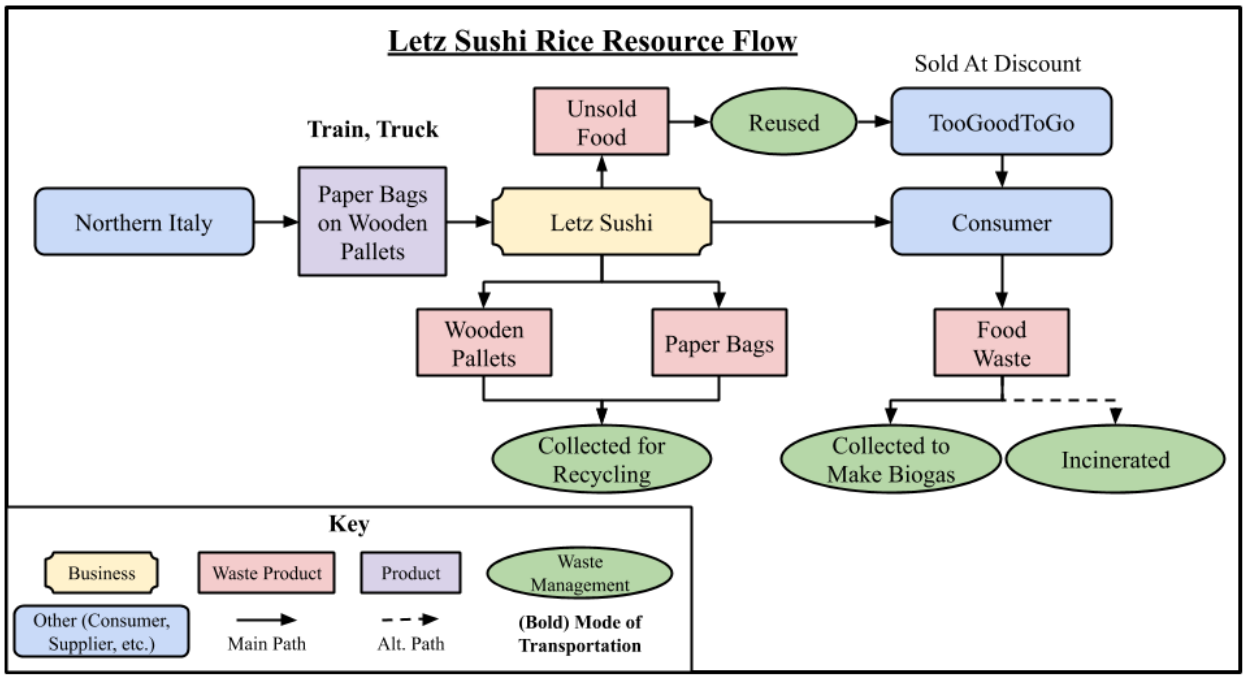

Figure 10: Letz Sushi Rice Resource Flow

Letz Sushi Rice Resource Flow Analysis

Table 10 provides the waste products generated through the rice resource flow. Based on the components of a circular economy provided in Table 1 in Section 3.1.3, Letz Sushi's current reuse of unsold food is an effective method. Since the wooden pallets and paper bags are recycled, this waste management method can be improved. In addition, the food waste is either collected to make biogas or incinerated, which is a less effective waste management method. Since the wooden pallets, paper bags and food waste are handled using less effective waste management methods, they were identified as an area for improvement when developing circular economy solutions.

Table 10: Waste Products and Waste Management Methods in Rice Resource Flow

Waste Product	CE Component(s) of Waste Management Method	
Unsold Food	Reuse	
Wooden Pallet	Recycle	
Paper Bags	Recycle	
Food Waste	Recycle	None (Incinerate)

Best Practice for Better Managing Waste in the Letz Sushi Rice Resource Flow

Table 11 lists several potential solutions considered to improve the waste management associated with the rice resource flow. Selling the wooden shipping pallets to TinkerTank or the local community has been identified as a best practice. This practice satisfies the 'Cost Savings' criteria because Letz Sushi would not have to pay for recycling of the pallets. Additionally, 'New Revenue Generation' is satisfied because Letz Sushi would be creating value from potential waste products, in this case the pallets. Lastly, 'Social' is satisfied because the community would be able to purchase potential waste products, demonstrating the sustainability outreach shown by the business, and therefore benefiting their green image.

Table 11: Potential Solutions to Better Manage Waste in Rice Resource Flow

Potential Solution	Justification from Expert Interviews	Benefits	Challenges	Criteria Satisfied	Score
Sell Pallets to TinkerTank or Community	**Upcycling by TinkerTank**	**-Sell waste rather than pay to dispose it -TinkerTank can convert them into more valuable product**	**-Find willing customer -Unlikely to sell for high price**	**Cost Savings (100), New Revenue Generation (100), Social (100)**	**300**
Use Canvas Bags Instead of Paper	Chocolate Factory Uses Metal Packaging Containers	-Can return to supplier for reuse -Letz Sushi can use for storage -Lower waste disposal costs	-Need supplier cooperation -Sanitary concerns -Heavier than paper bags	Cost Savings (100), Resiliency (100)	200
Donate Paper Bags to Local Community	Build a Local Identity	-Can be used for school art projects, trash collection, etc. -Offer to community garden for potting or compost -Save on waste disposal costs	-Find someone willing to take them	Social (100), Cost Savings (100)	200

Potential Solution	Justification from Expert Interviews	Benefits	Challenges	Criteria Satisfied	Score
Compost Restaurant Scraps and Sell to Local Businesses or Farms	Harvest Resources from Waste Products	-Save money on recycling -Sell potential waste product	-Sanitary concerns -Limited space and resources	Cost Savings (100), New Revenue Generation (100)	200
Educate Consumer on Concept of Composting	Educate About Biodegradable or Reusable Packaging and Proper Waste Management	-Enable consumer to compost rice -Reduce waste generated from takeout orders	-Consumers may be unwilling to compost -Resources needed to do this	Social (100)	100
Send Pallets back to Supplier or shipping company	Reuse and Sharing Instead of Recycling	-Pay less for recycling -Material is reused	-Need supplier cooperation -Sending pallets far away limits benefit	Cost Savings (100)	100

Summary of Best Practice for Better Managing Waste in the Letz Sushi Takeout Container Resource Flow

An analysis of the takeout container resource flow in Letz Sushi was conducted. The corresponding resource flow, waste products, waste management methods and potential solutions can be found in Appendix XI. For the takeout container resource flow, it is suggested as a best practice that Letz Sushi use reusable containers and offer a discount for returning the containers back to the restaurant. ‘Resiliency’ is satisfied because customers would be returning the containers to Letz Sushi which would assist the business in maintaining a constant supply of takeout containers. Additionally, ‘Social’ is satisfied because consumers would be purchasing their food in sustainable containers, thus making it clear to the customer that the company uses sustainable practices.

Summary of Best Practice for Better Managing Waste in the Letz Sushi Salmon Resource Flow

An analysis of the salmon resource flow in Letz Sushi was conducted. The corresponding resource flow, waste products, waste management methods and potential solutions can be found in Appendix XI. For the salmon resource flow, it is suggested as a best practice that Letz Sushi replace the foam boxes for shipping the salmon with reusable containers. ‘Cost Savings’ is satisfied because Letz Sushi would not have to spend money to dispose of the foam boxes. ‘Resiliency’ is satisfied because the reusable containers for shipping the salmon would be sent back to the supplier to be reused.

4.2.5 Broders Interview

After conducting an interview with an owner of Broders, two product resource flows have been identified that produce waste, corresponding to relish and Pastinos (chips). The complete analysis for the relish resource flow is presented in this section. The summary of the best practice for Pastinos is also included in this section. The complete analysis for Pastinos is in Appendix XI.

Broders Relish Resource Flow Results

Figure 11 identifies the resource flow of relish sold by Broders. Plastic bottles of relish are packaged in cardboard boxes on wooden pallets and wrapped in plastic wrap. They are then flown to Denmark from a supplier in Ireland, and then shipped by truck to Broders. Wooden pallets are returned to the supplier. Broders mainly uses the leftover boxes and plastic wrap to package orders shipped to its customers, but sometimes has them collected by a waste management service for recycling. The relish is then sold to the consumer. Any unused food waste left with the consumer is incinerated or collected to make into biogas, while the plastic bottle holding the relish is recycled.

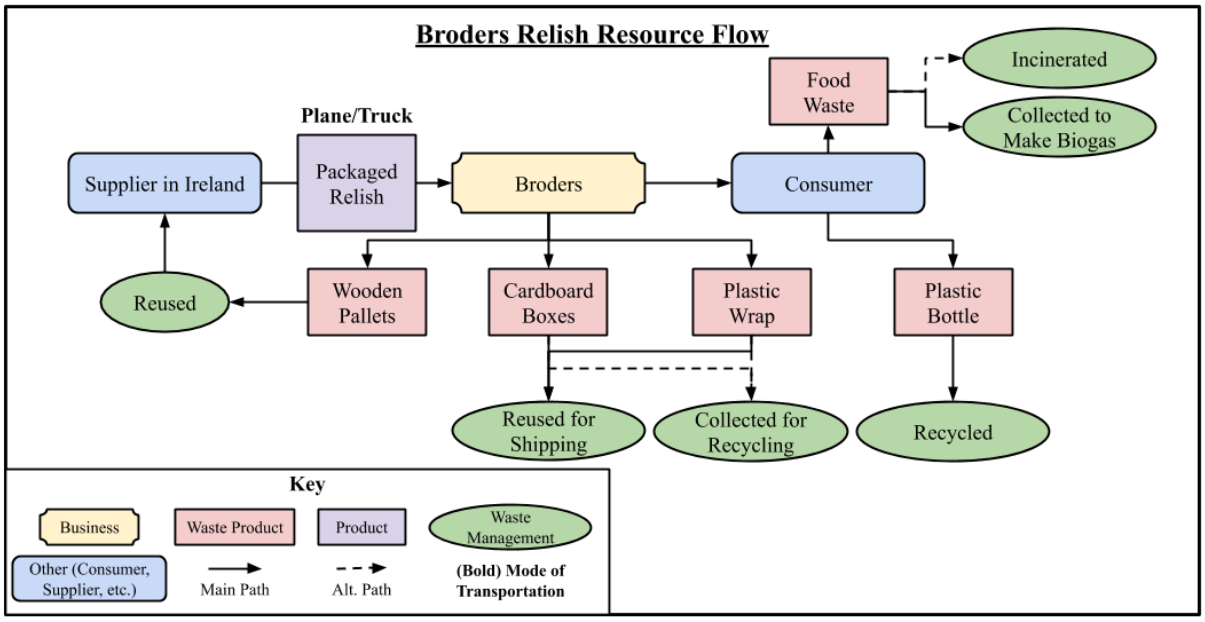

Figure 11: Broders Relish Resource Flow

Broders Relish Resource Flow Analysis

Table 12 provides the waste products generated through the resource flow of relish. Based on the components of a circular economy provided in Table 1 in Section 3.1.3, the recycling process used to recirculate wooden pallets is an effective method. Cardboard boxes and plastic wrap are recirculated using effective components of circular economy. These same two products, and plastic bottles, also rely on recycling which is not as effective of a method. Additionally, food waste is either collected to make biogas or incinerated which is an even less effective waste management method. As a result, food waste, plastic bottles, cardboard boxes and plastic wrap have been identified as areas for improvement.

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Table 12: Waste Products and Waste Management Methods of Relish Resource Flow

Waste Product	CE Component(s) of Waste Management Method	
Wooden Pallets	Reuse	
Cardboard Boxes	Reuse	Recycle
Plastic Wrap	Reuse	Recycle
Plastic Bottle	Recycle	
Food Waste	Recycle	None (Incinerate)

Best Practice for Better Managing Waste in the Broders Relish Resource Flow

Table 13 lists several potential solutions considered to improve the waste management associated with the relish resource flow. Replacing the plastic bottles with glass bottles and offering a deposit for customers to return these glass bottles was identified as a best practice. 'Social' is satisfied because offering a deposit for returning the glass bottles improves the business's green image. 'Resiliency' is satisfied because reusable glass bottles are a more sustainable option for the supplier to produce as opposed to a plastic bottle.

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Table 13: Potential Solutions to Better Manage Waste in Relish Resource Flow

Potential Solution	Justification from Expert Interviews	Benefits	Challenges	Criteria Satisfied	Score
Use Glass Bottles Instead of Plastic Bottles and Offer Deposit for Return	**Chocolate Factory Uses Metal Containers**	**-Easier to recycle than plastic -Ensure bottles get recycled -Encourage customers to return them**	**-Need supplier cooperation -Possibly more expensive -Sanitary concerns**	**Resiliency (80), Social (60)**	**140**
Give Plastic Wrap or Cardboard Boxes to Third Party to Use for Packaging	Reuse and Sharing Instead of Recycling	-Reuse instead of recycle -Pay less for recycling	-Might be difficult to find someone to take it	Cost Savings (70)	70
Educate Consumer on Concept of Composting	Education About Biodegradable/ Reusable Packaging and Proper Waste Management	-Allow consumer to compost -Repurpose waste	-Consumers may be unwilling to compost -Additional resources needed to do this	Social (60)	60
Refill Station for Relish	Green Profile	-Less waste (can reuse bottles) -Improves public perception of Broders	-Hard to implement -More work -Sanitary concerns	Social (60)	60

Summary of Best Practice for Better Managing Waste in the Broders Pastinos Resource Flow

An analysis of the resource flow for Pastinos in Broders was conducted. The corresponding resource flow, waste products, waste management methods and potential solutions can be found in Appendix XI. For the Pastinos resource flow, it is suggested as a best practice that Broders use a biodegradable or recyclable material for the chip bags. ‘Social’ is satisfied because a green label could be seen by the

consumer on this packaging, thus encouraging the consumer to recycle or biodegrade the bag. 'Resiliency' is satisfied because reusable or biodegradable bags are a more sustainable option for the supplier to use as opposed to a plastic bag that can only be landfilled or incinerated.

4.2.6 Best Practices for Better Managing Waste in All Product Resource Flows

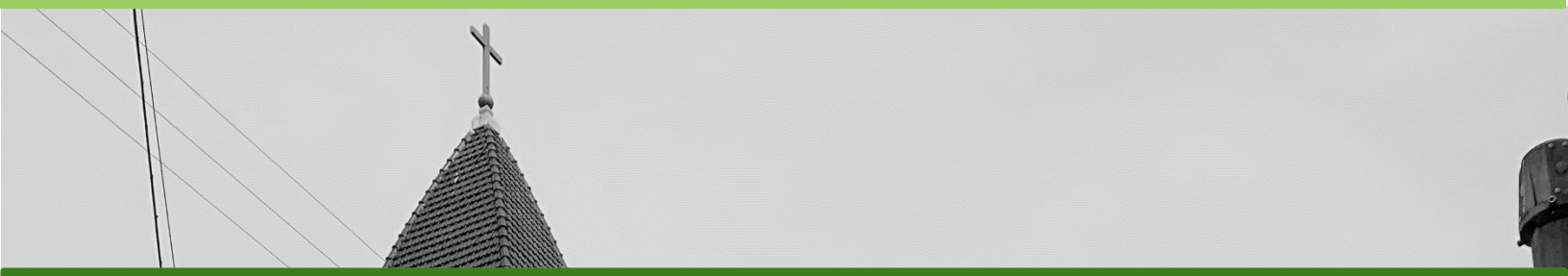
Table 14 contains all best practices developed for each product resource flow. The main goal of the best practices was to better manage waste in the specific product resource flow and therefore further close the circular economy loop. Although no best practices were shared across resource flows, there were common themes. Oftentimes, significant waste was produced from packaging of resources during transportation. From this, it was concluded that the use of sustainable packaging material is needed to address a large portion of this waste. Regarding food waste, it was identified that becoming self-sustainable and controlling your own food waste was the most ideal potential solution. This was accomplished by having a business store and grow their own food, as well as composting and spreading awareness about composting. As a result, these best practices are primarily focused around the control, reuse and repurposing of resources.

Table 14: Best Practices for Better Managing Waste in All Product Resource Flow

Company and Product	Best Practice	Benefits	Challenges	Criteria Satisfied
Ø-helse, Soap	Sell Soap Pumps to Make Soap Dispensers Out of Old Containers	-Don't need plastic soap bottles -Consumers can reuse other containers instead of recycling them	-Packaging to ship pumps -Pumps might only fit some containers -Could be expensive	New Revenue Generation, Social
Ø-helse, Health Supplements	Use a Local, More Sustainable Supplier that Uses Biodegradable Packaging	-Biodegradable packaging reduces environmental impact	-Difficult to find -Possibly more expensive	Social, Resiliency

Company and Product	Best Practice	Benefits	Challenges	Criteria Satisfied
Il Buco, Vegetables	Grow Own Vegetables in Greenhouse or Garden	-Less packaging used in food transport -Could use food waste as compost -Potential long-term cost savings	-Large up-front costs -Cost of maintaining garden	Social, Resiliency
Il Buco, Flour	Use Canvas Bags Instead of Paper	-Can return to farmer for reuse -Il Buco can use for storage -Lower waste disposal costs	-Need supplier cooperation -Sanitation -Heavier than paper bags	Cost Savings, Resiliency
Il Buco, Beer	Use Reusable Kegs	-No plastic waste -Can be returned to supplier to be reused -Save money on recycling	-Needs supplier cooperation	Cost Savings, Resiliency
Letz Sushi, Rice	Sell Pallets to TinkerTank or Community	-Sell waste rather than be charged for its disposal it -TinkerTank can convert them into more valuable product	-Find willing customer -Unlikely to sell for high price	Cost Savings, New Revenue Generation, Social
Letz Sushi, Takeout Containers	Use Reusable Containers and Offer Discount for Returning Them	-Less waste generation -Need to buy fewer containers -Customers can reuse containers instead of disposing	-Sanitary concerns -Unknown return rate -More expensive than disposable containers	Resiliency, Social
Letz Sushi, Salmon	Replace Foam with Reusable Containers	-Less waste generated -Less waste disposal costs -Can send back the reusable containers to supplier	-Need supplier cooperation -Sanitary concerns -Potentially more expensive	Cost Savings, Resiliency

Company and Product	Best Practice	Benefits	Challenges	Criteria Satisfied
Broders, Relish	Use Glass Bottles Instead of Plastic Bottles and Offer Deposit for Return	-Easier to recycle than plastic -Ensure bottles get recycled -Encourages customers to return	-Need supplier cooperation -Possibly more expensive	Resiliency, Social
Broders, Pastinos	Use a Recyclable Material/ Biodegradable Plastic for the Chip Bags	-Can biodegrade or be recycled instead of landfilled	-Need supplier cooperation -Could be more expensive	Social, Resiliency



CHAPTER 5
CONCLUSIONS & RECOMMENDATIONS

MILJØPUNKT AMAGER

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5. Conclusions and Recommendations

This section contains key findings that were concluded from the results and analysis. Additionally, recommendations for the food businesses and our sponsor, Miljøpunkt Amager, are included.

5.1 Conclusions

This project aimed to assist Miljøpunkt Amager through the development of effective circular economy practices that could be implemented by small food companies in Amager in an effort to improve sustainable businesses practices. Through the use of expert and business interviews, case studies on specific product resource flows were outlined through the use of a multi-criteria analysis which relied on a business's ranking of the case study criteria: cost-savings, new revenue generation, social, and resiliency. Finally, best practices for each product resource flow were determined based on the businesses ranking of the criteria.

Implementation of a circular economy within small food businesses first requires an understanding of specific concepts. A business must consider the ***motivations***, ***challenges*** and ***information*** related to a circular economy before identifying the best practices for better managing waste.

It is essential that a business identifies its own values in order to understand the ***motivations*** for implementing sustainable business practices. These values are necessary in order to determine the best practices for better managing waste that align with the company's needs. The results of the business criteria rankings show that each business will have its own values. For Il Buco, the criteria 'Resiliency' was ranked the highest, signifying the importance of using local and sustainable suppliers. For this case, the best circular economy practices were centered around establishing local suppliers. Conversely, Ø-helse ranked the 'Social' criteria the highest revealing that maintaining a green image for the public is most important for the business. The best circular economy practices for this situation were identified in order to benefit the public perception of the business. Businesses have different motivations for using sustainable

methods and these values will shape the best circular economy practices for each product resource flow.

Additionally, small food businesses must understand the ***challenges*** involved with implementing a circular economy in order to fully understand the feasibility of a solution. The resources necessary to employ circular economy practices in a business are a limiting factor. Implementing sustainable practices may require more employees to maintain these new aspects of a business. This would lead to increased labor and material costs. Finally, in order to make the corresponding resource changes, further cooperation with suppliers would become necessary. While a business may be open to adopting sustainable changes, aligning these values with the supplier's may be difficult.

Furthermore, a business needs additional ***information*** in order to successfully implement a circular economy and have the competency to design the resource flow. In order to design waste out of a product resource flow, a business must first identify the products which produce the most waste. Moving forward, a business can then analyze the corresponding resource flows for these products. In particular, a business must be aware of where its resources come from, where in the resource flow waste is generated, and how that waste is managed. From this, a business can then prioritize waste products to address within a resource flow based on how sustainably the waste is managed.

Lastly, a business will greatly benefit from knowing how other businesses are attempting to implement a circular economy. Through the interviews with circular economy experts, potential solutions were formed based on the expert's knowledge of past sustainable initiatives. Although solutions are specific to each business, sharing of sustainable practices among businesses will allow for inspiration of sustainable ideas.

Additional research was conducted for Miljøpunkt Amager at a Climate and Democratic Festival, as well as an online search of businesses partaking in circular economy practices in Amager. More information on this work can be found in Appendix XII.

5.2 Recommendations

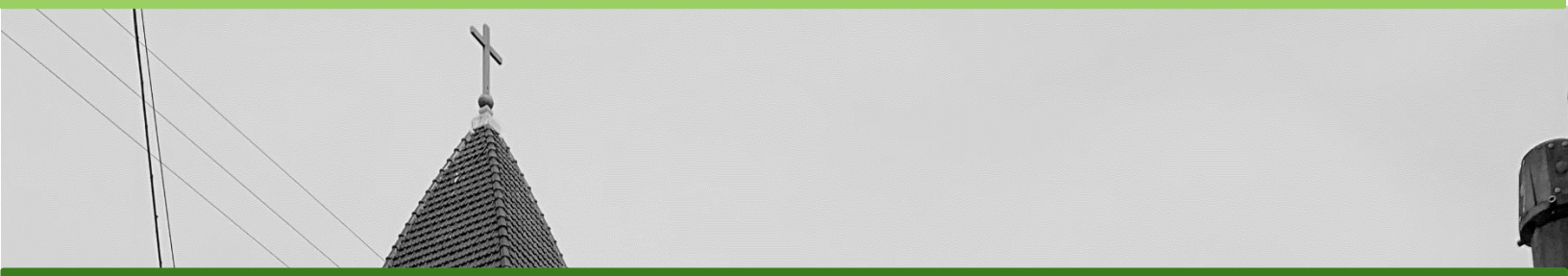
The following section contains recommendations for small food businesses who would like to consider implementing a circular economy. Additionally, this section includes recommendations for future work to be carried out by Miljøpunkt Amager. The recommendations have been produced from information gathered through background research, interviews with circular economy experts, interviews with small food businesses, and a multi-criteria analysis of product resource flows.

Given that the best potential circular economy solutions are unique for each food business, it is useful to standardize the process of obtaining the best practices instead of generalizing individual solutions across the entire food industry. It is recommended that small food businesses use the same process as outlined in the multi-criteria analysis for this project in order to identify best circular economy practices for better managing waste.

It is recommended that businesses conduct future work on understanding the viability of implementing circular economy practices. Many possible solutions identified in this project had potential cost savings or at the same time increased expenses. This project was limited because of an inability to collect financial information from the small food businesses interviewed due to confidentiality concerns. For this reason, it is recommended that a business conduct their own cost-benefit analysis in order to evaluate if these financial consequences would be acceptable. Likewise, many of the best practices would require a feasibility study in order to determine the viability of their implementation. For example, if Letz Sushi were to switch to reusable takeout containers, they would need to determine if they could find a supplier for them, if their customers would be willing to use them, and how much work and money would be needed to manage them.

Finally, it is recommended to Miljøpunkt Amager that more research be conducted on a greater variety of businesses. This research was limited due to the fact that the businesses used in the case studies were chosen based on their preexisting relationship with Miljøpunkt Amager and therefore have all previously

implemented sustainable practices. This potentially biased their values and criteria rankings in comparison to businesses that have not yet taken steps towards sustainability. To address this, less sustainable businesses should be studied. Furthermore, it would be of value to gain more insight on an industry other than food. Although the process of analyzing resource flows was standardized to be applied to any business, investigating other industries would ensure the usability of the resource flow analysis process. These recommendations were made possible through the case study method conducted in this project.



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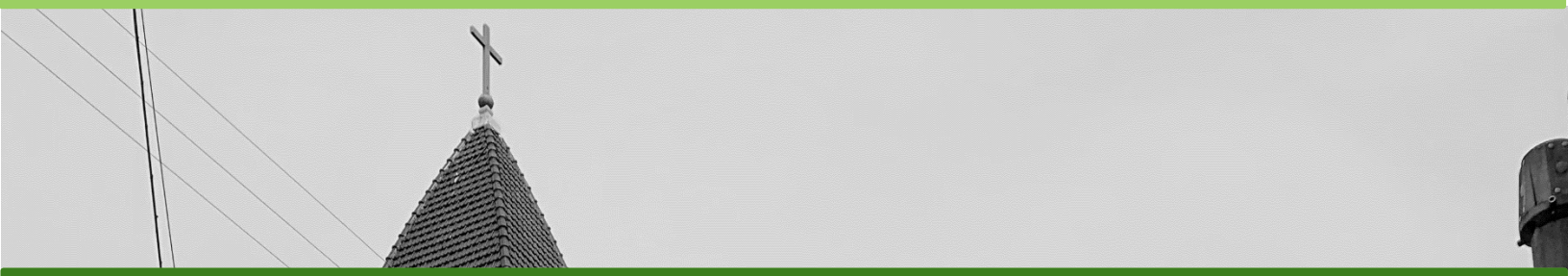

APPENDICES

MILJØPUNKT AMAGER

WPI

Appendices

Appendix I: Research Methods Timeline

Week	1	2	3	4	5	6	7
Circular Economy Expert Interviews							
Small Business Interviews							
Multi-Criteria Analysis							
Best Practices							

Figure 12: Methods Timeline

Appendix II: Justification for Choosing the Food Industry

The food industry was selected based on the existence of literature identifying it as producing more waste than any other industry in Denmark as well as sending over 25% of its waste to landfills or incinerators in 2015 (Danish Environmental Protection Agency, 2017). Although other industries have far higher rates of waste incineration and landfilling, due to the overall waste production in the food industry it sends more tons of waste to these linear-economy solutions (Danish Environmental Protection Agency, 2017). This is still relevant despite recent advances in organic waste being converted into biogas, which handled roughly 150,000 tons of organic waste from food businesses in 2018 (Hansen et al, 2019). Since the food industry produces one of the largest quantities of non-recycled waste in Denmark, these industries could be less developed in regards to preexisting sustainability methods. Accordingly, the benefits of implementing a circular economy in these businesses may be increased compared to companies in other industries.

Appendix III: List of Food Businesses Interviewed

Ø-helse

Website: http://www.oehelse.dk/

Description:

Ø-helse, meaning “island health,” is a health food store located in Amager Øst. The store has a variety of organic or biodynamic ingredients without preservatives in order to promote the health of their customers and the environment (Ø-Helse, 2018). Ø-helse started the Plastic-bag free Amager project mentioned in this report, which Miljøpunkt Amager participated in. Miljøpunkt recommended working with this business because of their previous relationship with them. Ø-helse is also a member of GoGreenDanmark, which is a network of companies pursuing sustainable business options (GoGreenDanmark, 2019).

Il Buco

Website: https://www.ilbuco.dk/

Description:

Il Buco is an Italian restaurant with sustainability focuses using organic and biodynamic raw materials. In addition, aspects of this business operate under sustainable practices such as their bakery (GoGreenDanmark, 2019). This restaurant is also a member of the GoGreenDanmark network.

Letz Sushi

Website:
https://letzsushi.dk/?gclid=EAIaIQobChMI3IDao9jp3AIVTLHtCh0CkQjAEAAYASAAEgLR0fD_BwE

Description:

Letz Sushi has several restaurants in the Copenhagen area, with the Amager Letz Sushi located in Amager Øst. This restaurant has a goal to be 100% sustainable by 2020 through a variety of efforts. One of the sustainability efforts includes making sushi trays with special consideration for energy recovery and recycling, which are composed of 80% recycled plastic (LETZ Sushi, 2019). Letz Sushi is also part of GoGreenDanmark. Miljøpunkt suggested looking into GoGreenDanmark, which is how Letz Sushi was selected.

Broders

Website: https://www.broders.dk/

Description:

Broders is another food store that is located in the center of Amager. The store sells a variety of foods and beverages, and Broders has a goal to avoid producing food waste (Broders, 2019). Broders was recommended by Miljøpunkt because they had also participated in Plastic-bag free Amager.

Appendix IV: Description of Circular Economy Experts

TinkerTank

TinkerTank is an organization that uses waste as a resource in order to create new products to sell. This company began due to large amounts of waste being thrown away by businesses and other organizations in Amager. TinkerTank wanted to utilize this waste in a beneficial manner so they began running several different types of workshops which handled the waste. These workshops include bike repair, art restoration, furniture upcycling, or woodworking. Most of the resources that are used and upcycled by TinkerTank include wood, clean plastic, textiles, and bicycle parts. The interview with representatives from TinkerTank gave key insight into sustainability initiatives being taken in Denmark to reach a circular economy, as well as valuable statistics and processes regarding the management of waste.

Michael Søgaard Jørgensen

Professor Jørgensen is a researcher at Aalborg University located in Copenhagen. His work focuses around circular economy and the planning structures necessary to implement this system in a business environment. He has authored numerous publications centered around sustainability initiatives and the desired characteristics of a corporation or organization looking to transition to a circular economy. Specifically, his paper *A Methodological Approach to Development of Circular Economy Options in Businesses (2018)* focuses on the analysis of the redesign processes necessary for a business to adopt in order to operate within the best practices for conducting circular economy.

Stine Hansen

Stine Hansen is the founder of an architecture company, VÅR Design, that focuses on the design and construction of innovative solutions to enhance the flow and viability of resources. Stine Hansen was referred to by Miljøpunkt Amager and has collaborated with Miljøpunkt in the past to create the *Green Loop City* report. This report discusses the potential for implementing circular economy in Sundby, a neighborhood within

Amager. During the interview, Stine gave an insight into what circular economy entails, specifically for small food businesses in Amager.

GoGreenDanmark

GoGreenDanmark is a network of over 200 companies focused on making sustainability accessible and a top priority for businesses to adopt (GoGreenDanmark, 2019). This organization was not interviewed for this project due to limited availability in the timeline of this project.

Appendix V: Interview Questions with Circular Economy Experts

TinkerTank

1. **Introductions**
    a. Explain reason for interview (develop case studies for implementing circular economy in small businesses in Amager)
    b. Do you mind if I record this interview?
2. **Tinker Tank**
    a. What is the main mission of your company?
        i. How and why did Tinker Tank start?
    b. What companies do you work with in Amager?
        i. Any food businesses?
3. **Circular Economy**
    a. When you hear the phrase “circular economy,” what does that mean to you?
        i. What are the considerations to take into account regarding circular economy?
        ii. What challenges do you see in implementing a circular economy?
        iii. How widespread do you feel circular economy is in Amager?
    b. How open do you feel Denmark is to implementing circular economy?
        i. What is the public perception of circular economy?
        ii. What are small businesses’ opinion of circular economy?
        iii. How do you expect circular economy to change Denmark?
    c. What are circular economy initiatives you have undertaken/have seen other organizations implement?
        i. What industries and business size did they apply to, potentially food industries?
        ii. How successful were food businesses in reducing waste?
        iii. What methods did food businesses use to address the problem?
4. **Waste**
    a. What are the most common waste products you work with in Amager (food businesses)?
        i. What statistics exist on this topic?
        ii. What is their impact on the environment?
        iii. How do you feel their use can be reduced/optimized?
    b. What are examples of sustainable recycling solutions?
        i. How long have they been in effect?
        ii. How successful have they been?

iii. What was the public reaction to them?

c. What are the expectations you have for a small business when it comes to reducing waste?

Professor Michael Søgaard Jørgensen

1. **Introductions**
    a. Explain reason for interview (develop case studies for implementing circular economy in small businesses in Amager)
    b. Do you mind if I record this interview?
2. **Circular Economy - *A methodological approach to development of circular economy options in businesses***
    a. What are the considerations to take into account regarding circular economy?
        i. Environmental Mapping (MECO) - Categorization of food waste
        ii. How can re-design (services, value chain, internal) processes apply to non-food waste in the food industry?
        iii. What challenges do you see in implementing a circular economy?
    b. What are circular economy initiatives you have seen organizations implement?
        i. What industries and business size did they apply to, potentially food industries?
        ii. How successful were food businesses in reducing waste?
        iii. What methods did food businesses use to address the problem?
3. **Waste**
    a. What are examples of sustainable recycling solutions?
        i. How long have they been in effect?
        ii. How successful have they been?
        iii. What was the public reaction to them?
    b. What are the expectations you have for a small business when it comes to reducing waste?

Stine Hansen

1. **Introductions**
    a. Explain reason for interview (develop case studies for implementing circular economy in small businesses in Amager)
    b. Do you mind if I record this interview?
2. **Circular Economy**
    a. When you hear the phrase “circular economy,” what does that mean to you?

i. What are the considerations to take into account regarding circular economy?
ii. What challenges do you see in implementing a circular economy?
iii. How widespread do you feel circular economy is in Amager?

b. How open do you feel Denmark is to implementing circular economy?
i. What is the public perception of circular economy?
ii. What are small businesses' opinion of circular economy?
iii. How do you expect circular economy to change Denmark?

c. What are circular economy initiatives you have seen other organizations implement?
i. What industries and business size did they apply to, potentially food industries?
ii. How successful were food businesses in reducing waste?
iii. What methods did food businesses use to address the problem?

3. Waste

a. What are the most common waste products you work with in Amager (food businesses)?
i. What statistics exist on this topic?
ii. What is their impact on the environment?
iii. How do you feel their use can be reduced/optimized?

b. What are examples of sustainable recycling solutions?
i. How long have they been in effect?
ii. How successful have they been?
iii. What was the public reaction to them?

c. What are the expectations you have for a small business when it comes to reducing waste (food businesses)?

Appendix VI: Interview Questions with Businesses in Amager

1. **Introductions**
    a. Explain reason for interview (develop case studies for implementing circular economy in small businesses in Amager)
    b. Do you mind if I record this interview?
    c. Would you be able to give description about your company?
2. **Circular Economy**
    a. When you hear the phrase “circular economy,” what does that mean to you?
        i. How widespread do you feel circular economy is in Amager?
        ii. Does your company use any circular economy methods?
            1. What were the motivations and benefits for implementing these circular economy practices?
        iii. What barriers do you see in implementing a circular economy (what barriers did you encounter when implementing circular economy practices, if any)?
    b. What does your business do in relation to sustainability?
        i. What did it take to implement these strategies (any sacrifices)?
        ii. Do you believe that having a green/sustainable image would increase your business?
        iii. Does your company have any identification labels denoting a green product?
        iv. Do you have any future plans to improve your sustainability?
3. **Resources**
    a. What is the resource/product that your company uses the most?
        i. Where does it come from?
        ii. How much does it cost?
4. **Waste**
    a. What are three waste products that your company generates?
        i. Is there any product that you believe you may be using ineffectively?
        ii. How do you dispose of these waste products?
        iii. How much does the disposal of this waste cost?
        iv. Do you have a specific organization that collects your recycling?
5. **Ask about Multi-Criteria**
    a. Explain each of the criteria
        i. Cost-savings
        ii. New Revenue Generation Streams
        iii. Social

iv. Resiliency

b. Rank each criterion in importance to your company from 0-100 with 0 being the least important and 100 being the most important

Table 15: Business Criteria Ranking Form for Semi-Structured Interviews with Small Businesses

Criteria	Definition	Example	Rank (0-100, with 100 being most important to your business)
Cost Savings	Identify ways to reduce material costs through the use of sustainable practices	Finding a business to take some/all of your waste for free instead of paying for a waste management service to take it	
New Revenue Generation	Any new source of revenue from a new sustainable product	A biodegradable bottle developed by a company generated a new stream of income	
Social	Have a strong image as a green/sustainable business in order to attract customers	Advertising your green practices to attract new customers	
Resiliency	The use of reliable, green and local suppliers instead of high-risk suppliers (the life-cycle of your product is in your control)	Getting your eggs from the local organic farm instead of an international supplier	

Appendix VII: Multi-Criteria Analysis

This method was chosen in order to provide a standardized way to develop circular economy solutions for each product resource flow. This method was chosen due to its past use in the field of sustainability. One such example was used in a study to determine the net benefits of eco-industrial parks in China (Zhao et al., 2015). This study involved comparing six parks with criterion focusing on economic benefit, social benefit, environmental benefit, ecological industry construction, and management level, with both quantitative and qualitative sub-criteria spread across the different main criteria.

Appendix VIII: Summarization of Circular Economy Expert Interviews

TinkerTank

Fundamentals of Circular Economy

TinkerTank stated that a circular economy is the reuse of material that would normally be thrown out by using it in some other way. Some examples they provided of circular economy practices include harvesting wood from sorting areas in the neighborhood and creating furniture for restaurants from discarded wood. The TinkerTank members emphasized how one of their main objectives is to get immediate value from resources in the local area. They stressed that keeping a circular economy local is a very important aspect to keep in mind.

Considerations and Suggestions for Implementation

TinkerTank stated that a key consideration for implementing a circular economy is a change in mindset when referring to waste. Instead of replacing old products, which would create waste, individuals could repair the products and therefore extend the life cycle. This type of sustainable approach is vital for reducing waste in the future. Furthermore, businesses transitioning towards a circular economic approach should focus on building their identity locally. This could include recruiting employees and collaborating with the local community. According to the interviewees, this will help a business attract customers in the community. Additionally, the interviewees said that community members appreciate and value products which have been upcycled. They state that a product that has been reused is one that has a “history.” As such these products are often preferred over new products in Amager.

Businesses should also be encouraged to provide some type of recycling-based incentive directed towards their customers in order to promote a sustainable system. For example, a business that uses lot of cans or glass bottles could offer some type of deposit system which would encourage their customers to return the bottles instead. This will ensure that the cans and bottles are recycled and not thrown out as waste.

Harvesting valuable resources from products that would normally be disposed of as waste is an important component of circular economy. Products such as furniture which take ample resources to produce are routinely thrown to the curb in Amager to be disposed of. The useful materials that these products are made of, such as wood, can be taken back and harvested in order to make brand new consumer items.

Challenges to Implementation

TinkerTank discussed some challenges that may be restricting businesses specifically in Amager from implementing circular economy practices. Amager can be referred to as the “ghetto” of Copenhagen because it is a lower income area. Lots of businesses there are struggling because it is not a highly concentrated area for business. Additionally, many of the businesses in Amager are older, established businesses. Established companies already have a structured flow of resources and a particular way of thinking, so changing to a circular economy mindset can be problematic.

In general, most companies lack the initiative to execute a plan for circular economy. Businesses are instead more focused on the value chain. Money and time are aspects of the company that are prioritized more than the environment. Therefore, a cost-benefit analysis of having a company participate in a circular economy would be beneficial from the business’s point of view. Since most of these businesses may be smaller and not have as much knowledge on sustainable practices, they need to be given a specific plan by a third party in order to properly participate in a circular economy. TinkerTank believed that they may be able to act as a central hub for knowledge, as well as for exchanging waste and resources.

Many laws and regulations must also be taken into account by businesses when adjusting their business model. An example of this is that specific waste products cannot be sold legally, but rather must be disposed of in a certain way. Furthermore, small businesses may have less regulations to follow than larger ones, but the bureaucratic restrictions must be considered when implementing circular economy practices in a business.

Professor Michael Søgaard Jørgensen

Fundamentals of Circular Economy

Professor Jørgensen explained that there are three overarching strategies that describe the fundamentals of a circular economy: slowing down, narrowing and closing resource flows. Application of these concepts will be unique for each industry; however, the basic principles will stay the same. In relation to the food industry, slowing down a resource flow could be allowing the food to reach its expiration date without going bad. Narrowing the flow involves redesigning a process flow to involve less resources. Less resources results in less opportunity for waste. Finally, closing the loop involves finding some way to reintroduce a resource back into the production cycle of a product. An example of this could be using old food to create a new product. Expired food can be used to create biogas or can be sent to a refinery where a product can be created. These three strategies compose the fundamentals of a circular economy which is based on reducing waste. Producing less waste enables a business to maximize a resource to its full potential.

Throughout the interview, Professor Jørgensen alluded to four main concepts defining a circular economy: reuse, recycle, repair and renting. Specific recommendations and initiatives directly related to these concepts are detailed later in this section.

Considerations and Suggestions for Implementation

A number of considerations and suggestions that businesses should take into account when implementing circular economy were discussed during the interview. Jørgensen emphasized the importance of understanding and tracking the amount of material waste used by a company. By keeping a record of the resource flow, a business will be able to recognize the actual waste products produced by their everyday operations, and thus make it possible to identify potential ways that this waste can be either limited or eliminated. Certain products may be able to be reused or given back to the supplier to induce further value in the supply chain. A suggestion in order to collect further data on our businesses involved the use of a form that would allow companies to highlight their waste. Here companies could select certain products, name the supplier of the product,

and detail the amount of waste produced by the product as it pertains to their business practices. This would highlight problem areas in the business's waste management, and encourage the initial prevention of waste by creating strategies to take back reusable items from the companies' consumers, or sourcing their merchandise from more sustainably focused suppliers.

In specific regard to the food industry, Jørgensen also highlighted key areas to look into. Food packaging serves an integral role in the operation of any food business. Well-designed packaging will keep food both fresh for a long period of time, and allow for a 100% yield in the amount of product used. An example of a peanut butter jar discussed the fact that the design of the packaging makes it difficult to easily access the entirety of the food inside the jar. Here consumers and businesses don't receive the full amount of the product they paid for and the unused resources go to waste. Jørgensen also stressed the importance of pushing for more vegetarian options in stores. Since meat takes a significantly larger amount of resources to process, vegetables inherently produce less waste in the generalized loop of their resource flow.

Challenges to Implementation

The main challenges a company must overcome involves the time necessary to implement a circular economy. Implementing the necessary changes to create a regenerative system can be time consuming and a company must not rush this process. Another challenge could include the effort and resources necessary to make the changes. This could be labor and money required to transition a business to circular economy practices.

Other challenges could include the public perception of a business. Long term customers could potentially be confused or taken aback if a business suddenly changes certain operations. Additionally, managing waste once it has left the business can be very difficult. It is desirable for a company to retrieve the waste from customers in order handle it internally. However, if the waste is widely dispersed, then it can be difficult to retrieve. Jørgensen suggested that managing waste using a small loop (i.e. handling the waste within the business) is superior to using a large loop (i.e. sending the waste off to

be handled by another party). This is because once the waste has been sent off, a business cannot be sure exactly what happens with the waste.

In regards to recycling, there are not many local recycling solutions in Amager. Despite recycling being a sustainable method, Jørgensen advised that it is harder for a business to recycle their waste locally opposed to reusing or sharing the waste. As mentioned before, local solutions are preferred over a broader circular option.

Past Initiatives and Motivations

Professor Jørgensen highlighted a number of past and current circular economy initiatives that have been undertaken by businesses. He discussed a coffee company that rented coffee machines to numerous cafes in the area. These cafes could use the machines and return them to the company, thereby keeping these resource intensive coffee machines in constant circulation. In the event the machines became damaged through use, the renting company would take the machine back, perform repairs, and return it to the customer. In this same vein of repair, Jørgensen also mentioned a company in Jutland who would retrieve and repair washing machines. This ensured that the resource intensive process of manufacturing a new washing machine was avoided, and the metal and steel assembly components of the machine would not be allowed to spread into the resource flow. This idea of repair of goods in order to increase the long-term value of the product was additionally alluded to by Jørgensen through the concept of repair cafes. The goal of these locations is to repair a wide spectrum of product ranging from electronics to power tools to simple toys. Experts in these subject matters volunteer to help citizens repair the products they bring in for free. Rather than throwing away these items, further value is gained from their production cycle.

Along with repair, the takeback, sharing and remanufacturing processes used by numerous food businesses was also made clear to us. A bakery was discussed in relation to the procedure for dealing with excess food waste produced from the production of their products. The crusts and ends of bread they found were able to be transformed into chips they were able to sell. This allowed them to yield 100% of the product they were using, profit as a result of this, and ultimately identify a new

sustainable practice for their business to follow. Additionally, a chocolate company was mentioned regarding the packaging of their merchandise. Metal boxes are used to distribute their products to consumers, thus eliminating the waste from a linearly designed container. Once in the consumers possession, these boxes can also be repurposed for other storage uses, thus eliminating the production of potential plastic waste products. Customers can also choose to return the containers to the store, and subsequently receive a discount on a future purchase. Here the store can reuse the container for a different purpose, and the customer has motivation to contribute to promoting a circular economy.

Two non-food businesses and organizations were also highlighted when referring to past and current successful circular economy initiatives. A leather coat company in Jutland has designed their business operation around creating a sustainable environment. They take in old leather jackets and either remanufacture or restore these potential waste items into a valuable and attractive product. These jackets are then allowed to be rented to consumers in order to reduce the amount of resources necessary to keep their inventory stocked. When the individual is done using the item, they can return it to the store who can then put the jacket back in circulation by either reselling or remanufacturing the product. An initiative centered around the recirculating of waste products called the GuldMinen (Gold Mine) in Copenhagen involves the retrieval of useable products from waste containers. Individuals inspected the disposed goods and chose which items were able to be reused or remade into new products. By considering the amount of resources used, the circular economy loop can be simplified and reduced.

Stine Hansen

Fundamentals of Circular Economy

A circular economy is very similar to a cradle-to-cradle approach. This concept operates on the idea of managing waste as much as possible. Analyzing waste streams and reintroducing waste back into a product’s life-cycle in order to create a loop is also a key

component of a circular economy. Furthermore, the ‘economy’ part of the phrase means that there is an economic benefit associated with the concept.

Considerations and Recommendations for Implementation

Maintaining a green profile for a business can be motivation for companies to convert to a circular economy business model. There is a large societal demand for improving the environment, so having a green profile can attract more customers and create more business for the companies. Many small businesses are far behind larger ones in this sense because of the time, money and resources needed to produce a green business model or product. Food packaging can be a large source of waste generated by small food businesses, so bioorganic and biodegradable products can be very valuable for these businesses. One issue with biodegradable plastic is that most of the end users cannot tell the difference between biodegradable plastic and normal plastic, so it ends up getting sorted incorrectly. There must be better communication about these products in order to make them more easily identified.

There are still problems with waste sorting in Amager. Waste sorting colors are not the same from one location to another and there are not as many options for sorting waste in public areas. Waste sorting currently still remains an individual effort since it is different in different households, schools and businesses. The ghettos of Amager do not sort waste as properly as other areas of the community. Businesses can contribute to solving this issue by providing a variety of sorting fractions and properly managing this waste.

Challenges to Implementation

Factors that may be preventing small businesses from implementing a circular economy include size of the workforce, resources and the economy. It is more difficult for smaller businesses to implement circular economy practices due to having fewer workers. Many of the workers at small business are usually younger people that only stay temporarily. Managing waste properly may not be as important to these younger workers. Stine emphasized that the younger generation should be a target group to educate about environmental issues. One example of a way that has been used to motivate the

younger population was by rebranding a garbage area to make a recycling party for younger people. The resources available to companies for recycling and keeping resources in circulation are also limited. The economy of the business can also be affected because properly sorting waste can cost extra money and time. Amager is a much more conservative area than most cities in which there are many established businesses. It may be much more difficult to try to change the way that established businesses manage their resources and waste. Stine recommended to investigate the difference between established and new startup businesses.

Past Initiatives and Motivations

Stine discussed past initiatives that have been started by both the community and businesses in the area. A green waste initiative had been passed at the municipal level in order to motivate environmental efforts. Local initiatives have also been undertaken in which community members went to different companies to collect compost. This was a productive project that was able to involve the local community in taking action while also educating them. Waste-free city was another initiative that involves how more of the waste within the city can be reused. A project that is used in Germany, called Pumpipumpe, includes using stickers on mailboxes showing what people want to share with their neighbors. Stine suggested that this applying this project to businesses may be able to encourage implementing a circular economy locally. Other green initiatives that Stine mentioned were Plastic-bag free Amager and TinkerTank.

On top of these initiatives, there were also several examples of businesses that make green efforts. Dallevalle, a buffet in Amager center, and Erik's Bageri, a local bakery, both give away leftover food from the day to the community at the end of the night in order to avoid generating food waste. Similarly, WeFood and TooGoodToGo are both businesses that collect surplus food and redistribute it. Gasoline Grill is a local restaurant that has received sustainability awards for reducing their carbon footprint, especially with using green packaging materials. An organic farm, Seerup Gaard, sells produce to local businesses within Amager. These companies have started the bottom-up approach to implementing a circular economy.

There have been several initiatives in the area for transitioning toward a circular economy, and in order to allow businesses to continue these initiatives, some considerations must be taken into account. For example, different approaches may need to be taken depending on the size of the company. It is crucial to figure out what exactly will motivate each company to transition. Circular economy has been making lots of progress throughout the past years, but it is important to involve the businesses in the community to gain momentum toward this goal.

Appendix IX: Summarization of Business Interviews

Ø-helse Interview Results

Sustainability

What does the phrase 'circular economy' mean to you?

- I am unsure of what a circular economy is

Specific to Ø-Helse, would you be able to talk more about what you sell?

- Health supplements, organic food, body soap
- Plastic bags that can be recycled - dog poop bags, freezer bags, garbage bags

Pertaining to your business, what have you done related to sustainability?

- Avoid plastic bags, charge 3 kroner for every plastic bag
- Plastic bags are 80% recyclable plastic

Has this benefitted you at all?

- No, not really monetarily because the plastic bags are sold for 3 kroner
- People care about the environment and a green image helps with customers
- Example of green image is refilling your own bottles of soap

Any future plans to implement sustainability?

- Los Market is a company that receives excess boxes and additionally allows you to refill your own bags with food from dispensers- she hopes to do this in the future
- Nothing is easy to implement

Products/Waste

What product do you sell the most?

- Health supplements

High-Risk products?

- Open to alternative products if they are cheaper

Is there any product that is inefficient?

- No

What kind of waste is produced with packaging for health supplements?

- Organic produce is wrapped individually to differentiate from the others

Is disposal costly or challenging to get rid of?

- Yes, pays for a company to come pick up specific waste
- Cardboard boxes/ Styrofoam - people come in to get it for their small companies for free
- Special garbage can - sorting the waste
- She separates garbage

What specific companies do you have come pick up cardboard?

- Web shop companies that use the boxes for shipping their products out

How did you get into contact with these companies?

- They come to the shop and ask

Multi-Criteria Analysis

Rank each one from 0-100 on how important it is to your business with 0 being the least important and 100 being the most important.

- Cost Savings - 60
- New Revenue Differentiation -70
- Social - 95
- Resiliency - 40

Information

- monaisabel2000@gmail.com
- Amagerbrogade 173

Follow-up Interview Results with Ø-helse

Products/Waste

What 3 products produce the most waste in your shop?

- Most of the waste comes from receiving the products from the supplier
- Products are made by supplier, packaged in cardboard boxes and then sent to the shop
- Suppliers put all the boxes on wooden pallets for bulk transportation to O-Helse
- The pallets are wrapped in plastic in order to keep all of the boxes together on the truck
- Truck comes about twice a week
- The main waste products as a result of receiving shipments from suppliers are boxes and plastic

What happens to the pallets when you are done?

- Delivery man takes back wooden pallets for reuse

What happens to the plastic?

- There is a separate garbage can for plastic (recycling)

What happens to unused boxes?

- Smaller boxes are given away to web shops where they are reused

Do any products on the pallets contain more packaging waste than others?

- Some supplements packaged in bottles are wrapped by plastic in groups of 6 bottles at a time, but are then sold individually in the store
- This results in plastic waste

Do you receive all your products from the same supplier/firm?

- No, I buy from one firm in Jutland which buys products from approximately 20 other suppliers

- Then buys from 20-25 smaller firms

Are the smaller suppliers local?

- All products are received from suppliers in Denmark
- I do not buy products from other countries, there are taxes for foreign imports

Do you receive any products from suppliers in Copenhagen?

- Yes, approximately 25% of the products bought are from suppliers in Copenhagen

Your business sells a lot of health supplements which come in small bottles, do you have any way of retrieving these bottles for recycling once they have been sold to the customer?

- No, but one of the firms which our suppliers are received from offers a take-back recycling system for 3 kroner per bottle

What happens to expired products?

- Eat or throw away the expired products
- Products go on sale when they are approaching their expiration date (30-50% sale)

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Il Buco Interview Results

Sustainability

What does the phrase 'circular economy' mean to you?

- Never have used it, but I understand that it involves staying within a circle of materials.

Pertaining to your business, what have you done related to sustainability?

- Tried to give back veggie scraps to farmers, but the barrels they were sent in never came back because the farmer thought washing barrels was too much work
- Have container for food waste which goes to a plant that makes gas and fuel products out of organic waste
- Bread waste is collected on Friday and given to a farmer in exchange for delivering meat
- Metal pans given to coffee producer to avoid the waste of plastic containers
- No plastic trash bags in trash bins. Washes cans everyday
- Buys local produce like meat and fish from Denmark

Does the community know about your sustainability initiatives?

- Not yet. Trying to communicate to them and could be better at doing this.

Has this benefitted you at all?

- Possibly could generate more clients due to the sustainable public image

Any future plans to implement sustainability?

- Looking to find space to open own greenhouse for produce

Products/Waste

What product do you use the most?

- Vegetables
    - Comes in crates that go back to farmer. Some cardboard, some plastic
    - Trying to phase out plastic but cannot be completely plastic free
- Sugar cane takeout food containers which are biodegradable
- Coating in disposable coffee cups is corn starch. Cup is cardboard and lid is biodegradable
- Cauliflower from Italy
- No fresh herbs in winter because they come from Turkey, Israel or Denmark greenhouses making them expensive

Identify 3 products that cause waste in your business

- Bakery flour comes in 10 kg paper bags. Some come in 25 kg but it is illegal. Truck comes to deliver the flour. Supplier is a small local business who doesn't want to invest in large machinery such as a silo.
    - Paper bags are recycled

- Beer is shipped in locally and the beer is shipped in plastic key kegs. Trying to convince company to produce beer in steel container but they don't have technology, and also don’t want to have to drive it back to supplier
- Foreign fruits and vegetables. From Italy. Comes in cardboard or plastic crates. All packaging wastes. Some wood crates can be used to burn in the fire in the evening, some used to store goods. Good quality plastic containers sometimes given to farmers to deliver produce

Does it cost any money to dispose of waste?

- Pay 50 Kr to have waste emptied and 5000 Kr per month per restaurant. The price per kilo for food waste, cardboard, plastic, and bottles will vary

Multi-Criteria Analysis

Rank each one from 0-100 on how important it is to your business with 0 being the least important and 100 being the most important.

- Cost Savings - 10
    - Sustainable improvements are very expensive. Biodegradable containers and cups cost twice of the tin alternative. Can’t always pass this extra price onto client
- New Revenue Generation -60
- Social - 75
    - Does not have a green image for the purpose of attracting more customers but that would be great if it did
- Resiliency - 100

Information

- info@ilbuco.dk
- Njalsgade 19C

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Letz Sushi Interview Summary

Sustainability

If you've heard the phrase "Circular Economy" before, what does that mean to you?

- If you asked him half a year ago, couldn't wrap his head around being circular for a food business
- Now realizes there are other parts to it
    - Sustainability: fish should be able to reproduce in water
    - Don't use more than they need, reuse what they can

What sustainability practices has your company implemented?

- As sustainable with purchasing as possible
- Use FSC certified bamboo for chopsticks (avoid cutting down rainforest)
    - Not reusable though (get bent if put in dishwasher)
    - Looked into reusable as an alternative, but that wouldn't make a difference
        - Missing ones would need to be replaced
        - Know a fresh pair of chopsticks hasn't been anywhere you don't want it to be
- Conscious with purchasing to avoid damaging Earth (always an impact)
- Try to recycle (bottles, etc.)
- Made to order: avoid food-waste
    - Leftovers sent on TooGoodToGo
- Leftover parts of fish get made into biofuel
- Furniture made of recycled materials
    - Recycled steel/wood
    - Plastic: fish nets pulled out of oceans
    - FSC certified wood where possible
- Use cartons instead of plastic bottles
- They're not used several times a week; limits what they can do
    - Looked into taking back packaging, but packaging easily damaged
        - Look/feel of product essential
        - People have high standards with raw fish (wouldn't like scratched trays)
    - Going to use compostable packaging (not great but best they could do)
        - Use fibers leftover by making sugar from sugar cane
            - Upcycled (used to be used as fuel to heat homes)
- Want to not use oil and plastic
    - Energy comes from windmills
- Altered transportation logistics
    - 2.5 years before: ~3.5 deliveries of raw materials per shop per day
    - Now: centralize purchasing; 1 car per shop per day

- Recently obtained B-corporation status

How much of your business comes from take-out orders?

- About 70%

Do you have future plans for sustainability?

- Sustainable packaging as mentioned previously
- Donations:
    - Currently water purchases help put kids in school in Africa
    - Want to focus on core product (oceans):
        - Starting in April: donate to pull plastic out of oceans (100g per water)
    - For each kids' menu they save a sea turtle (good for biodiversity)
    - Want to make an impact
        - Green Kayaks: Letz Sushi will book a kayak; people can book it for free if they pull plastic out of the water

Products/Waste

What resources does your company use the most?

- Lots of human resources
- Rice (for actual products)
    - Organic, comes from N. Italy
    - Comes in paper bags on pallets
        - Paper gets recycled
    - Transported via train

What three products would you say produce the most waste in your company?

- Packaging
    - Plastic reused (packaging made of 50% recycled plastic)
- Food waste a factor but being reused (biogas)
    - Reused somewhat (made into biogas)
- Water
    - Washing rice takes a lot of it
    - Have centralized rice production to reduce this but it's still significant

- Fish
    - Salmon
        - Comes in flamingo box [polystyrene foam], not easy to recycle
        - Turn it in to municipality, but a lot is likely burned
        - 1 container every 14 days (needs to be fresh), so enormous waste quantity
            - Would like solution (either send them back or something)
        - Transported via truck (not as good of a rail system there)
    - Local suppliers

        - Source of monthly products (e.g. from other side of Zealand)
        - More potential possible
        - However, consumer would rather have tuna than local mackerel
            - Want to look and sound sustainable, but not willing to risk extra cost; rather trust diet they know
        - Introducing organic sea trout (to replace salmon)

Do you have to pay to deal with your waste?

- Yes, Denmark has a fairly good system
    - A lot is recycled or burned instead of landfilled
- Still room for improvement in system
    - Trash blows around on windy days
    - Not something they can directly influence as much though
    - Not many people want to put attention on solutions, instead journalism focuses on problems

Multi-Criteria Analysis

How would you rank each of these criteria?

- They're all important, basically all 100
    - Cost savings are important for a business
        - They've put lots of money in recent years into changing company to be more sustainable
        - Investors interested in sustainability
    - New revenue would come from improving image to reach new customers
    - Social used to generate turnover, good marketing
        - At a local school monthly to teach kids how to think sustainably
            - Look for environmental certifications
            - Every action has an impact (e.g. Bangladesh shrimp farming negatively affects families)
    - Resiliency also critical
    - B-corp certification: think of sustainability holistically
        - Examples: Patagonia, Ben & Jerry's

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Broders Interview Summary

Sustainability

What does the phrase 'circular economy' mean to you?

- It is the reuse of material
- For example, reusing clothes or swapping clothes with somebody else
- Reuse material in a product to create a new product

Do you have any sustainability initiatives within your store?

- We have a 'due on date' table which holds products that are nearing their expiration date. The products on this table are sold at a discounted price to incentivize customers to purchase them
- We have napkins that are made of recycled paper
- We use bags made of recycled material (Plastic Bag Amager)
- We sell skin care products that are made from recycled organic coffee grounds from local cafes. The packaging is also made of sustainable green plastic
- We use an application called, Youlocal, which allows for someone to list products at a discounted price. Using this app, we list the products on our 'due on date' table. People can then buy products on the table using the app and then come in and pick them up
- We also give food nearing its expiration date to hospitals or homeless people
- Expiring food is also given away for free to organizations hosting their own events
- Bowls for porridge are made of corn stalks

Products/Waste

What product do you sell the most of?

- We sell Roche ginger bottles which are made of glass
- When we choose products, we will look at the green image of the supplier. If the supplier is not sustainable and there is an alternative sustainable supplier which provides a similar product then we will choose the more sustainable supplier
- One of the suppliers we use for water is called 'Clankier Source' and they have a goal to produce more oxygen than CO2 by 2020. Furthermore, they extract their water from underneath fields which have been organically grown for at least 300 years. These sustainable initiatives were one of the reasons we chose this supplier
- With the exception of beer and grums, all of our products are imported from outside the country

If you had to choose 3 products in your business that produce waste for a resource flow analysis, what would they be?

- Jalapeno Pepper Relish

    - Comes in plastic container (also comes in glass bottle but the plastic is cheaper and therefore sells more frequently)
    - Imported from supplier in Cork, Ireland
    - Shipped by plane/truck in cardboard boxes placed on wooden pallets wrapped in plastic shrink wrap
    - Cardboard boxes are either reused within the store or recycled
    - Pallets are given back to the truck transporting the material
    - Shrink wrap is reused in boxes within Broders for impact absorption
    - Consumer is responsible for recycling the plastic bottles
    - Broders pays for their own recycling (annual fee)
- Pastinos (Chips)
    - Comes in plastic bag which cannot be recycled (due to film on inside of bagging)
    - Product is made of 100% pasta
    - Imported from supplier in England
    - Shipped by plane/truck in cardboard boxes placed on wooden pallets wrapped in plastic shrink wrap
    - Cardboard boxes are either reused within the store or recycled
    - Pallets are given back to the truck transporting the material
    - Shrink wrap is reused in boxes within Broders for impact absorption
    - Consumer disposes of product in normal trash collection (not recycling)

Multi-Criteria Analysis

Rank each one from 0-100 on how important it is to your business with 0 being the least important and 100 being the most important.

- Cost Savings - 70
- New Revenue Differentiation -60
- Social - 60
- Resiliency - 80

Appendix X: Business Sustainability Practices Results

Table 16: Ø-helse's Current Sustainability Practices

Current Sustainability Practices			
Practice	**Description**	**Advantages**	**Disadvantages**
Plastic Bag-Free Amager	Providing free bags made from old textiles instead of plastic bags	Avoiding plastic waste	Losing income from selling plastic bags
Soap Bottles	Providing soap dispensers for customers to refill their soap bottles at the store for a discounted price	Avoiding soap bottle waste and allowing for reuse	Takes extra labor to maintain the soap dispensers
Recycled Plastic	Plastic bags sold in the store are made from 80% recycled plastic	Reusing plastic	

Table 17: Ø-helse's Prospective Sustainability Practices

Prospective Sustainability Practices			
Practice	**Description**	**Advantages**	**Disadvantages**
Imitate Los Market	Los Market uses large dispensers for products in the store instead of having each product individually wrapped	Avoid packaging waste	More labor to maintain

Table 18: Il Buco's Current Sustainability Practices

Current Sustainability Practices			
Practice	**Description**	**Advantages**	**Disadvantages**
Bread Waste	Bread waste is collected weekly and given to a local farmer in exchange for delivering meat	Avoids producing food waste and receives meat in return	
Trash Bins	Does not use plastic trash bags, just place directly into the trash bins and reuse them	Avoids producing plastic waste	More work to clean the trash bins every time

Current Sustainability Practices			
Practice	**Description**	**Advantages**	**Disadvantages**
Local	Buys local produce such as fish and meat in Denmark	Less CO_2 emission from transportation	
Food Waste	Sent to a plant that can make fuel from organic waste	Avoids producing food waste and creates new source of energy	
Vegetable Scraps	Give scraps back to farmers to compost?	Avoids producing food waste	Barrels were never returned because it was too much work for farmers to wash them

Table 19: Il Buco's Prospective Sustainability Practices

Prospective Sustainability Practices			
Practice	**Description**	**Advantages**	**Disadvantages**
Greenhouse	Trying to find their own space to open a greenhouse to grow their own produce	Can control the sustainable practices of growing their resources	Extra labor to maintain

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Table 20: Letz Sushi's Current Sustainability Practices

Current Sustainability Practices			
Practice	**Description**	**Advantages**	**Disadvantages**
FSC Certified Products	Using FSC certified bamboo chopsticks	Avoids cutting down the rainforest	Not reusable (get bent if put in the dishwasher)
Made to Order	Only make food once it had been ordered instead of making a surplus of food beforehand	Avoids having excess food waste	More work
TooGoodToGo	Sell their leftover sushi on the TooGoodToGo app at a discounted price	Avoids producing food waste	
Leftover Fish	Fish heads and bones can be made into biofuel	Avoids producing food waste and can create energy	
Furniture	Furniture used in restaurants is made of recycled materials	Avoid needing to use new materials	
Cartons	Use cartons in the restaurant instead of plastic bottles	Cartons can be recycled instead of producing plastic waste	
Deliveries	Changed from having 3-4 cars to 1 car delivering materials to the stores	Saves gas and produces less CO_2 emissions	Less time efficient
B Corporation Certification	Meets the highest standard of social and environmental performance	Green image	
Windmills	Energy for the company comes from windmills	Renewable energy source	
Water Donations	Give donations to put schools in Africa when water is bought	Positive image	Costs money

Table 21: Letz Sushi's Current Sustainability Practices

Prospective Sustainability Practices			
Practice	**Description**	**Advantages**	**Disadvantages**
Compostable Packaging	Compostable packaging made of sugar cane fibers	Avoids plastic waste, upcycles sugar cane	
Ocean Donations	Will donate to pull 100g of plastic out of the ocean for every water sold	Green image and keeps ocean clean	Costs money
Sea Turtles	For every kids' meal sold, a sea turtle is rescued	Green image and maintains ocean life	Costs money
Green Kayaks	At waterfront locations, customers will be able to book a kayak and it will be free if they pull plastic out of the water	Green image and keeps ocean clean	Costs money

Table 22: Broders' Current Sustainability Practices

Current Sustainability Practices			
Practice	**Description**	**Advantages**	**Disadvantages**
On Due Date Table	Products near expiration date are put on this table and sold at a discount	Products that will go to waste soon are incentivized to be sold	
Sustainable Napkins	Napkins are made out of recycled paper	Napkins can biodegrade easier and are made sustainably	
Sustainable Bags	Bags are made of recycled paper or retrieved from Plastic Bag Free Amager	No plastic bags, and bags can now biodegrade or be reused	Structural quality of bags can suffer
Grums Skin Care	Product made from recycled coffee grinds that is packaged in biodegradable plastic	Waste product of coffee is put to use and plastic can have limiting environmental effects	

Current Sustainability Practices			
Practice	**Description**	**Advantages**	**Disadvantages**
YourLocal	Apps that allows excess or old products to be listed at a discount	Products about to be disposed of can be sold	
Bowls for Porridge	Made out of cornstalks	Bowls made from natural biodegradable product	
Donating Food	Old or excess food is given to hospitals, homeless people, or to organizations hosting events	Soon to be waste products are put to use	

Appendix XI: Business Product Resource Flows Results & Analysis

Ø-helse Health Supplement Resource Flow Results

Figure 13 identifies the resource flow for health supplements used in Ø-helse. The supplements start off by being packaged in plastic containers from a supplier in Jutland (mainland of Denmark). They are then shipped in cardboard boxes by truck to Ø-helse in Amager. The cardboard boxes are held together by plastic wrap and shipped on wooden pallets. When received by Ø-helse, the wooden pallets are returned back to the Jutland supplier. The cardboard boxes are either collected by a waste management service for recycling or taken by local web shop companies to be used for their deliveries. The plastic wrap is also collected for recycling. Once the supplements are purchased by the consumer, unused supplements are disposed of via landfill. The plastic supplement containers should be recycled; however, some consumers could dispose of them as incinerated waste.

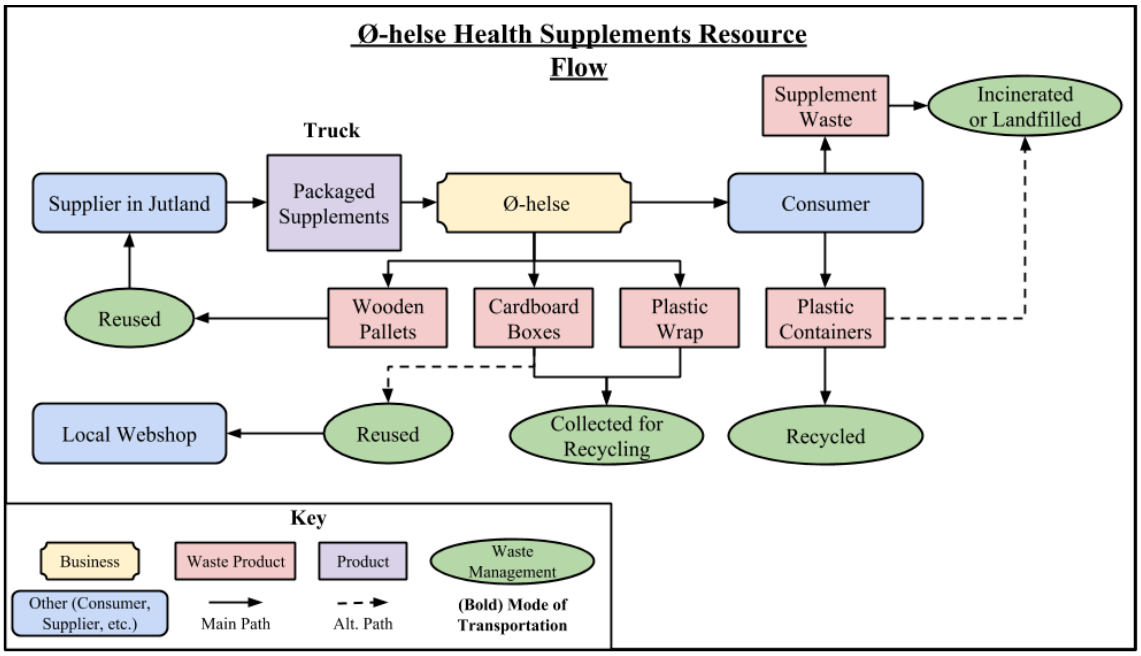

Figure 13: Ø-helse Health Supplements Resource Flow

Ø-helse Health Supplement Resource Flow Analysis

Table 23 provides the waste products generated through the resource flow of the health supplements. Based on information provided in Table 1, Ø-helse's current reuse of wooden pallets and cardboard boxes is an effective method. However, since the cardboard boxes are occasionally recycled instead of reused, this process can be improved. In addition, plastic wrap, supplement waste and plastic containers are handled using less effective waste management methods and have been identified as an area for improvement.

Table 23: Waste Products and Waste Management Methods in Health Supplement Resource Flow

Waste Product	CE Component(s) of Waste Management Method	
Wooden Pallets	Reuse	
Cardboard Boxes	Reuse	Recycle
Plastic Wrap	Recycle	
Plastic Containers	Recycle	
Supplement Waste	None (Landfilled)	

Best Practice for Better Managing Waste in the Health Supplement Resource Flow

Table 24 lists several potential solutions considered to improve the waste management associated with the health supplement resource flow. Using a local supplier that uses biodegradable packaging was identified as a best practice. This solution satisfies the 'Resiliency' criteria because using a local supplier is a sustainable option. Furthermore, biodegradable packaging demonstrates a care for the environment and helps the green image of Ø-helse. This satisfies the 'Social' aspect of the criteria.

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Table 24: Potential Solutions to Better Manage Waste in Health Supplement Resource Flow

Potential Solution	Justification from Expert Interviews	Benefits	Challenges	Criteria Satisfied	Score
Use a Local, More Sustainable Supplier that Uses Biodegradable Packaging	**Build a Local Identity, Use Biodegradable/ Reusable Packaging and Proper Waste Management**	**-Biodegradable packaging reduces environmental impact**	**-Difficult to find a supplier - Possibly more expensive**	**Social (95), Resiliency (40)**	**135**
Have Customers Return Plastic Containers for Reuse/Recycle and Possibly for Money	Incentive	-Ensures that the plastic does not go to the landfill -Improves green image	-Costs more to incentivize and have collected for recycling	Social (95)	95
Refill Station for Health Supplement Pills	Green Profile	-Less waste -Improves public perception of Ø-helse	-Hard to implement	Social (95)	95
Give Plastic Wrap to Other Company/Person to Use for Packaging	Reuse and Sharing Instead of Recycling	-Reuse instead of recycle -Pay less for recycling	-Might be difficult to find someone to take them	Cost savings (60)	60

Il Buco Flour Resource Flow Results

Figure 14 identifies the resource flow for flour used in Il Buco. The flour is delivered to Il Buco by truck in paper bags from a local supplier in Denmark. When the bags of flour are used at the restaurant, the paper bags are collected by a waste management service for recycling. Il Buco spends about 5000 DKK per month to have its recycling collected. Il Buco then uses the flour to prepare food that is then given to the customer. The bread waste leftover from preparing the food and food waste from the consumer is then sent to a local pig farm.

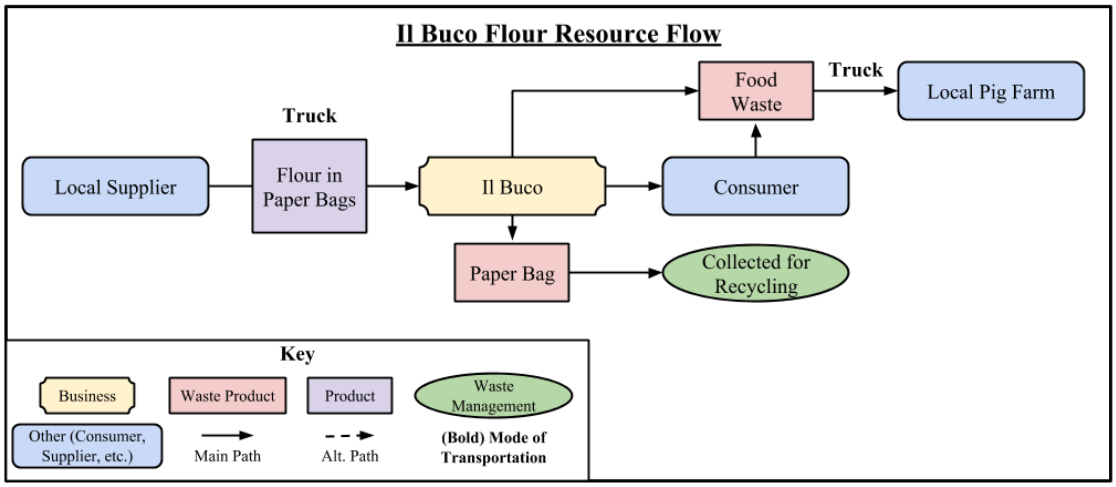

Figure 14: Il Buco Flour Resource Flow

Il Buco Flour Resource Flow Analysis

Table 25 provides the waste products generated through the resource flow of the flour. Based on information provided in Table 1, Il Buco's recycling of food waste and paper bags is a less effective waste management method and has been identified as an area for improvement.

Table 25: Waste Products and Waste Management Methods in Flour Resource Flow

Waste Product	CE Component(s) of Waste Management Method
Food Waste	Recycle
Paper Bag	Recycle

Best Practice for Better Managing Waste in the Flour Resource Flow

Table 26 lists several potential solutions considered to improve the waste management associated with the health supplement resource flow. It is suggested as a best practice that Il Buco use canvas flour bags as an alternative to the paper bags. This satisfies the criteria of 'Cost Savings' since Il Buco would no longer have to pay for disposal of the paper bags. In addition, 'Resiliency' is satisfied because Il Buco is cooperating with their local supplier to reuse the bags.

Table 26: Potential Solutions to Better Manage Waste in Flour Resource Flow

Potential Solution	Justification from Expert Interviews	Benefits	Challenges	Criteria Satisfied	Score
Use Canvas Bags Instead of Paper	**Chocolate Factory Uses Metal Packaging Containers**	**-Can return to farmer for reuse -Il Buco can use for storage -Lower waste disposal costs**	**-Need supplier cooperation -Sanitation -Heavier than paper bags**	**Cost Savings (10), Resiliency (100)**	**110**
Build a Small "Silo" to Store Flour	Narrowing and Slowing Resource Flow	-No packaging waste -Larger amounts of flour at a time	-Expensive -Laws and regulations in Denmark -Need supplier cooperation	Resiliency (100)	100
Sell Uneaten Food on TooGoodToGo	Leftover Food Sellers	-Food that would be thrown out can be sold	-Listed food may go unsold -Cost of using service	New Revenue Generation (60)	60

Il Buco Beer Resource Flow Results

Figure 15 identifies the resource flow of beer in Il Buco. The beer is purchased from a local supplier in Denmark. The product is then packaged and shipped, by truck, in plastic beer kegs known as KeyKegs. Once used by the customer, the plastic kegs are disposed of and collected by a waste management service for recycling.

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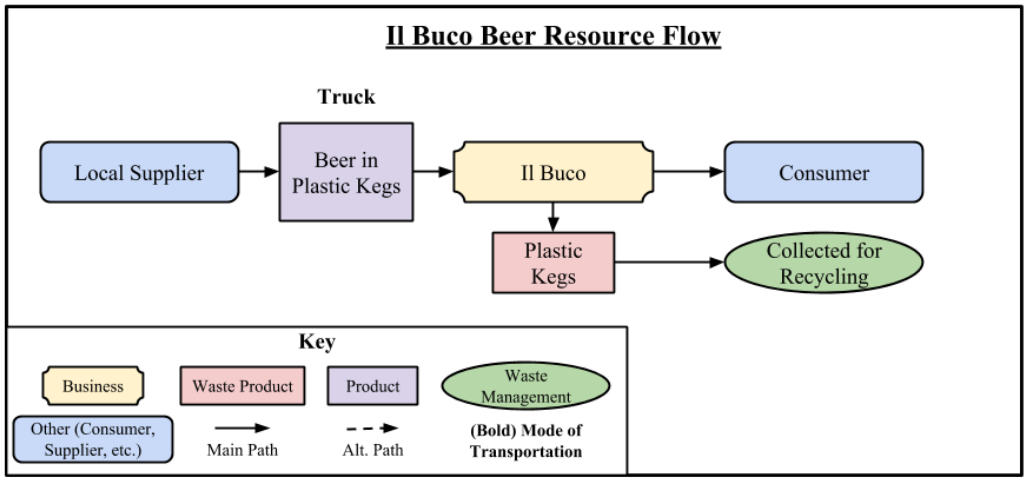

Figure 15: Il Buco Beer Resource Flow

Il Buco Beer Resource Flow Analysis

Table 27 provides the waste product generated through the resource flow of beer. Based on information provided in Table 1, Il Buco's current method of recycling their plastic beer kegs is a less effective waste management method and has been identified as an area for improvement.

Table 27: Waste Products and Waste Management Methods in Beer Resource Flow

Waste Product	CE Component(s) of Waste Management Method
Plastic Kegs	Recycle

Best Practice for Better Managing Waste in the Beer Resource Flow

Table 28 lists several potential solutions considered to improve the waste management associated with the flour resource flow. Using reusable kegs has been identified as a best practice. This solution satisfies the criteria 'Cost Savings' because there would be less money spent on recycling, and packaging costs may potentially be reduced. 'Resiliency' would be satisfied since Il Buco would be able to control the sustainability of the beer resource flow and supplier.

Table 28: Potential Solutions to Better Manage Waste in Beer Resource Flow

Potential Solution	Justification from Expert Interviews	Benefits	Challenges	Criteria Satisfied	Score
Use Reusable Kegs	**Chocolate Factory Uses Metal Packaging Containers**	**-No plastic waste -Return to supplier to be reused -Save money on recycling**	**-Needs supplier cooperation**	**Cost Savings (10), Resiliency (100)**	**110**
Repurpose Plastic Kegs After Use	Harvest Resources from Waste Products	-Save money on recycling -Use for storage	-Hard to deconstruct -May not be aesthetically pleasing	Cost Savings (10)	10

Letz Sushi Takeout Container Resource Flow Results

Figure 16 identifies the resource flow of Letz Sushi's takeout containers. They are initially purchased from a warehouse in Denmark. The product is then packaged in cardboard boxes and shipped to Letz Sushi via truck. The cardboard packaging is a waste product and as a result is disposed of and collected by a waste management service for recycling. The actual takeout containers are then given to customers to store their food. The consumer then either recycles or incinerates the container based on whether or not they know the container is recyclable.

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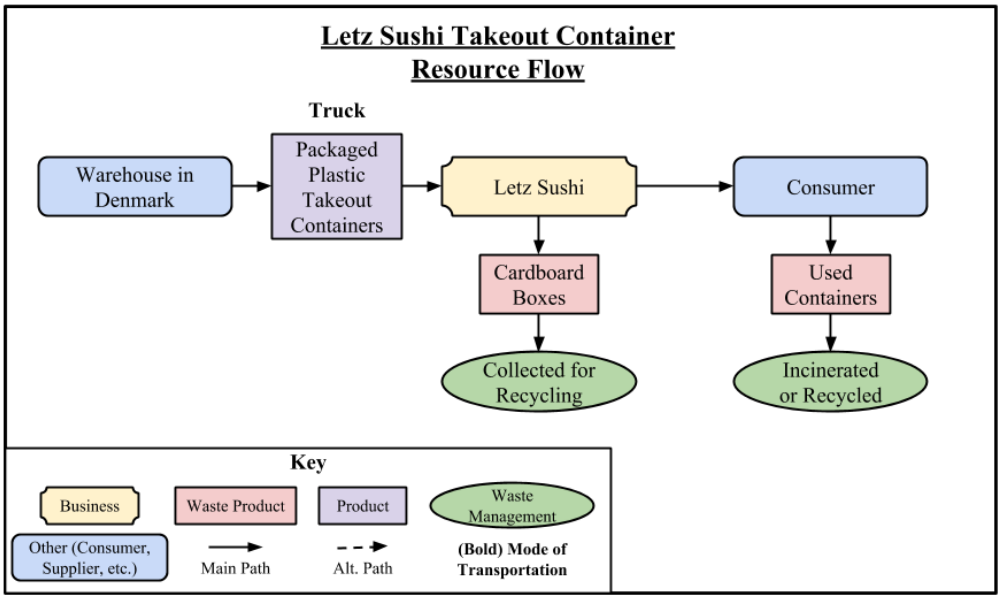

Figure 16: Letz Sushi Takeout Container Resource Flow

Letz Sushi Takeout Container Resource Flow Analysis

Table 29 provides the waste products generated through the resource flow of takeout containers. Based on information provided in Table 1, both waste products are handled using a less effective waste management method. Cardboard boxes and used containers rely on the largest loop in a circular economy. As a result, areas of improvement will focus on these waste products.

Table 29: Waste Products and Waste Management Methods in Takeout Container Resource Flow

Waste Product	CE Component(s) of Waste Management Method	
Cardboard Boxes	Recycling	
Used Containers	Recycling	None (Incinerate)

Best Practice for Better Managing Waste in the Takeout Container Resource Flow

Table 30 lists several potential solutions considered to improve the waste management associated with the take out container resource flow. Using reusable containers and offering a discount for returning them was identified as a best practice. 'Resiliency' is satisfied because customers would be returning the containers to Letz Sushi which

would assist the business in maintaining a constant supply of takeout containers. Lastly, 'Social' was satisfied because consumers would be purchasing their food in sustainable containers thus making it clear to the customer that the company uses sustainable practices.

Table 30: Potential Solutions to Better Manage Waste in Takeout Container Resource Flow

Potential Solution	Justification from Expert Interviews	Benefits	Challenges	Criteria Satisfied	Score
Use Reusable Containers and Offer Discount for Returning Them	**Chocolate Factory Uses Metal Packaging Containers; Incentivize**	**-Avoid waste generation -Need to buy fewer containers -Customers can reuse containers instead of disposing**	**-Sanitary concerns -Unknown return rate -More expensive than disposable containers**	**Resiliency (100), Social (100)**	**200**
Use Biodegradable Containers	Use of Biodegradable/ Reusable Packaging and Proper Waste Management	-Could be made of plant waste -Avoid using single-use plastic	-Potentially more expensive -Need for consumer education	Social (100)	100
Give Cardboard Boxes to Third Party to Use for Packaging	Reuse and Sharing Instead of Recycling	-Material is reused -Pay less for recycling	-Might be difficult to find someone to take them	Cost savings (100)	100

Letz Sushi Salmon Resource Flow Results

Figure 17 identifies the salmon resource flow for Letz Sushi. The salmon is delivered to Letz Sushi from Norwegian supplier by truck and packaged in foam boxes. The foam boxes are collected to be incinerated. When preparing the salmon at Letz Sushi, the unused fish heads and bones are collected to make biogas. Fish that is leftover at the end of each day is sold at a discount to consumers through the app TooGoodToGo. Consumers then produce food waste which is incinerated.

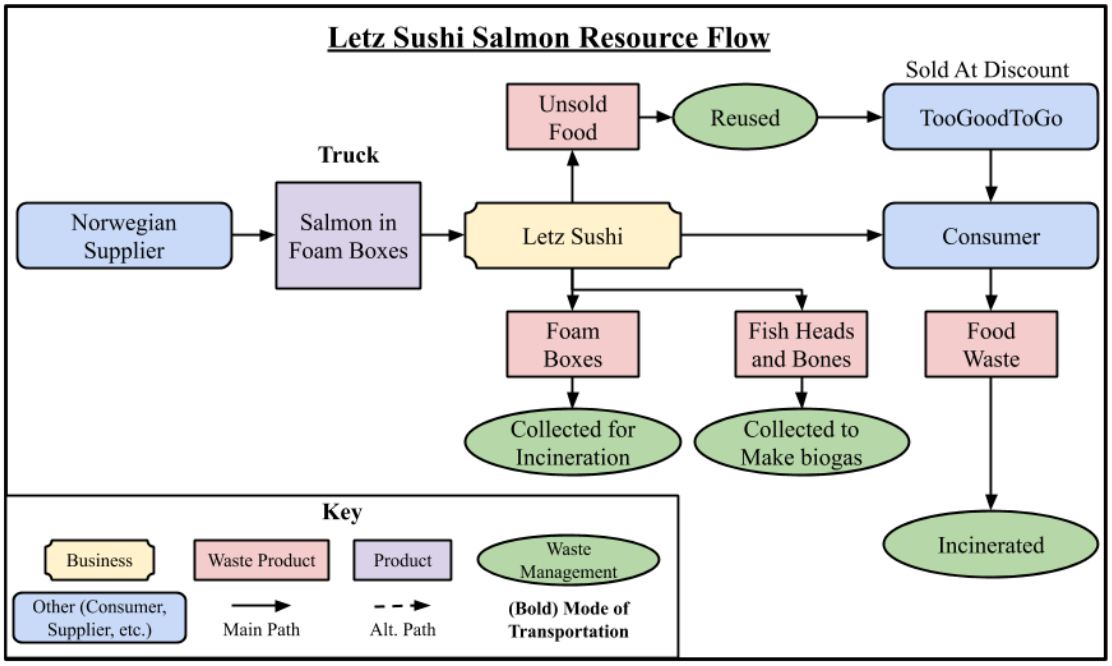

Figure 17: Letz Sushi Salmon Resource Flow

Letz Sushi Salmon Resource Flow Analysis

Table 31 provides the waste products generated through the resource flow of salmon. Based on information provided in Table 1, Letz Sushi's current reuse of leftover food is an effective method. However, the treatment of the fish heads/bones, foam boxes and food waste indicate less effective waste management methods and have been identified as areas for improvement.

Table 31: Waste Products and Waste Management Methods in Salmon Resource Flows

Waste Product	CE Component(s) of Waste Management Method	
Unsold Food	Reuse	
Fish Heads and Bones	Recycle	
Food Waste	Recycle	None (Incinerate)
Foam Boxes	None (Incinerate)	

Best Practice for Better Managing Waste in the Salmon Resource Flow

Table 32 lists several potential solutions considered to improve the waste management associated with the salmon resource flow. Replacing the foam boxes with reusable containers was identified as a best practice. 'Cost Savings' is satisfied because Letz Sushi would not have to spend money to dispose of the foam boxes. 'Resiliency' is satisfied because the reusable containers for shipping the salmon would be sent back to the supplier to be reused.

Table 32: Potential Solutions to Better Manage Waste in Salmon Resource Flow

Potential Solution	Justification from Expert Interviews	Benefits	Challenges	Criteria Satisfied	Score
Replace Foam with Reusable Containers	**Chocolate Factory Uses Metal Packaging Containers; Incentivize**	**-Less waste generated -Less waste disposal costs -Can send back the reusable containers to supplier**	**-Need supplier cooperation -Sanitary concerns -Potentially more expensive**	**Cost Savings (100), Resiliency (100)**	**200**
Use a Local Supplier of Fish	Shrinking Resource Loops	-Shorter transport distance -Making resource loop smaller and more local	-Potentially more expensive -Specific varieties might not be available locally	Resiliency (100)	100
Wash and Reuse Foam Boxes for Storage	Reuse and Sharing Instead of Recycling	-Less waste disposal costs	-Sanitary concerns	Cost Savings (100)	100
Educate Consumer on Biogas Creation	Educate About Biodegradable/ Reusable Packaging and Proper Waste Management	-Allow consumer to create biogas -Repurpose waste from takeout orders	-Consumers may be unwilling to sort waste -Resources needed to do this	Social (100)	100

Broders Pastinos Resource Flow Results

Figure 18 identifies the resource flow for Pastinos chips at Broders. The Pastinos are shipped by plane in cardboard boxes from a supplier in England to Denmark. Upon arrival to Denmark, the Pastinos are then shipped by truck to Broders. The cardboard boxes are sent on wooden pallets and wrapped together by plastic wrap. When received by Broders, the wooden pallets are returned back to the English supplier. The cardboard boxes and plastic wrap are either collected by a waste management service for recycling or used by Broders to ship orders to customers. Once the Pastinos are bought by the consumer, the food waste and chip bag are incinerated.

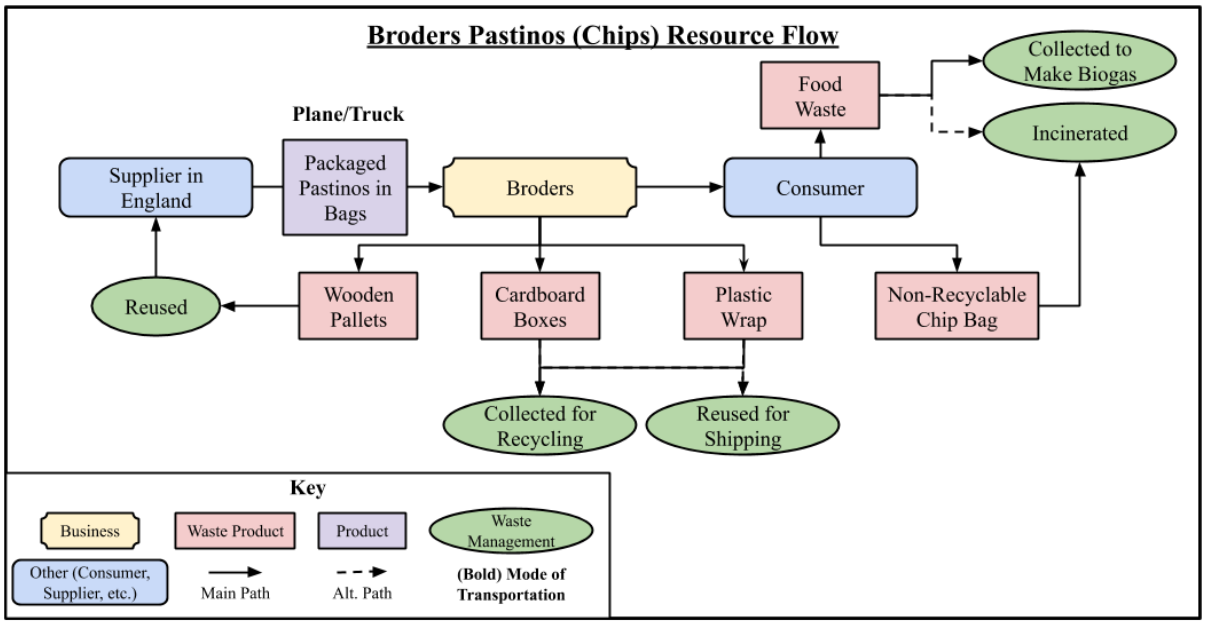

Figure 18: Broders Pastinos Resource Flow

Broders Pastinos Resource Flow Analysis

Table 33 provides the waste products generated through the resource flow of Pastinos chips. Based on information provided in Table 1, Broders' current reuse of wooden pallets, cardboard boxes and plastic wrap is an effective method. However, since the cardboard boxes and plastic wrap are occasionally recycled instead of reused, this process can be improved. In addition, the food waste is either collected to make biogas or incinerated and the non-recyclable chip bags are also incinerated. Since the

cardboard boxes, plastic wrap, food waste and non-recyclable chip bags are handled using less effective waste management methods, they have been identified as areas for improvement.

Table 33: Waste Products and Waste Management Methods of Pastinos Resource Flow

Waste Product	CE Component(s) of Waste Management Method	
Wooden Pallets	Reuse	
Cardboard Boxes	Reuse	Recycle
Plastic Wrap	Reuse	Recycle
Food Waste	Recycle	None (Incinerate)
Non-Recyclable Chip Bag	None (Incinerate)	

Best Practice for Better Managing Waste in the Pastinos Resource Flow

Table 34 lists several potential solutions considered to improve the waste management associated with the Pastinos resource flow. Using a biodegradable or recyclable material for the chip bags was identified as a best practice. 'Social' is satisfied because a green label could be seen by the consumer on this packaging, thus encouraging the consumer to recycle or biodegrade the bag. 'Resiliency' is satisfied because reusable or biodegradable bags are a more sustainable option for the supplier to use as opposed to a plastic bag that can only be incinerated.

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Table 34: Potential Solutions to Better Manage Waste in Pastinos Resource Flow

Potential Solution	Justification from Expert Interviews	Benefits	Challenges	Criteria Satisfied	Score
Use a Recyclable Material/ Biodegradable Plastic for the Chip Bags	**Use of Biodegradable/ Reusable Packaging and Proper Waste Management**	**-Can biodegrade or be recycled instead of incinerated**	**-Need supplier cooperation -Could be more expensive**	**Social (60), Resiliency (80)**	**140**
Educate Consumer on Concept of Composting	Education About Biodegradable/ Reusable Packaging and Proper Waste Management	-Allow consumer to compost chips -Reduce waste generated from takeout orders	-Consumers may be unwilling to compost -Resources needed to do this	Social (60)	60
Give Plastic Wrap or Cardboard Boxes to Third Party to Use for Packaging	Reuse and Sharing Instead of Recycling	-Reuse instead of recycle -Pay less for recycling	-Might be difficult to find someone to take it	Cost Savings (70)	70

Appendix XII: Other Work for Miljøpunkt Amager

The following Appendix contains information pertaining to work conducted with Miljøpunkt Amager that, although relating to the circular economy, was not part of the case studies involving product resource flows. The focus of this work was on assessing the awareness of a sharing cabinet as well as identifying businesses currently contributing to a circular economy in Amager.

Klima og Demokrati Festival (Climate and Democratic Festival)

On April 7th, a climate festival was held in Amager. Organizations and politicians of Amager attended this festival to share and bring awareness to sustainable living. Miljøpunkt Amager was an active participant in this festival. Multiple activities were directed by Miljøpunkt Amager for attendees of the festival to participate in. Two of the activities they coordinated involved a sharing cabinet and a mapping of circular economy businesses in Amager. A description of these two specific activities from the festival, in addition to the results gathered, are shown below.

Sharing Cabinet

The concept of a sharing cabinet operates on the principle of sharing items with a neighbor (or local community) as opposed to someone having exclusive ownership of an item. The purpose of doing this is to avoid multiple people buying the same product which is then infrequently used. At the festival, citizens were asked three questions related to the idea of a sharing cabinet: “What do you share?”, “What are you willing to share?” and “What prevents you from sharing?”. When a participant proposed an item they share or are willing to share, they were encouraged to either hand-draw the object on a piece of paper or find it from one of the preexisting pictures already printed out. The images were then placed on a poster. Similarly, participants were asked to write down ideas of what prevents them from sharing and place them on the poster as well. The poster from this activity held during the festival can be seen in Figure 19.

Figure 19: Climate Festival Sharing Cabinet

Table 32 displays the findings from the sharing cabinet activity. A variety of items were mentioned by the citizens that they either currently share or would be willing to share, ranging from small objects such as tools to vehicles.

Table 35: Climate Festival Sharing Cabinet Data

What do you share?	What are you willing to share?	What prevents you from sharing?
- Bicycle - Books - Cabinet - Coffee Machine - Food Mixer - Gloves - Hose - Ladder - Musical Instruments - Recycling Containers - Saw - Scooter - Shoes - Shovel - Sports Balls - Trailer	- Auger - Bicycle - Cabinet - Car - Clothes - Dishwasher - Drill - Duster - Garden - Kayak - Lawn Mower - Mop - Printer - Rain Boot - Scooter - Tea Kettle	- Accessibility to the cabinet - Easier to buy your own goods - Hygiene - Society - Who empties the vacuum bag? (Accountability)

What do you share?	What are you willing to share?	What prevents you from sharing?
- Washing Machine	- Toaster - Tools - Toys - Trailer - Water Bottle	

These findings showed that local residents are open to sharing their goods. The majority of these goods were low in cost and somewhat dispensable to the majority of people, making them easier to share. Though the concept was well received, the residents identified numerous concerns that prevent them from sharing in certain situations. The suggestion, 'Accessibility to the cabinet', identified the challenge of finding a sharing cabinet to utilize in their area. If the cabinet is challenging to find for the average individual, the majority of people would find it easier to simply buy the cheaper goods on their own rather than relying on the sharing of these resources. Additionally, some residents expressed their concern that individuals using their shared items need to be kept accountable. Ensuring that the product returns to them in the condition it left in is not always a guaranteed result of the cabinet, and thus could discourage people from sharing.

Festival Mapping of Businesses

The mapping of circular economy businesses activity asked participants to locate businesses in Amager that they know participate in circular economy practices. The circular economy practices include sharing, reuse, repair, parts harvest, and recycling. The purpose of this activity was to provide businesses and citizens a resource they can use to identify companies utilizing circular economy practices within the area. The citizens were provided with a map of Amager and wrote down the business on a sticky note which was then placed on the map.

Figure 20 shows the general location of businesses identified by these citizens. Located on the map were seven bicycle repair shops, two tailors, a telephone repair shop, a radio repair shop, and an electronics repair workshop.

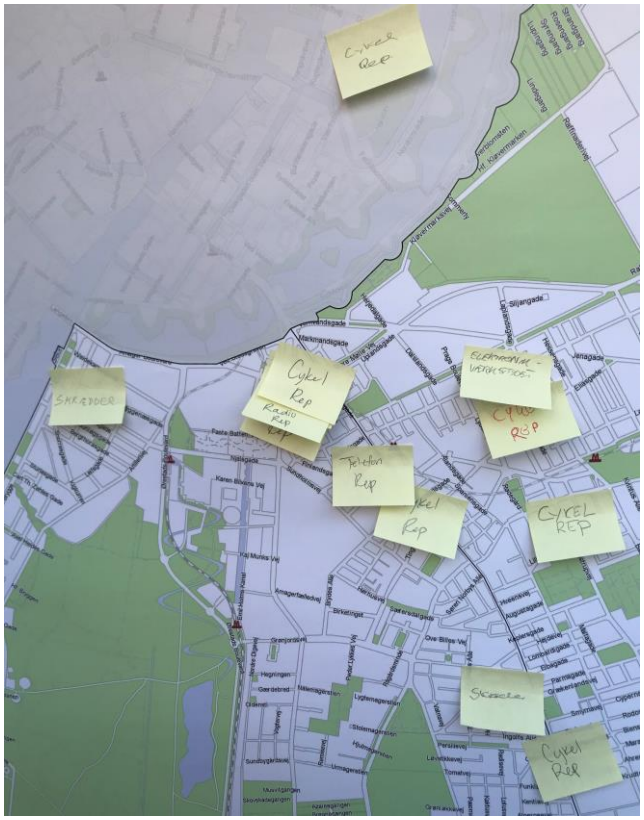

Figure 20: Festival Map of Businesses that Contribute to Circular Economy in Amager

Although residents were aware that some circular economy businesses existed, they did not provide either a specific name or address for most businesses identified.

Online Search of Businesses that Contribute to the Circular Economy in Amager

In addition to the festival mapping, an online search of businesses that contribute to the circular economy in Amager was conducted. Using the website Google Maps, businesses within the borders of Amager (see Figure 3 in 2.4) were identified. Google Maps was chosen based on ease of use as well as incorporating a geographic location. For example, the Amager Resource Center uses Google Maps in order to identify all recycling plants in Amager (Amager Resource Center, 2019). For the mapping in this project, the businesses were sorted based on the following components of a circular economy that they best fit into:

- Sharing: businesses that sell services rather than products, such as a car rental agency
- Reuse: businesses that resell products brought into them that people no longer want, like a thrift store
- Repair: businesses that allow customers to bring in products to extend their useful lives. One such example would be a computer repair service
- Parts harvesting: businesses that take useful components out of products no longer worth repairing. An example of this is an auto wrecking service.
- Recycling: locations where businesses or residents could bring waste, such as a local waste drop-off location

If a business fit into one of these categories, it was included on the map. All of these categories were then entered into a Google My Maps list, which allows the geographic relationship of the businesses to be observed.

The cumulative My Maps list of circular economy businesses in Amager can be seen in Figure 21, where each business is color coded based on which component of a circular economy it fits into. A link to the map is in Appendix XIII. A complete list of the businesses can be found in Table 36.

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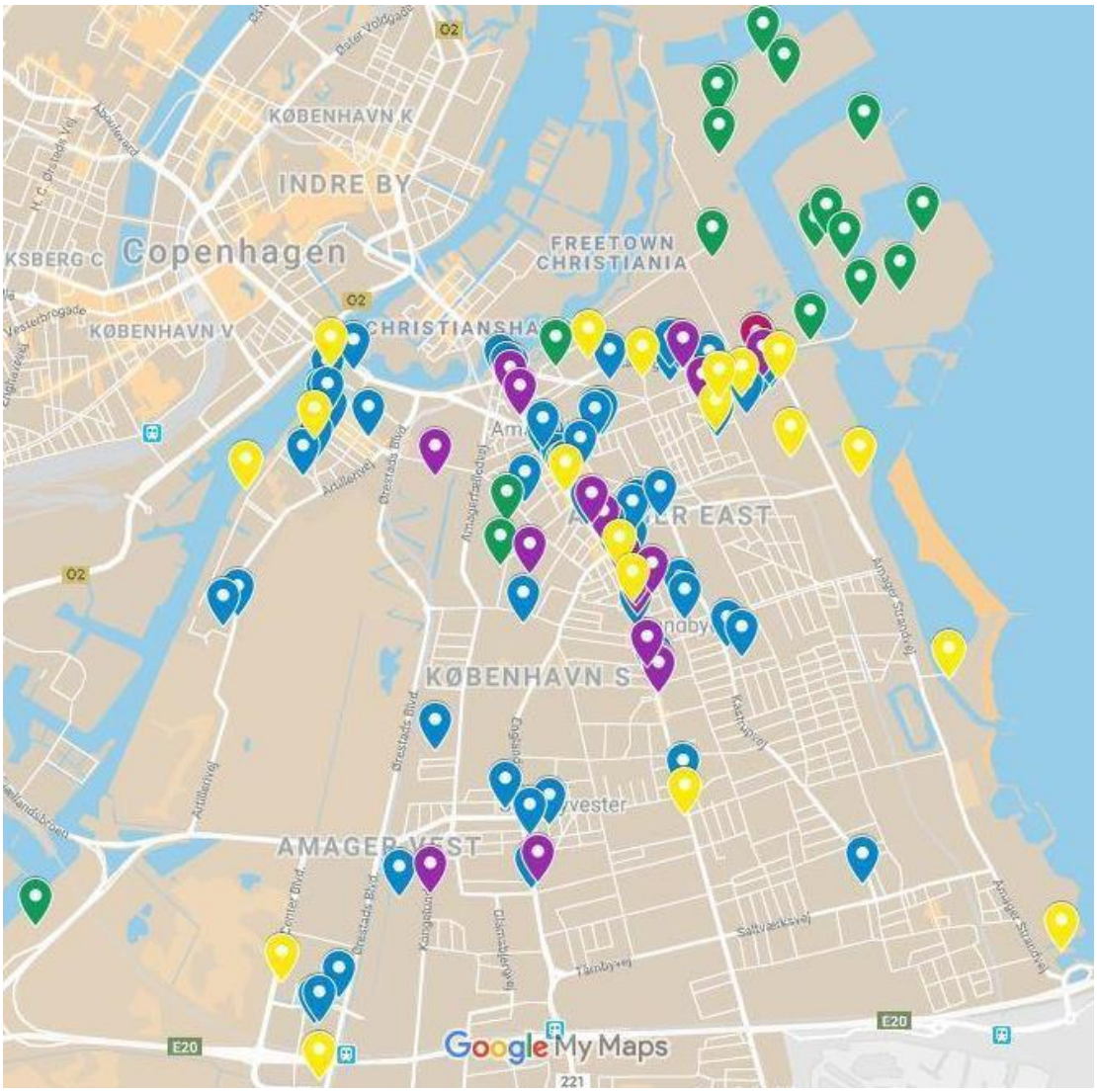

Component of Circular Economy	Sharing	Reuse	Repair	Parts Harvest	Recycle
Color					

Figure 21: Map of Businesses Related to the Circular Economy in Amager

In addition, each list within the cumulative map was displayed independently, which can be seen in Figures 22 and 23. Many of the businesses identified in this mapping exercise are on Amagerbrogade, a major road. Similarly, the southern region of Amager has significantly fewer businesses participating in a circular economy in comparison to the northern region.

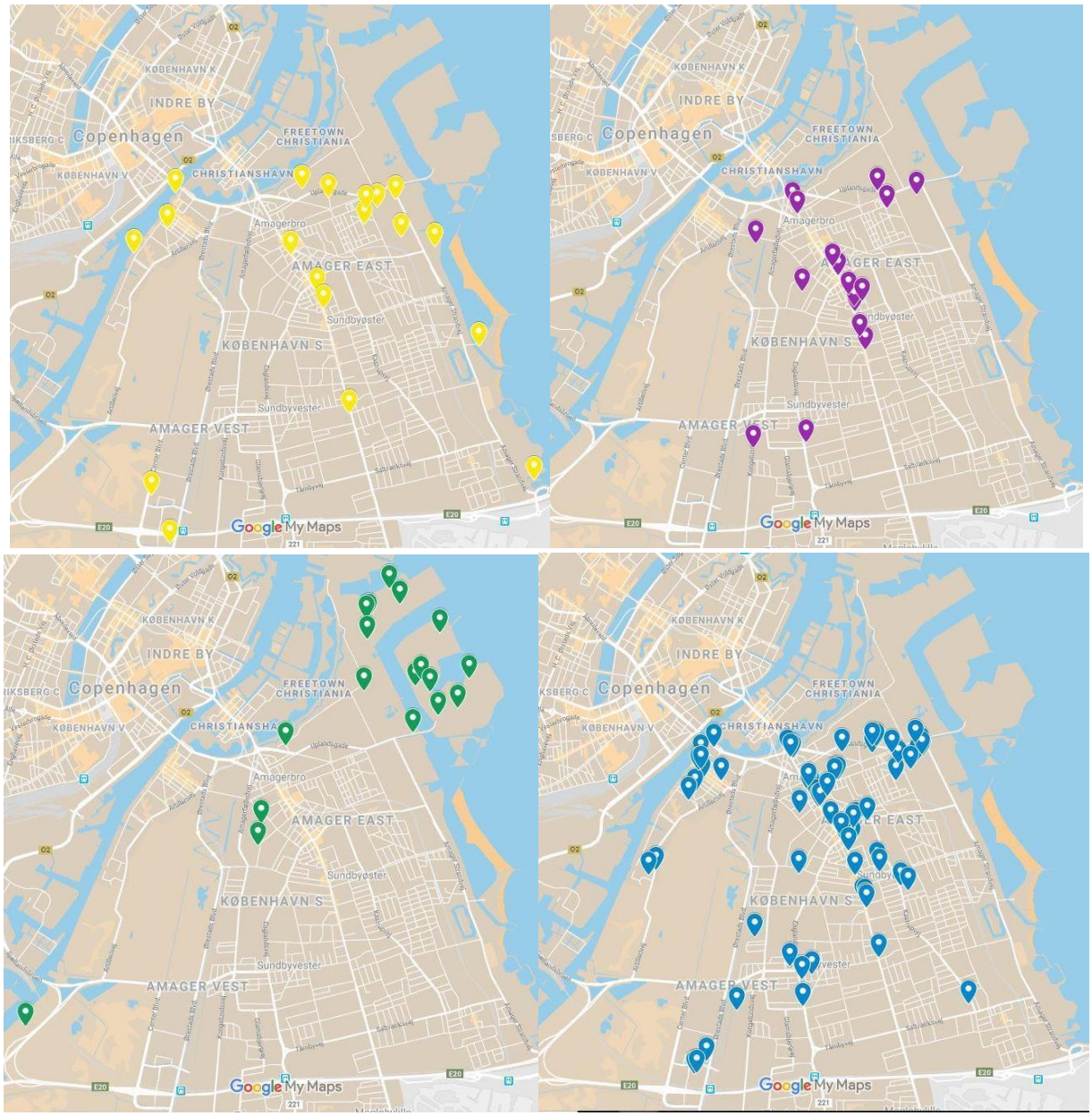

Figure 22: Categories of Circular Economy Businesses in Amager. Clockwise from Top Left: Sharing, Reuse, Repair, and Recycling

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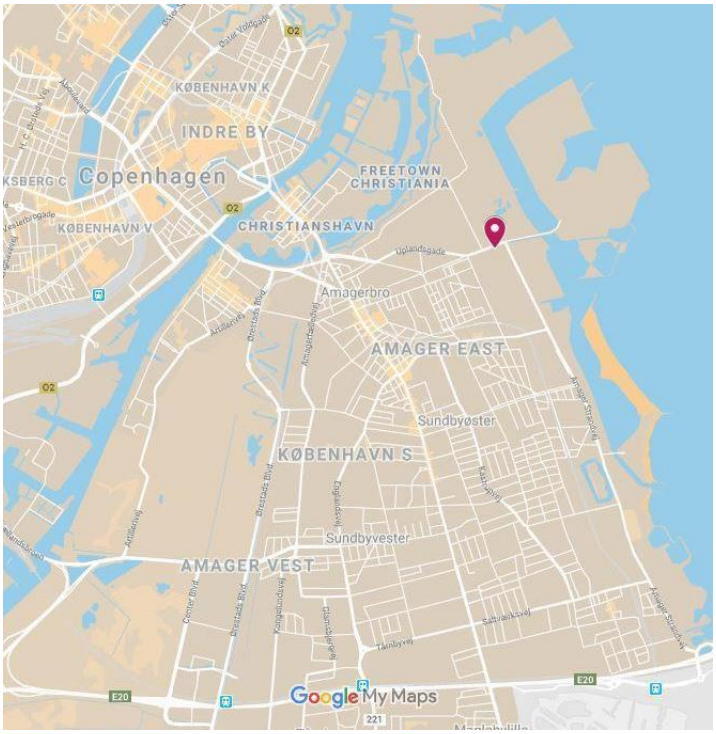

Figure 23: Parts-harvesting Businesses in Amager

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Table 36 is the complete list of businesses included in Figure 20.

Table 36: List of Businesses that Contribute to the Circular Economy in Amager

Business	Business Address	Business Website (if any)	Type of Business	Part of CE
Amager Bakke	Vindmøllevej 6, 2300 København	https://www.a-r-c.dk/amager-bakke	Recycling	Recycling
ARC - I/S Amager Ressourcecenter	Vindmøllevej 6, 2300 København	https://www.a-r-c.dk/	Recycling	Recycling
Beyond Coffee's Sundholm-farm	Sunholmsvej, Sundholmsvej 50, 2300 København	http://www.beyondcoffee.eu/	Mushroom farm (use coffee grounds)	Recycling
City Container Cph A/S	Kraftværksvej 25, 2300 København	https://citycontainercph.dk/	Waste Solution service	Recycling
H.J. Hansen Prøvestenen A/S	B-Vej 14, 2300 København	https://www.hjhansen.dk/	Recycling center	Recycling
HOFOR A/S - Amagerværket	Kraftværksvej 37, 2300 København S	https://www.hofor.dk/baeredygtige-byer/amagervaerket/	Recycling	Recycling
Hørgården nærgenbrugsstation	2300, Brydes Allé 60A, 2300 København	https://www.a-r-c.dk/	Recycling center	Recycling
Junkbusters - Containere, Bigbags, Afhentning Storskrald | Grus, Sten og Sand	Raffinaderivej 20 K, 2300 København	https://www.junkbusters.dk/?p=om-junkbusters	Waste Service	Recycling
NORRECCO A/S - K-vej Prøvestenen	K-Vej 19, 2300 København	https://norrecco.dk/modtageanlaeg/proevestenen/	Waste management service	Recycling
Ragn-Sells Danmark A/S	L-Vej 5-7, 2300 København	https://www.ragnsells.dk/	Recycling center	Recycling
RGS Nordic	Selinevej 4, 2300 København	rgsnordic.com	Waste Management service	Recycling
RGS Nordic	Vindmøllevej 45, 2300 København	http://www.rgsnordic.com/om-os-og-genbrug/	Waste management service/ Biological treatment plant	Recycling
Smoka I/S	U-Vej 7, 2300 København	http://www.smoka.dk/	Solid waste engineer	Recycling

Business	Business Address	Business Website (if any)	Type of Business	Part of CE
Sten & Grus Prøvestenen A/S	B-Vej 8, 2300 København	http://stenoggrus.dk/	Construction materials provider	Recycling
Stena Recycling A/S	Prøvestensbroen 7, 2300 København	stenarecycling.dk	Recycling Plant	Recycling
Unicon A/S C-Vej 1	Prøvestenen, 2300 KØBENHAVN S	https://www.unicon.dk/	Recycling center	Recycling
Vægtergangen Genbrugsplads	Vægtergangen 32A, 2770 Kastrup	a-r-c.dk	Recycling Center	Recycling
Vermlandsgade Genbrugsstation	Herjedalgade 2-4, 2300 København	https://www.a-r-c.dk/	Recycling station	Recycling
3	Arne Jacobsens Allé 12, 2300 København	3.dk	Electronics Store	Repair
4M Auto	Nyrnberggade 23, 2300 København	4mauto.dk	Auto Repair Shop	Repair
AC Auto Autoværksted i København	Uplandsgade 70, 2300 København	acauto.dk	Auto Repair	Repair
Alex Bicycles Skottegården	Skottegården 8, 2770 Kastrup		Bicycle Store	Repair
Ama'r Cykelservice	Holmbladsgade 27, 2300 København	amarcykelservice.dk	Bike store	Repair
Ama'r Cykel Ekspert	Øresundsvej 22, 2300 København		Bike shop	Repair
Amager Cykler	Amagerbrogade 130, 2300 København		Bike shop	Repair
Amager Låseservice	Amagerbrogade 194, 2300 København	http://www.amagerlaaseservice.dk/	Locksmith	Repair
Amager Nilfisk & Elektrolux v/Mogens Birch Broch	Holmbladsgade 48, 2300 København	amagernilfisk.dk	Electronics Store	Repair
Anni Jensen Guld & Sølv	Amagerbrogade 45, 2300 København	anni-guldogsoelv.dk	Jeweler	Repair
AO Håndværkerbutik	Prags Blvd. 53, 2300 København	ao.dk	Tool Store	Repair
Autocentralen V/leif Hansen	Englandsvej 230, 2300 København		Car Dealer	Repair

Business	Business Address	Business Website (if any)	Type of Business	Part of CE
Autoviva udstødninger - Webshop	Strickersvej 8, 2300 København	https://autoviva.dk/shop/frontpage.html	Auto parts store	Repair
Aveny	Amagerbrogade 42, 2300 København	aveny.dk	Jewelry Store	Repair
Bakier Tailoring	Øresundsvej 16B, 2300 København	http://www.bakiertailoring.dk/	Tailor	Repair
Besser El	Maltagade 2, 2300 København		Electrician	Repair
BJ Biler	Yderlandsvej 14, 2300 København		Car Repair/Maintenance	Repair
Bjarne Jakobsen Automobiler	Portlandsvej 37, 2300 København		Car Dealer	Repair
Byens Sycenter i København, Amager	Amagerbrogade 96 G, 2300 København S	symaskinexperten.dk	Sewing Machine Store	Repair
Claus G Melcher ApS	Egilsgade 8, 2300 København S		Jewelry Designer	Repair
Computer112.dk	Toskiftevej 129, 2300 København	computer112.dk	Computer Repair	Repair
CPH Bike Shop	Holmbladsgade 38, 2300 København	cphbikeshop.dk	Bike store	Repair
Cykel Center v/Faroozan Arlimmi	Amagerbrogade 56B, 2300 København		Cycling	Repair
Cykelsmeden Amagerbrogade	Amagerbrogade 2, 2300 København		Cycle repair	Repair
Cykelthomas	Øresundsvej 44, 2300 København	https://www.cykelthomas.dk/	Bike repair shop	Repair
Cykelværkstedet Gold Star v/Søren C Jørgensen	Amagerbrogade 9B, 2300 København		Bike shop	Repair
Dell A/S	Arne Jacobsens Allé 17, 2300 København	dell.dk	Computer store	Repair
Din Bilpartner Amager - J.A. Auto ApS	Strandlodsvej 8, 2300 København	jaauto-amager.dk	Auto Repair Shop	Repair

Business	Business Address	Business Website (if any)	Type of Business	Part of CE
Dyrberg/Kern Denmark	Prags Blvd. 80, 2300 København	dyrbergkern.dk	Jewelry	Repair
Elgiganten	Amagerbrogade 62, 2300 København	elgiganten.dk	Electronics Store	Repair
G33T33 Coportation	Lemnosvej 2, 1. sal, Sundbyoester, 2300 Copenhagen S		Computer Consultant	Repair
GL-Au2Check	Yderlandsvej 25D, 2300 København S		Auto Repair Shop	Repair
Hookells	Lindgreens Allé 18, 2300 København		Sewing Shop	Repair
Imerco Fields	Arne Jacobsens Allé 12, 2300 København S	imerco.dk	Hardware Store	Repair
Islands Brygge Cykler	Islands Brygge 15, 2300 København	https://www.facebook.com/Islandsbryggecykler/	Bike Store	Repair
Jupiter Ekstra Amagerbrogade	Amagerbrogade 197, 2300 København	https://jupiter-ekstra.dk/	Bike shop	Repair
Kalles Cykler	Amagerbrogade 37, 2300 København		Bike Store	Repair
KiteDanmark	Uplandsgade 70, 2300 København	kitedanmark.dk	Skate Shop	Repair
Leben Cph	Amagerbrogade 201, 2300 København	https://lebencph.dk/	Lighting store	Repair
Lenemarie.DK v/Lene Marie Gotholdt	Byglandsgade 12, 2300 København	http://www.lenemarie.dk/	Jeweler	Repair
Lund's Autogummi V/klaus Lund	Isafjordsgade 9, 2300 København	http://www.lundsauto.dk/	Tire shop	Repair
M.H. Auto	Yderlandsvej 25, 2300 København S	mhauto.dk	Auto Shop	Repair
MBA Biler	Englandsvej 195, 2300 København	mbabiler.dk	Car Dealer	Repair
Mercedes-Benz CPH | København S	Snorresgade 17, 2300 København	https://www.mercedesbenzcph.dk/	Auto Repair Shop	Repair

Business	Business Address	Business Website (if any)	Type of Business	Part of CE
MIH VVS ApS	Uplandsgade 68, 2300 København	mihvvs.dk	Auto Repair	Repair
Mobil Reparationer - iPhone reparation	Amagerbrogade 6, 2300 København	https://www.mobilreparationer.dk/	Phone repair	Repair
Newton Cykler	Amagerbrogade 267, 2300 København S	https://newtoncykler.dk/	Bike shop	Repair
Orient Guld og Sølv	Amagerbrogade 59, 2300 København		Jeweler	Repair
PC Panik	Peder Lykkes Vej 61, 2300 København	pc-panik.dk	PC Repair	Repair
Pcupdate	Amagerbrogade 109, 2300 København	pcupdate.dk	Computer Repair Service	Repair
Pcworkshop I/S	Amagerbrogade 166, 2300 København	http://www.pcworkshop.dk/	Computer repair service	Repair
S.R. Knudsen	Samosvej 10A, 2300 København		Blacksmith	Repair
Schrøder Cykler A/S	Amager Blvd. 4, 2300 København	http://schroeder-cykler.dk/	Bike Store	Repair
Seistrup	Egilsgade 10, 2300 København	https://www.pseistrup.dk/	Furniture Store	Repair
ShopSolbriller.dk	Topasgangen 31, 2300 København	shopsolbriller.dk	Sunglass Store (repair)	Repair
Skan-X-Daek	Artillerivej 157, 2300 København	skan-x.dk	Wheel Store (repair)	Repair
Sølv Danmark	Njalsgade 53, 2300 København		Jeweler	Repair
Stig Cykler	Elbagade 43, 2300 København	http://stigcykler.dk/reparationer/	Bike store	Repair
Suhrs Autogenbrug	Prags Blvd. 92-94, 2300 København	suhrs-autogenbrug.dk	Auto Shop/Wrecker	Repair Parts Harvest
Synsgruppen Bilsyn Vermlandsgade	Vermlandsgade 53, 2300 København	http://www.synsgruppen.dk/	Car Inspection station	Repair

Business	Business Address	Business Website (if any)	Type of Business	Part of CE
Tailor Lounge	Egilsgade 15, 2300 København	http://www.tailorlounge.com/	Tailor	Repair
thansen	Rundholtsvej 4, 2300 København	http://www.thansen.dk/	Auto Parts Store	Repair
Urmageren	Amagerbrogade 203, 2300 København	https://www.facebook.com/Urmagerenssmykker/	Watch store (+ repair)	Repair
Velobarista	Sturlasgade 14, 2300 København	http://velobarista.dk/	Bike Store	Repair
Vind`S Auto V/leif Vind	Strandlodsvej 9 A, 2300 København S		Car Inspection	Repair
VVS Comfort Rasmussen Søn & Sønner	Amagerbrogade 135, 2300 København	https://www.rasmussenogsoenner.dk/	Heating / plumbing contractor	Repair
www.dkvolt.dk	Vejlands Allé 108, 2300 København	dkvolt.dk	E-commerce Service (Repair)	Repair
YouSee	Reberbanegade 3, 2300 København	kundeservice.yousee.dk	Cell Phone Store	Repair
Academic Books på Søndre Campus	KUA2, Bygning 14, Karen Blixens Vej 8, 2300 København	academicbooks.dk	Book store (reuse)	Reuse
Bazar	Nyrnberggade, 2300 København		Consignment	Reuse
Bob & Lutetia	Amagerbrogade 161, 2300 København	https://www.facebook.com/boboglutetia/	Thrift / Consignment Store	Reuse
Danmission Genbrug Amager Vest	Kongelundsvej 65, 2300 København S	genbrug.danmission.dk	Thrift Store	Reuse
Danmission Genbrug København S	Amagerbrogade 153, 2300 København	https://genbrug.danmission.dk/blog/butik/danmission-genbrug-koebenhavn-3/	Thrift store	Reuse
Englandsvejens Tømmerhandel A/S	Englandsvej 229, 2300 København	etommerhandel.dk	Lumber Store	Reuse
Grand Central Flea	Amagerbrogade 10, 2300 København		Flea Market	Reuse
Kirkens Genbrug Amagerbrogade	Amagerbrogade 103, 2300 København	https://menighedsplejer.dk/	Thrift Shop	Reuse

Business	Business Address	Business Website (if any)	Type of Business	Part of CE
Lopperne Amager	Uplandsgade 72, 2300 København		Flea Market	Reuse
Mødrehjælpens Lokalforening Amager	Amagerbrogade 22, 2300 København	moedrehjaelpen-amager.dk	Thrift Shop	Reuse
Oxford 2'hand	Amagerbrogade 205, 2300 København		Consignment shop	Reuse
Røde Kors Butik - København S	Amagerbrogade 87, 2300 København	rodekors.dk	Thrift Store	Reuse
Røde kors megastore amager	Amagerbrogade 139, 2300 København	https://www.facebook.com/pg/R%C3%B8de-Kors-Megastore-Amager-122622185240415/about/?ref=page_internal	Consignment shop	Reuse
Smukt Brugt	Amagerbrogade 186, 2300 København	http://smukt-brugt.dk/	Interior decoration store	Reuse
The Blue Hall, Antiques	Ved Amagerbanen 9, 2300 København	denblaahal.dk	Flea Market	Reuse
TinkerTank	Hørhusvej 5, 2300 København	https://www.tinkertank.dk/	Recycling workshop	Reuse
UpCopenhagen 2ndhand	Tycho Brahes Allé 23, kld. tv, 2300 København	https://www.upcopenhagen.dk/	Second hand store	Reuse
Wefood	Amagerbrogade 151, 2300 København	https://www.noedhjaelp.dk/vaer-med/wefood-danmarks-foerste-butikker-med-overskudsmad-og-varer	Store (damaged /close to expiration date food)	Reuse
Adventure-bike.dk	Arne Jacobsens Allé 7, 2300 København	adventure-bike.dk	Bike Rental	Sharing
Autorental Biludlejning og leasing	Vermlandsgade 33, 2300 København	https://bilbooking.dk/	Auto rental	Sharing
B.k.r Auto Aps	Lindgreens Allé 5, 2300 København S		Car Dealer	Sharing

Business	Business Address	Business Website (if any)	Type of Business	Part of CE
Byensbilleje Amager	Laplandsgade 6, 2300 København	byensbilleje.dk	Car Rental	Sharing
GoBoat	Islands Brygge 10, 2300 København	https://goboat.dk/	Boat Rental Service	Sharing
I/S Danske Filmproducenter	Halfdansgade 10, 2300 København		Movie Rental Kiosk	Sharing
Jannie Baltzer	Islands Brygge 30B, 2300 København	https://www.janniebaltzer.com/	Bridal Shop	Sharing
Kajakhotellet	Ved Havnen 2, 2770 Kastrup	https://kajakhotellet.dk/shop/frontpage.html	Kayaking	Sharing
Kastrup Kajak Klub	Amager Strandvej 413, 2770 Kastrup	https://www.kastrupkajakklub.dk/	Canoe & Kayak Club	Sharing
Kostumelageret ApS	Nyrnberggade 23, 2300 København		Costume Rental Service	Sharing
Øens Stilladser ApS	Amager Strandvej 18, 2300 København	https://oensstilladser.dk/	Scaffolding Rental Service	Sharing
One2move Biludlejning København Amager	Strandlodsvej 8, 2300 København	one2movebiludlejning.dk	Car rental	Sharing
Røverkøb Maling	Amagerbrogade 127, 2300 København	roverkob.dk	Paint Store (rent tools)	Sharing
Røverkøb Maling	Amagerbrogade 66, 2300 København	roverkob.dk	Paint Store (rent tools)	Sharing
Sebtor Auto I/S	Lergravsvej 62, 2300 København	sebtorauto.dk	Car dealer	Sharing
Sixt	Ørestads Boulevard 114-118 Crowne Plaza, Hotel guests only, 2300 København	https://www.sixt.dk/billeje/danmark/kobenhavn/kobenhavns-crowne-plaza?xaid=7500&c1=DK&c2=kobenhavn&c3=kobenhavns-crowne-plaza&fir=1	Car rental agency	Sharing
Surf.dk	Amager Helgoland, 2300 København	http://www.surf.dk/	Surfing (classes and renting of surfboards)	Sharing

Appendix XIII: Electronic Files

Link to Mapping	https://drive.google.com/open?id=1tpaJhSBJWOgDVfU_TXvEYOJ7lXARHDil&usp=sharing