Master's thesis

NTNU
Norwegian University of Science and Technology
Department of International Business

Even Helle and Lennart T. Alnes

Circular Business Models: A multiple case study

Circular business models for fishing gear recycling: A multiple case study

How can companies by integrating circular business models utilize marine plastic litter?

Master's thesis in International Business and Marketing
Supervisor: Richard Glavee-Geo

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This master thesis is written as part of the International Business and Marketing program at NTNU. Our thesis marks the ending of a five year higher education period for both of us, and now our time at NTNU Ålesund is coming to an end. It has been a tough challenge, although it has been very rewarding. When we leave the university for the final time, we leave with many new friendships and many good memories.

We have overcome many challenges along the way with our fellow students, and together we have created a good working environment at the study hall. There has been good times, funny times, tough times and difficult times, but in the end, we finally did it. Covid-19 gave us many social challenges during the first year of our master degree, but luckily, we could write our thesis without too many restrictions.

We would like to thank Professor Richard Glavee-Geo for his role as our supervisor. His dedication to and competence in this subject of study has been incredibly inspirational and helpful along the process. Richard has been available for feedback and suggestions during this work, and we really appreciate his efforts to help us out and guide us along the way. We would also like to show our gratitude to the companies and people who gave their time to us and helped us collecting the data we needed, we did really benefit from their knowledge.

ABSTRACT

Purpose – The main purpose of this study is to find out how companies can utilize marine plastic litter by integrating circular business models. It will identify the business opportunities and challenges for the use of recycled fishing gear, and how the implementation of extended producer responsibility will affect. In addition to this, it addresses how the government can contribute to increased recycling, value creation and utilization of plastic resources in the fishing gear industry with a more circular economy.

Design and Methodology – A multiple case study was applied with three key actors in the value chain. For data collection, we conducted semi structured interviews of employees and managers.

Findings - Findings shows that there are five key roles in the recycled fishing gear value chain: Producer/manufacturer, fishing vessels, port reception facility, recycling facility, and recycled plastic customers. For recycled fishing gear, we developed five sustainable value creation factors in terms of opportunities and challenges: Reuse/repair, design, additives, material recycling and energy recovery.

Theoretical implications – This study adds to stakeholder theory, and theory about sustainable value creation and extended producer responsibility. Additionally, the study contributes by exploring the factors that help explain how the different roles of value chain actors contributes to sustainable value creation in the recycled fishing gear industry.

Practical implications - The findings of this study provide valuable managerial and policy implications that can help the value creation potential of the industry. This involves implications for manufacturers, fishing vessels, fish farms and different receptions.

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CHAPTER 1: Introduction

1.1 Background and motivation of the study

Too much plastic litter ends up in the ocean space. According to Gro-Ellen Linnås, 15 tons of plastic ends up in the sea every minute Whether the plastic is in big pieces or has been broken down into microplastic or nano plastic, it harms fish, whales, and everything else that lives in the world's largest ecosystem - the sea. Large pieces of garbage, such as those that originate from the fishing industry as lost equipment, have the potential to harm marine life through ghost fishing and animals that become tangled in the debris and are unable to free themselves. Ropes or fishing nets around various sections of the body cause the animals to drown or suffer a long and painful death.

The problem is that plastic does not break down. Instead, it turns into micro plastic; these are pieces of plastic that are smaller than 5 mm. The micro plastic can often carry harmful chemicals with it, and enters the food chain by being eaten by shells, fish and birds. It is best for everyone who lives in and by the sea that we limit the amount of rubbish that ends up there so that it does not harm animals and human life.

The issue of global climate change has gotten a lot of press around the world. The ocean is the world's largest active carbon pool, and it has a significant impact on global climate change. However, due to the massive consumption and mishandling of global plastics, marine plastic pollution is becoming increasingly significant. The influence of marine plastics on the ecology that controls CO2 exchange and circulation in the ocean could result in increased greenhouse gas emissions.

Microplastics on the ocean floor may have an impact on the carbon store of the ocean. The ocean's surface is not the last destination for plastics. Plastic garbage created on land accounts for only 1% of the plastic waste produced on the ocean surface (Kaiser, Kowalski et al. 2017). The capacity of plastics to sink is determined by their density and biofouling. Biofilms on microplastics can alter their buoyancy and viscosity in saltwater, reducing their flotation kinetics and hydrophobicity and causing them to sink to the ocean's depths. It may have an impact on the circulation of organic materials and nutrients in deep water, influencing the ocean's carbon

supply. Certainly, the behaviours of microplastics and their possible influence in the deep-ocean environment are mostly unknown (Shen, Ye et al. 2020).

Abandoned fishing equipment is one of the deadliest types of plastic waste found in the ocean. So-called ghost fishing harms 66 percent of marine mammal species, half of all seabird species and all sea turtle species. The number of species affected has doubled in just over twenty years. This is stated in a report recently launched by World Wide Fund for Nature. Ghost fishing also damages important marine habitats, such as coral reefs and mangrove forests, and destroys the food supply and livelihoods of coastal communities and fishermen (WWF 2020).

We need global, binding cooperation to stop the plastic waste that is about to drown the oceans. We must act to prevent fishing equipment from going astray, while at the same time ensuring that the equipment that is lost does as little damage as possible, through more reporting, better choice of materials and by new types of marking of fishing equipment that is in the sea, so that what is lost can be found again and retrieved. There is little information about the extent of ghost fishing in Norwegian waters. As of today, it is only mandatory for commercial fishermen to report lost fishing equipment, for recreational fishermen it is voluntary (WWF, 2020).

As governments, industry, and academia pay more attention to the circular economy and sustainability, business model innovation for circularity and sustainability is becoming increasingly important for enterprises to maintain their competitive advantage. With the amount of plastic ending up in the ocean space every minute, it is obvious that something must be done. While policy implementation by government and international institutions can help, circular business model and circularity is one strategy that can help control and reduce the marine pollution problem.

1.2 Research problem

The circular economy concept has sparked a huge movement toward decoupling economic development from natural resource use over the last decade. As opposed to the current linear economy, it is viewed as a long-term economic system in which economic growth is disconnected from resource consumption through natural resource reduction and recirculation (Corona, Shen et al. 2019). Not that much research has been done on the potential use of marine plastics in production. Even though a few companies are making use of recycled plastics in remanufacturing, the literature does not have many empirical cases and lessons that can be learned from these business cases. Therefore, our thesis seeks to provide empirical cases that will enrich the general understanding of this topic. On the background of this, the research problem is stated as:

How can companies by integrating circular business models utilize marine plastic litter?

This thesis addresses a comprehensive world problem around plastic waste in the ocean space. Littering of the world's oceans has come up especially on the agenda in recent years and has contributed to many companies taking measures to counteract this. Our goal is to address the marine litter pollution problem**.** In terms of the international business issues related to this thesis, we want to identify the business opportunities and challenges for companies in the fishing gear recycling industry, as well as the value creation potential. In addition to this, we want to explore how the implementation of extended producer responsibilities (EPR) schemes will affect this. Therefore, our specific research questions that we seek to answer are:

RQ1: What are the roles played by the different actors in the recycled fishing gear value chain?

RQ2: What are the business opportunities and challenges for the use of recycled fishing gear, and how will the implementation of EPR schemes affect these?

The aim for this thesis is to identify and better understand what the different actors does to prevent marine plastic littering. We expect that the actors in the value chain have different opinions regarding problems and various solutions, depending on where they are in the value chain.

We assume that the primary data source collection will be vital for us to achieve the objectives we have set in terms of answering the research questions. Interviewing some of the main actors in the value chain, and supplementing this data with a careful review of secondary data, will ensure that we gather a sufficient amount of material for our analysis. Especially important is the knowledge and insight about the industry as a whole, but in addition to this, information concerning the roles played by different actors in the value chain will help us form an overview of the whole picture.

As of the producers who will eventually have to take EPR into consideration, we anticipate revealing an uncertainty associated with this implementation. Not necessarily a negative attitude towards change, but uncertainty linked with regulations that have yet to be realized. We do not assume that producers are against the implementation, but that they have some concerns about extra work and higher production costs. It is hard to tell at this very moment how the different actors will respond to the possible changes that are coming in relation to the implementation of EPR, but we will do our best to find out.

1.3 Norwegian Regulations

The Norwegian Directorate of Fisheries has extensive experience and a great deal of accumulated knowledge about problems related to marine litter from fishing activity and aquaculture. In 2021 they made an action plan to strengthen efforts against marine litter and with this, initiate measures aimed at reducing marine litter that commercial fishing, recreational fishing and aquaculture are responsibly for (Fiskeridirektoratet 2021).

Norway is at the forefront of regulations against marine litter and measures for clean-up and prevention compared with other countries. The *Pollution Control Act* establishes a general ban on littering on land and at sea. The *Marine Resources Act* and the *Aquaculture Act* provide authorizations for rules that limit harmful effects, and the *Product Control Act* provides authorizations for rules on, for example, material use in plastic products for fisheries and aquaculture to minimize environmental disturbances because of use. This law has so far not been used to provide rules specifically aimed at fisheries and aquaculture (Fiskeridirektoratet 2021).

Several parts of the Norwegian legislation are specifically aimed at actors in the seafood industry to prevent marine litter. The regulations also apply to foreign fishing vessels in the waters under Norwegian fishing jurisdiction. For fishing with what are called fixed fishing gear such as nets and pots, there are clear requirements for how long these can stay in the sea before they must be pulled up and emptied for fish and shellfish. The requirements for emptying fishing gear primarily considers the quality and welfare of marine species, but is also an important measure to reduce the risk of gear being lost.

Section §28 of the *Marine Resources Ac*t further stipulates that on a very general basis it is prohibited to both throw and leave gear, moorings, etc. in the ocean. Experience shows that the loss of fishing gear is inevitable from time to time, even if it is undesirable (Lovdata 2008). Should such situations occur, the *Marine Resources Act §23* and the *Exercise Regulations §78* are clear in terms of that whoever loses their tool must make an attempt at recovery and should this not succeed, the loss must be reported according to the specific gear (Lovdata 2008, Lovdata 2021).

1.4 Structure of the thesis

This thesis is divided into six chapters. In the introduction part of every new chapter, the content is briefly described. The research is introduced in chapter 1, with an overview of the background of this study, the motivation behind it and the research questions. Chapter 2 presents the theoretical framework, which in turn has been applied in this thesis. This naturally starts with presenting circular economy, the value chain and stakeholder theory, followed by the business model canvas and a theoretical framework about sustainable business model innovation. In addition to this, the literature review also addresses marine plastic litter and pollution, extended producer responsibility and different regulations relevant for the industry.

In the third chapter, the methodology and research design of the thesis is presented, in addition to some information about qualitative research and our data collection procedure. We will present our findings in chapter 4, starting with a short presentation of the respondents. Findings in relation to RQ1 will be presented first, followed by findings from RQ2.

Chapter 5 addresses discussions about the findings. The first part discusses how the different roles of the value chain can help in sustainable value creation. The second part take a closer look on recycled fishing gear, EPR and government policies.

Concluding remarks of the thesis will be presented in chapter 6, which will naturally consist of a summary of our findings. Additionally, contribution to theory and practical/managerial implications are presented. Lastly we will define limitations and future research.

CHAPTER 2: Theoretical Framework

This chapter will analyse existing literature on a variety of subjects important to this study project, such as the circular economy, value chain theory and stakeholder theory. Other important frameworks, such as the business model canvas and sustainable circular business model innovation will be reviewed. In addition to this, recent academic research about marine plastic litter and pollution, extended producer responsibility, and relevant regulations will be presented.

2.1 Circular Economy

A circular economy, as defined by the Save Our Seas 2.0 Act, is an economy that takes a systems-based approach and includes industrial processes and economic activities that are restorative or regenerative by design, allow resources used in such processes and activities to maintain their highest value for as long as possible, and strive for waste elimination through superior design of materials, products, and systems (including business models). It's a shift from the current approach, in which resources are mined, turned into products, and then discarded. A circular economy minimizes material consumption, redesigns materials to be less resource-intensive, and repurposes "waste" to create new materials and products.

Circularity is built on three principles:

- Design out waste and pollution
- Keep products and materials in use
- Regenerate natural systems

Economic activity in a circular economy builds and rebuilds overall system health. The notion acknowledges the necessity for the economy to function efficiently at all sizes - for large and small firms, organizations and individuals, worldwide and locally. The negative effects of economic activities that harm human health and natural systems are shown and designed out in a circular economy. This includes the emission of greenhouse gases and dangerous substances, air, land, and water pollution, as well as structural waste like traffic congestion. Activities that maintain value in the form of energy, labor, and materials are favored in a circular economy. To

keep goods, components, and materials flowing in the economy, designers must consider durability, reuse, remanufacturing, and recycling. Circular systems promote efficient use of bio-based resources by fostering a variety of applications as they cycle between the economy and natural systems. A circular economy minimizes the use of non-renewable resources while preserving or enhancing renewable ones, such as by returning important nutrients to the soil to aid regeneration or by relying on renewable energy rather than fossil fuels (EMF 2017).

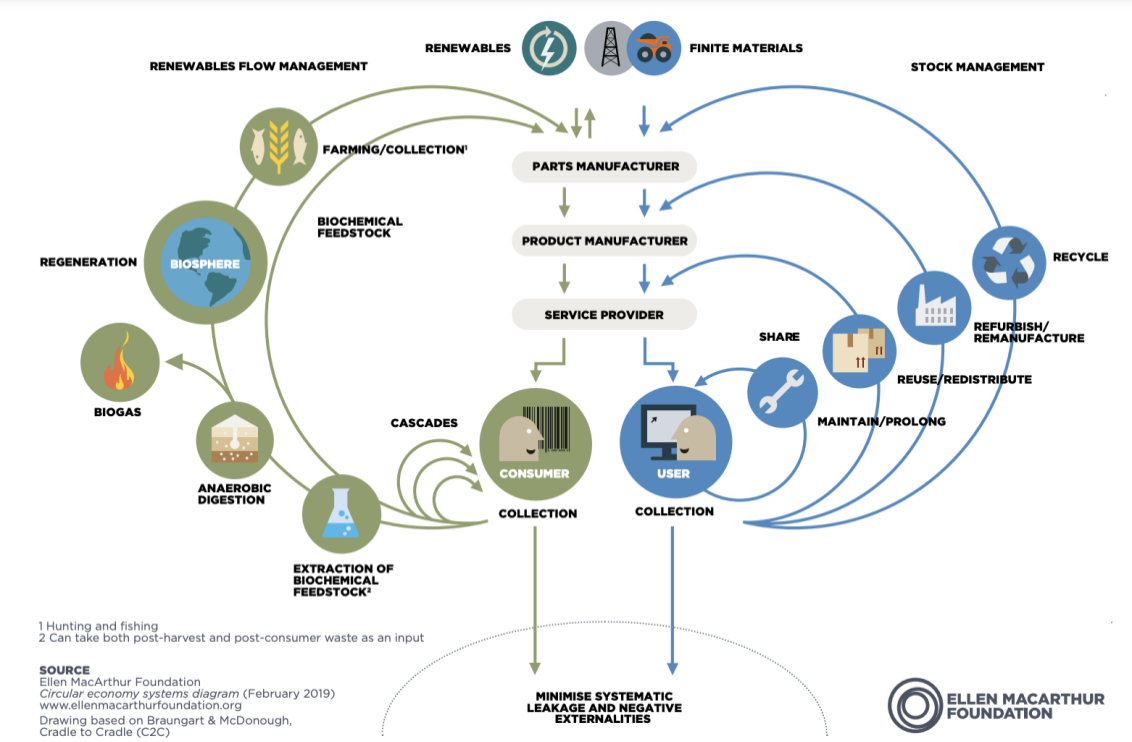

Figure 2.1: Outline of a Circular Economy (EMF, 2017)

We eliminate waste and pollution, cycle products and resources, and rejuvenate nature in a circular economy. The butterfly diagram, which depicts the continual flow of materials in the economy, is a circular economy system diagram. The technological cycle and the biological cycle are the two main cycles. Products are retained in circulation in the economy through reuse, repair, remanufacture, and recycling in the technological cycle. Materials are thus kept in use and never go to waste. The nutrients from biodegradable materials are returned to the Earth through processes such as composting or anaerobic digestion in the biological cycle. This permits the land to regrow and resume the cycle (EMF 2017).

2.2 Value Chain and Competitive Advantage

The value chain was first developed by Michael Porter in 1985. For studying the sources of competitive advantage, a systematic approach to examining all of a firm's activities and how they interact is required. The value chain breaks down a company into its strategic operations in order to better understand cost behavior and existing and potential sources of differentiation. When a company does these strategically vital activities more cheaply or better than its competitors, it earns a competitive advantage (Porter 2001).

A company´s value chain is part of a bigger set of operations known as the value system. In a firm's value chain, suppliers have value chains (upstream value) that manufacture and deliver the acquired inputs. Suppliers can influence a company's performance in a variety of ways in addition to delivering a product. On their way to the buyer, many products pass via the value chains of channels (channel value). Additional operations that affect the buyer and influence the firm's own activities are performed via channels. A company's product eventually enters the value chain of its buyer. The role of a company and its product in the customer's value chain, which determines buyer needs, is the ultimate basis for differentiation. Understanding not only a firm's value chain but also how the business fits into the wider value system is critical to gaining and maintaining competitive advantage (Porter 2001).

Firms in the same industry have different value chains, reflecting their histories, strategies, and implementation effectiveness. One significant distinction is that a company's value chain may differ from that of its competitors in terms of competitive scope, potentially providing a competitive advantage (Porter 2001).

For this section, the value chain of Porter (1985) is used as a reference, but theory is collected from Weele (2018). Porter (1985) differentiates between five generic categories of primary activities and four categories of support activities:

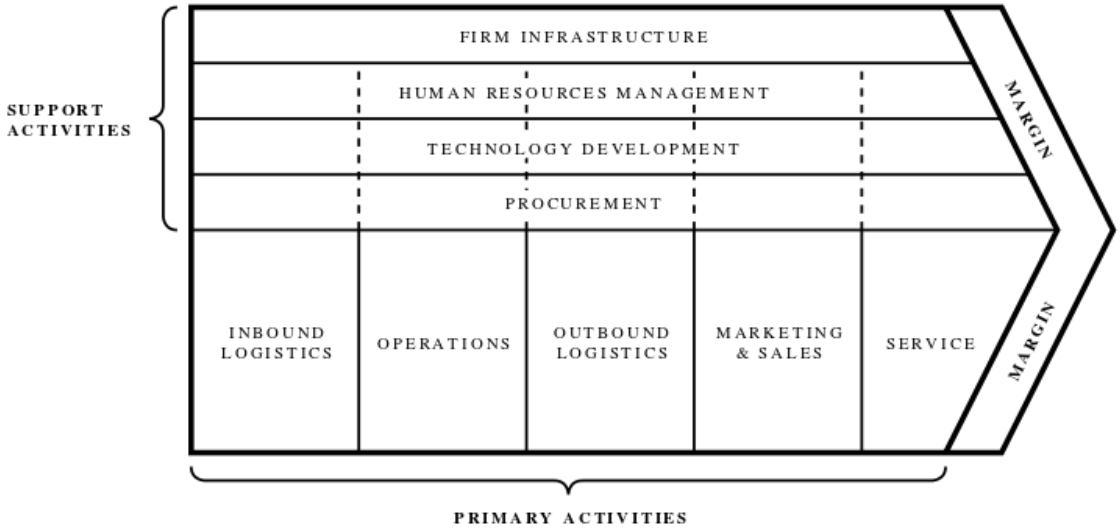

Figure 2.2: Porters Value Chain

2.2.1 Primary Activities

Inbound Logistics: Inbound transportation, incoming inspection, materials handling, storage, inventory control, and reverse logistics are all operations linked to receiving, storing, and distributing inputs to the manufacturing process.

Operations: Machining, assembly, packing, equipment maintenance, testing, printing, and facility operations are all activities related with transforming inputs into the final product.

Outbound Logistics: Finished goods warehousing, material handling, outbound transportation, order processing, and scheduling. These are all activities related with collecting, storing, and physically distributing the final product to clients.

Marketing and Sales: Advertising, promotion, sales and distribution channel selection.

Services: Installation, repair and maintenance, training, parts supply, and product adjustment are all services associated with delivering services to clients to enhance or preserve the value of the product.

2.2.2 Support Activities

Procurement: The function of purchasing inputs used in the value chain of a company. Raw materials, supplies, and other consumable commodities, as well as assets like machinery, laboratory equipment, office equipment, and buildings, are examples of these.

Technology development: In this sense, "technology" has a very broad interpretation, because every activity, in Porter's opinion, incorporates technology, whether it be know-how, procedures, or technology contained in processes, systems, or product designs. Most high-value activities rely on a technology that incorporates several sub-technologies from various scientific areas.

Human resource management (HRM): Encompasses all actions aimed at attracting, hiring, training, developing, and compensating all types of employees on the company's payroll.

Firm Infrastructure: These activities serve the entire organization. Infrastructure doesn't just support one or two key activities; it supports the entire set of business processes. Management, planning, finance, accounting, legal, government affairs, quality management, and facility management are just a few examples. The split of these activities among headquarters and business units is typically the subject of discussion in larger firms, which is why it changes so regularly (Weele 2018).

2.3 Stakeholder Theory

Stakeholder theory is unassailable in the sense that it asserts that businesses should pay attention to all of their stakeholders. Stakeholder theory is perfectly consistent with value maximization up to this point, which means that executives must be aware of all factors that may have an impact on the company (Jensen 2002). The stakeholder theory, however, is more than that. Any theory of action must instruct actors on how to select from a variety of competing and incompatible constituent interests. Customers want low prices, great quality, and expensive service, among other things. Employees demand high pay, good working conditions, and perks like vacations, medical benefits, and pensions. Capital providers seek little risk and great returns. High charitable contributions, social expenditures by businesses to benefit the community as a whole, secure employment, and increasing investment are all things that communities want. It's the same with every possible constituency. Clearly, any decision criterion - and the objective function is at the heart of any decision criterion - must explain how to make compromises between frequently conflicting and inconsistent objectives (Grant 2021).

The stakeholder approach to the firm is a view of the corporate enterprise as a coalition of interest groups, with senior management's responsibility being to balance these various—often conflicting—interests (Grant 2021). The stakeholders are vital to the success and survival of the corporation. They gain from the corporation's actions and operations because of their relationship with it, but also have the ability to violate their rights if not treated right. While the idea of a company acting in the best interests of all its stakeholders is appealing in theory, Grant argues that the stakeholder model has two major drawbacks in practice:

Performance evaluation. In theory, pursuing stakeholder interests entails maximizing the value provided for all parties involved. In practice, estimating the generation of such value is impossible. As a result, managing for stakeholders necessitates defining each stakeholder group's goals and determining compromises amongst them. According to Michael Jensen: “multiple objectives is no objective” (Jensen 2002).

Corporate governance is a term used to describe how and by whom a top management's performance can be evaluated if it is charged with pursuing and balancing the interests of various stakeholders. Does this mean that every stakeholder group must have a representative on the

board of directors? As a result of the consequent tensions, political bickering, and ambiguity surrounding performance objectives, senior management is likely to substitute its own interests for those of stakeholders (Grant 2021)

2.4 Business model Canvas

A business model describes how an organization creates, delivers and captures value. The following model, created by Osterwalder and Pigneur (2010), consists of nine basic building blocks that show the logic of how a company makes money. Customers, offering, infrastructure, and financial sustainability are the four fundamental components of a business covered by the nine blocks. The business model serves as a blueprint for implementing a strategy through organizational structures, processes, and systems.

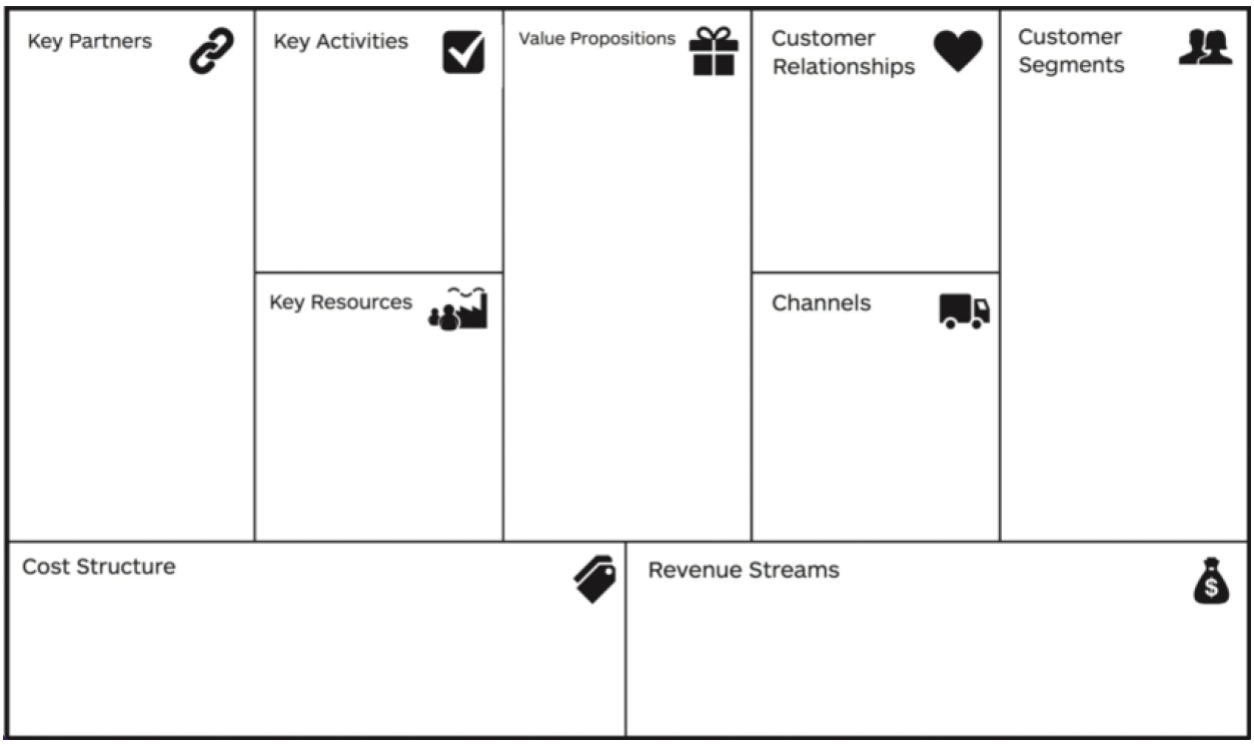

Figure 2.3: Business Model Canvas (Osterwalder and Pigneur 2010)

2.4.1 Customers

Specifies the various people or organizations that a company wishes to reach and serve. Customers are the lifeblood of any firm. No corporation can last long without (profitable) customers. A corporation may divide clients into various segments based on shared needs, behaviors, or other characteristics in order to better serve them. Several large or small customer segments may be defined by a company model. An organization must decide which segments it will serve and which sectors it will neglect. After that, a business model can be carefully created on a thorough grasp of unique customer requirements (Osterwalder and Pigneur 2010).

2.4.2 Value proposition

A collection of items and services that add value to a specific customer segment. Customers choose one company over another because of the value proposition. It resolves a customer issue or meets a customer requirement. Each value proposition is made up of a carefully selected set of products and/or services that are tailored to the needs of a certain customer segment. In this view, the value proposition is a collection of benefits that a firm provides to its customers.

Some value propositions are innovative, representing a novel or disruptive offering. Others may resemble existing market offerings, but provide additional features and traits (Osterwalder and Pigneur 2010)

2.4.3 Channels

Defines how a business connects with and reaches out to its customer segments to create a value proposition. A company's contact with clients is made up of communication, distribution, and sales channels. Customer touch points known as channels play a vital part in the customer experience.

Channels serve a variety of purposes, including:

- Raising client awareness of a company's products and services
- Assisting clients in determining the value proposition of a company
- Providing clients with the ability to acquire specific products and services
- Delivering a Value Proposition to customers
- Providing post-purchase customer support

(Osterwalder and Pigneur 2010)

2.4.4 Customer Relationships

Defines the types of customer interactions that a company develops with particular customer segments. Each customer segment should be defined in terms of the type of relationship the organization aims to develop. Relationships can range from personal to automated. The following motivations may influence customer relationships: Customer acquisition, customer retention, and revenue growth (upselling) (Osterwalder and Pigneur 2010).

2.4.5 Revenue Streams

Reflects the cash generated by each customer segment. Revenue streams are the arteries of a business model, if consumers are its heart. For what value is each customer segment actually willing to pay, a corporation must question itself. When that question is answered correctly, the company can produce one or more revenue streams from each customer segment. Different pricing techniques, such as fixed list prices, bargaining, auctioning, market dependent, volume dependent, or yield management, may be used for each revenue stream (Osterwalder and Pigneur 2010).

2.4.6 Key Resources

Identifies the most critical assets required for a business concept to succeed. Every company model necessitates the use of key resources. These resources enable a company to develop and deliver a value proposition, access new markets, retain connections with existing customers, and

generate money. Depending on the type of business model, different key resources are required. A microchip manufacturer needs high-capital production facilities, but a microchip designer is primarily concerned with human resources.

Physical, financial, intellectual, and human resources are all valuable resources. The corporation might own or lease critical resources, or purchase them from strategic partners (Osterwalder and Pigneur 2010).

2.4.7 Key Activities

Explains the most critical steps a firm must take to ensure that its business model is viable. A number of key activities are required by every business strategy. These are the most critical steps a business must follow to be successful. They, like key resources, are responsible for developing and delivering a value proposition, reaching out to new markets, maintaining customer relationships, and generating money. Key activities, like key resources, vary based on the type of company strategy. Software development for instance, is one of Microsoft's most important activities (Osterwalder and Pigneur 2010).

2.4.8 Key Partnership

Defines the supplier and partner network that allows the business model to function. Partnerships are becoming a cornerstone of many business strategies, and companies form them for a variety of reasons. Alliances are formed by businesses to improve their business models, decrease risk, or acquire resources.

According to Osterwalder and Pigneur (2010), we can distinguish between four different types of partnerships:

1. Strategic alliances between non-competitors
2. Coopetition: strategic partnerships between competitors
3. Joint ventures to develop new businesses
4. Buyer-supplier relationships to assure reliable supplies

2.4.9 Cost Structure

All costs related to running a business model. The most significant costs spent while operating under a specific business strategy are described in this building block. Costs are incurred when creating and delivering value, managing customer relationships, and earning money. After determining key resources, key activities, and key partnerships, such costs can be estimated pretty readily. However, some company models are more cost-focused than others. Low-cost airlines, for example, have structured their entire business strategies around low-cost structures (Osterwalder and Pigneur 2010)

2.5 Sustainable circular business model innovation

With non-renewable natural resources decreasing and getting more expensive, the dominant linear economic model is running out of gas. Given that a major share of non-renewable resources is depleting and natural resource price volatility is increasing, the necessity for a circular economy is obvious (EMF 2013).

2.5.1: What are the key elements of sustainable circular business model innovation?

With non-renewable natural resources depleting and getting more expensive, the dominant linear economic model is running out of gas. Given that a large share of non-renewable resources is depleting, and natural resource price volatility is increasing, the necessity for a circular economy is obvious (MacArthur 2013). The move to a circular economy is being accelerated by current trends such as rising consumption, new generations of consumers, urbanization and employment, tightening legislation, and technology advances (Antikainen and Valkokari 2016).

According to Antikainen and Valkorari (2016) we currently live in a non-sustainable "Take-Make-Waste" paradigm based on a linear economic model, which is causing several of the environmental issues and will eventually lead to a sustainability dead end as Earth's resources is limited and will be overloaded. The major challenge is to rethink how to maximize the value of products and materials in order to reduce natural resource use and have a beneficial societal and

environmental impact (Kraaijenhagen, Van Oppen et al. 2016). One of the most significant changes in a circular economy will be consumption and the role of consumers. As the concept of owning is replaced with buying access and performance, the interactions between consumers and items and services will shift dramatically. In other words, rather of paying for ownership, consumers will pay per use or a monthly subscription for access (Antikainen and Valkokari 2016).

The shift to service businesses can be considered as one of the main answers for speeding the circular economy since businesses may be enticed to manufacture products with a long service life, which are heavily used, and are also cost- and material-effective (Tukker and Tischner 2006)

2.5.1 Current understanding of a circular business model

A business model represents the rationale of how an organization creates, delivers, and captures value. Business model innovation is a new approach of creating, delivering, and capturing value that is achieved by altering one or more business model components (Osterwalder and Pigneur 2010). To address present difficulties and move towards a circular economy paradigm, innovative ideas and disruptive business models are clearly required (Boons, Montalvo et al. 2013).

Rather than focusing solely on generating economic value, the literature on sustainable business model innovation focuses on generating value for a broader variety of stakeholders, taking into account societal and environmental benefits. In order to speed the development of sustainable business models in both reality and theory, the archetypes of sustainable business models have been identified and designated. The archetypes are:

- Maximize material and energy efficiency
- Create value from waste
- Substitute with renewables and natural processes
- Deliver functionality rather than ownership
- Adopt a stewardship role

- Encourage sufficiency
- Re-purpose the business for society/environment
- Develop scaleup solutions

(Bocken, Short et al. 2014)

Collaboration with local non-governmental organizations to increase integration into the community and awareness of the local culture, for example, is emphasized in order to understand how sustainable business models produce value for a broader range of stakeholders (Stubbs and Cocklin 2008).

Sustainable and circular business models are literature streams that are closely connected and can be considered a subcategory of business models. A circular business model can be defined as the rationale of how an organization creates, delivers, and captures value with and within closed material loops (Mentink 2014). The notion is that a circular business model does not have to close material loops inside its internal system boundaries to be considered "circular," but can be part of a system of business models that close a material loop together. By their very nature, circular business model innovations are networked: they necessitate collaboration, communication, and coordination among complex networks of interdependent but independent actors/stakeholders. Finding the "win-win-win" scenario while re-designing corporate ecosystems is a challenge, because engaged actors' self-interests are balanced, influencing and facilitating their behaviors in order to cooperatively develop the circular business model. However, due to physical and practical constraints, neither 100 percent circular nor 100 percent linear business models exist in reality (Antikainen and Valkokari 2016).

2.5.2 Current tools and methods for circular economy business modelling and challenges

The business model has been widely considered as an important unit of analysis in innovation studies throughout the previous decade. The academic literature contains overviews of the most essential methodologies and tools for general business model innovation (Antikainen and Valkokari 2016). The design of a new business model or its re-configuration are both examples of business model innovation (Massa, Tucci et al. 2017). Academics and practitioners have

advocated a variety of strategies and approaches to help businesses innovate their business models. The business model canvas is the most well-known tool for describing business models. It is a generic and easy-to-use tool that has been used in a variety of industries (Osterwalder and Pigneur 2010).

Christophe Sempels built a sustainable business canvas based on the business model canvas, which extends to ten aspects to the original canvas (Sempels 2014). He includes perspectives on organizational effectiveness and efficiency, positive and negative externalities, and productivity factors in his canvas. Bas Mentink undertook a thorough examination of existing business modeling tools and their applicability to the development of circular business models (Mentink 2014). Based on his findings, he offers the business cycle canvas, which highlights the significance of comprehending the loop's circularity. The necessity of having an integrated business model for the entire supply chain is included in this loop, as are the roles of suppliers and stakeholders. This strategy necessitates a knowledge of each actor's motivations and how value is co-created for them.

The value mapping tool developed by Bocken and colleagues incorporates the multiple-stakeholder value viewpoint, introducing three types of value (value captured, destroyed, and missed) as well as value opportunities for major stakeholder groups (environment, society, customer, and network actors). One of the key advantages of their tool is that it raises awareness of the possibility for unintended consequences for external stakeholders, as well as suggesting alternative solutions that might enable better alignment of stakeholder interests (Bocken, Rana et al. 2015).

In addition, the play-it-forward tool (Dewulf 2010) is derived from the business model canvas, adding the building blocks for a triple bottom line, which involves considering sustainability viewpoints, in other words, integrating environmental, business, and societal perspectives

2.5.3 The framework for Sustainable Circular Business Model Innovation

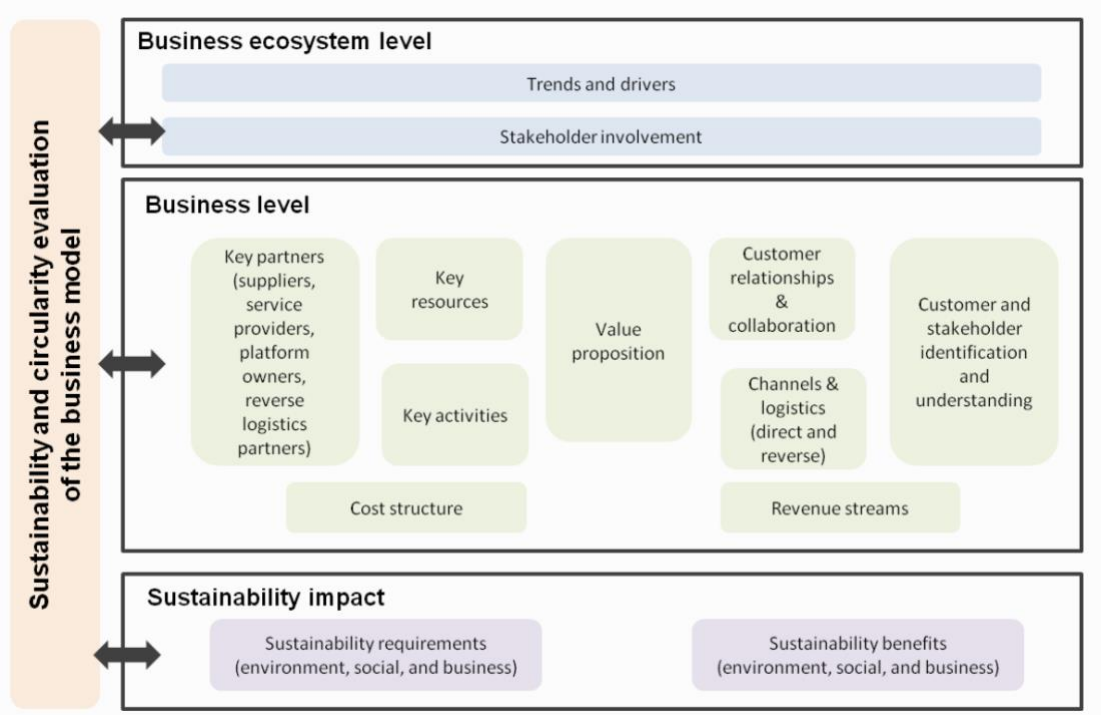

Figure 2.4: Sustainability and Circularity Evaluation of the Business Model (Antikainen and Valkokari 2016)

Antikainen and Valkokari (2016) have built their framework upon the ideas and the structure of a business model canvas, studies on circular economy and sustainability, and other tools. The goal is to create a general paradigm for business model innovation that can be used to help companies design and re-configure their business models.

Because the entire business ecosystem is shifting and the circular economy requires systematic innovation, a multilevel analysis is necessary. Changes to sustainable and circular business models should take into account macro (global trends and drivers), meso (ecosystem and value co-creation), and micro (companies, customers, and consumers) factors (Antikainen and Valkokari 2016). New legislation, for example, could have a big impact on the business strategy. The influence of the business model is split into costs and benefits for long-term sustainability, giving it a triple bottom line perspective.

The framework incorporates the concept of continual iteration, as well as the examination of the business model's sustainability and circularity. These elements are required to obtain true information about the business model's long-term viability, as well as to optimize and comprehend the dynamics of the operations.

A change in one supply chain link can have a significant impact on the entire business. The element of this evaluation that deals with sustainability can be done using the growing literature of lifecycle-assessment methods. The circularity viewpoint emphasizes on model visualization to comprehend the required players, linkages, cycle stages, and material and information flows (Antikainen and Valkokari 2016).

2.6 Marine Plastic Litter and Pollution

According to United Nations Environment Program (UNEP), *"Marine litter consists of items that have been made or used by people and deliberately discarded into the sea or rivers or on beaches; brought indirectly to the sea with rivers, sewage, storm water or winds; or accidentally lost, including material lost at sea in bad weather"* (UNEP 2022).

2.6.1 Ghost fishing

Fishing gear that is lost and left on the seabed contributes to littering and can continue fishing for a long time. This results in a hidden mortality of fish and shellfish and is called *ghost fishing*. Fishing gear is lost at sea for a number of different reasons. Passive fishing gear, such as nets, gillnets, pots and lines, are connected to the sea surface with a rope and often a floating object , called fishing buoy (Directorate of Fisheries 2020).

The surface watch/ fishing buoy can disappear below the sea surface, for example, if the gear is transported out into deeper water with the current, if the gear slides off an edge on the seabed, or due to changes in low tide and high tide. The rope that connects the gear and the buoy can be broken due to wear and tear, excessive load, or if knots in the gear comes loose. Ship traffic can also pose a risk to propellers, if ropes are cut or dragged with the gear in deeper water (Directorate of Fisheries 2020).

When the fishing buoy disappears or the rope to the gear breaks, the fisherman loses the connection to the gear, and it can be difficult to get the gear back up. Lost gear without a stated position lying on the bottom, also poses a danger that new gear is hooked into these and can thus also be lost. It is therefore important to report the loss of fishing gear and conduct gear cleaning (Directorate of Fisheries 2020).

2.6.2 Microplastics – a threat to ocean carbon sequestration?

The issue of global climate change has gotten a lot of press around the world. The ocean is the world's largest active carbon pool, and it has a significant impact on global climate change. However, due to the massive consumption and mishandling of global plastics, marine plastic pollution is becoming increasingly significant. The influence of marine plastics on the ecology that controls CO2 exchange and circulation in the ocean could result in increased greenhouse gas emissions. The question is whether (micro)plastic pollution in the oceans will interfere with ocean carbon sequestration (OCS). Four scientific evidences are presented to demonstrate the possible impact of microplastics on OCS (Shen, Ye et al. 2020):

1) Affect phytoplankton photosynthesis and growth

2) Have toxic effects on zooplankton and affect their development and reproduction

3) Affect marine biological pump

4) Affect ocean carbon stock

Microplastics, for starters, can interfere with phytoplankton photosynthesis and growth. Phytoplankton, despite its modest size, plays a critical function in marine ecosystems. Phytoplankton is the ocean's principal producer, and it may use CO2 absorbed from the atmosphere or the sea to make organic matter and oxygen through photosynthesis. Approximately 80% of the world's total oxygen generation comes from marine primary production. As a result, scientists are eager to learn more about phytoplankton, which plays a vital function in the OCS (Witman 2017)**.** However, the widespread presence of microplastics in the water has a negative impact on phytoplankton growth, resulting in a change in phytoplankton community and so jeopardizing the marine ecosystem's stability.

Secondly, microplastic are hazardous to zooplankton, affecting their development and reproduction. Zooplankton is the first and most important phytoplankton consumer. They are vital in the regeneration of marine nutrients, the cycling of biogenic components, the transfer of mass, energy, and genetic information through the food chain/web, and the degradation of pollutants. If zooplankton is not involved in the OCS processes, the carbon sequestered will quickly re-join the water and atmosphere.

Thirdly, microplastics may have an impact on the biological pump in the ocean. Biological pump and microbial carbon pump are the main ways for ocean to sequestrate CO2. The former refers to the process through which phytoplankton converts inorganic carbon into particulate organic carbon (POC) through photosynthesis, self-deposition, and zooplankton feeding, with POC eventually reaching the deep oceans. Through the action of bacteria, the latter turns active dissolved organic carbon into recalcitrant dissolved organic carbon, extending the residence period in oceans. Carbon can be transported to the deep oceans via fecal pellets when phytoplankton is consumed by zooplankton. These fecal pellets sink to the ocean floor, where they eventually become buried in the mud.

Lastly, microplastics on the ocean floor may have an impact on the carbon supply of the ocean. The ocean's surface is not the last destination for plastics. Plastic garbage created on land accounts for only 1% of the plastic waste produced on the ocean surface. The sinking ability of plastic are linked with biofouling and density. Biofilms on microplastics can alter their buoyancy and viscosity in saltwater, reducing their flotation kinetics and hydrophobicity and causing them to sink to the ocean's depths. It may have an impact on the circulation of organic materials and nutrients in deep water, influencing the ocean's carbon supply.

Overall, the four scientific evidences above suggest that the presence of microplastics has a significant impact on ocean carbon sequestration. As global plastic manufacturing rises, the ocean, as an open habitat, will be subjected to greater white pollution. The influence of marine microplastics on the OCS is a relatively recent research issue. Many of the conclusions are still theoretical, and there isn't enough evidence to back them up. As a result, marine carbon sinks are crucial to the global climate, and the potential influence of microplastic pollution on

phytoplankton-sequestered CO2 and its delivery to the deep ocean via zooplankton should be a big worry (Shen, Ye et al. 2020)

2.7 Extended Producer Responsibility (EPR)

Extended Producer Responsibility is a concept that states that product manufacturers and importers should bear a significant amount of responsibility for the environmental impacts of their products throughout the product life cycle, including upstream impacts from material selection, downstream impacts from the manufacturing process, and upstream impacts from product use and disposal. Producers assume responsibility for environmental impacts that cannot be avoided by design, by creating their products to minimize life-cycle environmental impacts (OECD 2022).

Recycling has a number of advantages over alternative trash disposal methods. It lowers production costs, lowers demand for landfill-related facilities, saves energy and natural resources, and potentially creates jobs (Nahman 2010). Despite its advantages, the recycling industry has been unable to produce the anticipated results. Barriers to the creation of a viable recycling sector include a lack of incentives for stakeholders, a lack of information, and technical limits (Nahman 2010).

2.7.1 Why EPR?

There is a growing recognition that traditional environmental policies that focus on manufacturing processes may not be sufficient to preserve human health and the environment. While industrial and energy production continue to be significant sources of pollution and waste, post-consumer wastes have become increasingly important during the last two decades. Many regulations and programs have been implemented to address the growing waste problem, but they have not been enough to offset the demand for new landfills and incinerators. At the same time, in many OECD countries, opposition to new landfills or incinerators is growing (OECD 2001).

Both the treatment of products in their post-consumer phase and addressing the upstream activities in the selection of materials and in the design of a product are major implications and modifications linked with EPR. Under these circumstances, it is believed that proper signals can be conveyed to the producer to internalize a significant percentage of the environmental externalities from the product's final disposal. EPR can contribute in the promotion of OECD nations' common environmental goals, such as waste prevention and reduction, higher use of recycled materials in manufacturing, and increased resource efficiency.

The Polluter-Pays Principle (PPP) has been proposed as a way to ensure that polluters bear the costs of the environmental impacts they cause, rather than society as a whole. It has long been claimed that policy action should occur as close to the point of externality as possible. In recent years, however, efforts like EPR have expanded the definition of "polluter" to include those in the product chain, such as manufacturers of items with environmental implications. As a result, accountability is shared. Whether EPR is cost-effective or not is determined by whether such measures produce greater and more appropriate incentives to minimize the externality than alternative solutions. Administrative expenses of policy execution, post-consumption sorting costs, and product market structure will all play a part in determining whether EPR is more or less effective and efficient than other instruments (OECD 2001) .

2.7.2 The Objective

The OECD project on EPR looks at solutions to reduce municipal waste streams by lowering or eliminating traditional local-government subsidies and transferring major or total financial responsibility for product management to private sector firms, including at the post-consumer phase (OECD 2001).

2.8 Regulations for Marine Plastic Litter

The Marine Resources Act

- The provisions in § 17 on loss of gear ("Anyone who loses or has to cut gear has a duty to look for the gear.", Cf. the first paragraph)
- The provisions of § 28 on "Prohibition against leaving objects in the sea" ("It is prohibited to throw, or unnecessarily leave travel gear, moorings and other objects in the sea or on the bottom that may damage marine life, hinder the conduct of harvesting, damage to hauling vessels or put vessels in danger. », cf. the first paragraph).

The Pollution Control Act

- § 1. (purpose of the Act)

  The purpose of this law is to protect the external environment from pollution and to reduce existing pollution, to reduce the amount of waste and to promote better treatment of waste.

  The law shall ensure a sound environmental quality, so that pollution and waste do not lead to health damage, harm well-being or damage nature's ability to produce and self-renew.

- § 8. (restrictions on the duty to avoid pollution)

Common pollution from

1) fishing, agriculture and forestry, etc.,

2) homes, holiday homes, offices, business or meeting rooms, schools, hotels and warehouses, etc.

3) temporary construction activities,

is permitted under this Act to the extent that no special regulations have been issued pursuant to section 9.

CHAPTER 3: Methodology

A variety of methods are used to accomplish the project's goals, including studying some of the available literature on the subject, analysing current legislation and regulations, and lastly conducting semi-structured interviews. Qualitative methods in the form of interviews with key stakeholders are used to acquire a more personalized view from the selected companies, allowing for a deeper understanding of plastic waste management, disposal and circular view.

The approach and research methods will be described in the following chapter. Knowing which research methodology is most appropriate for the research purpose and questions is crucial (Walle 2015). As a result, different research methods are applicable for various research problems (McCusker and Gunaydin 2015).

3.1 Research Design

According to Weiss (1995), when deciding which qualitative research methodologies to use, the main advantage of interviewing is the depth of information acquired from the interviewee. While the verbal aspect of the interview sessions remains important, various social cues – such as the interviewee´s voice, intonation, body language, and so on – can provide the interviewer with a wealth of additional supplementary insights that can later be summarized to reveal useful recommendations.

There is an underlying, if not explicit, research strategy in every sort of empirical research. The design is the logical sequence that connects empirical data to a study's initial research questions and, eventually, to its discussion in the most basic sense. Another approach to conceive of a research design is as a "blueprint" for your study, addressing at least four issues: what topics to investigate, what data to collect, what data are relevant, and how to analyse the results (Philliber, Schwab et al. 1980).

Case studies can be classified as exploratory, explanatory, or descriptive, according to Yin (1994). There can be single-case or multiple-case applications in all of the following types of

case studies. The ability to incorporate a variety of evidence sources is a significant advantage of case study data collection (Yin 2009). In case of this particular study, an exploratory approach

seems best because the research questions only focuses on “what” questions, and an exploratory study can be justified by asking these kinds of questions (Yin 2009).

3.2 Qualitative Research

Qualitative research is a type of research that focuses on words rather than numbers while collecting and analysing data (Bryman 2016). It is an inductivist research strategy; the categories and topics were constructed from the ground up by organizing the data into progressively abstract information units (Creswell and Creswell 2017). Inductive methods entail switching back and forth between themes and databases until the researcher(s) has come up with a comprehensive set of themes. The data is then analysed deductively according to the defined themes to see whether more evidence can be found to support each topic or if more information is required. As a result, the process begins inductively, but deductive reasoning becomes increasingly important as the study progresses. In other words, data analysis and data gathering occur simultaneously, and the process is iterative (Creswell and Creswell 2017).

3.3 Data Collection

Data collection is about gathering data so that the research question can be answered. Setting the study's boundaries, gathering information through unstructured or semi-structured observations and interviews, documents, and visual materials, and defining the technique for capturing information are all steps in the data collection process (Creswell and Creswell 2017).

There is six primary sources of evidence for case study research (Yin 1994):

- Documentation
- Archival records
- Interviews
- Direct observation
- Participant observation
- Physical artifacts

Documentation and interviews has been the primary sources of information for this study. Two interviews were conducted via Microsoft Teams and were recorded for further study, and one interview was an in-person interview. All interviews were manually transcribed, allowing for more extensive extraction of significant material.

Table 3.1: List of qualitative data collection sources. Adapted from Creswell and Creswell (2017)

	Primary Data	Secondary Data
	Interviews	**Documents**
Method	One-on-one recorded interviews on Microsoft Teams. Face-to-face interview	- Analysis of organizational documents - Analysis of public documents
Data Source	Interviewees	Articles, books, reports, journals and research papers

3.3.1 Gathering Primary Data

Interviews are a common method of gaining access to people's experiences, inner perceptions, attitudes, and thoughts about reality. Interviews that are semi-structured are more adaptable. An interview guide is normally prepared, including both closed-ended and open-ended questions, although the interviewer has some flexibility during the interview to change the order of the

questions to be asked and to add questions based on the context of the participant's responses (Zhang and Wildemuth 2009).

Interviews have both strengths and weaknesses. The strengths is that it is targeted and insightful, meaning it concentrates on the case study topic and provides perceived causal inference. Weaknesses are linked with bias due to poor questions, response bias, incomplete recollection and reflexivity, which is when the interviewee expresses what the interviewer wants to hear (Tellis 1997). In terms of the data collection for this thesis, semi-structured interviews were the best option. An interview guide was prepared in advance, and the respondent would naturally, after discussing different subjects back and forth, answer more and wider than expected.

The informants can freely respond to questions asked in an unstructured interview, also known as an in-depth interview. Furthermore, both the interviewer and the interviewee have a great deal of flexibility and freedom during the process (Walle, 2015). Structured interviews, on the other hand, are frequently compared to surveys. They're more formal, with a thorough script and a desire for more exact facts. In addition, the subjects are allowed far less flexibility in their responses (Walle, 2015).

Semi-structured interviews are conversational, just like unstructured interviews, and the interviewer is more likely to lead the topic in the desired direction (Walle, 2015). An interview guide is a set of questions or themes that the researcher will cover. As the interviewer picks up the respondents' answers, he or she may ask questions not listed in the interview guide (Bryman, 2016). As a result, unlike an unstructured interview, the interview flow is more controlled. All of the same questions will be asked, with similar wording, from subject to subject (Bryman, 2016). 45-60 minute long interview sessions with a clearly defined set of questions was created after a careful examination of the gathered secondary data. Each participant received the same formal approach. For ensuring a natural flow of dialogue, more freedom and flexibility were made available.

3.3.2 Gathering secondary data

A literature review connects a research project to an existing research stream (Walle, 2015). A careful review of documentation involving research papers, articles, and journals relating to the research questions was undertaken in order to acquire appropriate secondary data for creating the theoretical framework and to gain a sharp grasp of the research problem.

In addition, a literature review also includes a variety of documents. It is inconspicuous, specific, and broad; documents can be studied multiple times. When doing case study research, documents, according to Yin (2014), play an explicit role in data collecting. Systematic searches for relevant documents are essential in any data collecting effort. It is crucial to examine documents attentively since they may contain skewed selectivity, have limited reporting value, or be difficult to locate and access (Yin, 2014).

The amount of existing literature about sustainable business models is plentiful, whereas there is limited research on the effects of implementing EPR, and especially in the recycled fishing gear value chain. Therefore, the unstructured interviews were of significant importance when collecting as much data as possible.

3.4 Analysis of the Data

Qualitative validity means that the researcher uses certain techniques to assess the accuracy of the findings, whereas qualitative reliability means that the researcher's approach is consistent across multiple studies and projects (Gibbs 2018).

For this study, the first goal of designing a semi-structured interview was to find answers to what roles are played by different actors in the recycled fishing gear value chain. Secondly, to get answers about the business opportunities and challenges for the use of recycled fishing gear, and how the implementation of EPR schemes affects these.

3.4.1 Validity

Validity is one of qualitative research's strengths, and it involves establishing whether the findings are valid from the perspective of the researcher, the participant, or the account's readers. In qualitative literature, terms like trustworthiness, authenticity and credibility is used (Creswell and Miller 2000). Case studies have been criticized for collecting data based on subjective assessments, which has been shown to have an impact on the study's construct validity (Yin, 2014). As a result, numerous sources of evidence were used in this study to solve this challenge.

To ensure the validity of this research project, multiple strategies was used. Creswell and Creswell (2017) advocates different strategies, and the procedural perspective recommended is to discuss more than one strategy to check the accuracy of the findings. Triangulation of data is an employed strategy to ensure internal validity, meaning that data has been collected through multiple sources.

3.4.2 Reliability

In its most basic form, reliability refers to the consistency with which an experiment, test, or other measuring method produces consistent results across time. Every measurement of a phenomenon contains some chance error. While the objective of error-free measurement is admirable, it has never been achieved in any field of science (Carmines and Zeller 1979).

The correctness of the information processed is also a concern of reliability. During the interviews, notes were taken and, with consent by the interviewees, recorded for subsequent review. Following a review for the interviewee's privacy, the recorded interviews were transcribed and erased. The notes taken along the way also helped to construct follow-up question for the interviewees. Transcriptions was also thoroughly examined for errors that could lead to obvious mistakes, as is recommended as a reliability procedure by (Gibbs 2007).

It is worth mentioning that the data's trustworthiness may have been harmed by the fact that quotations from the interviewees were translated from Norwegian to English. The translation was critical in ensuring that the quotes made sense to the audience.

CHAPTER 4: Findings

This chapter introduces the main findings of this study. Findings are organized into six main parts. First, a presentation of respondents, and then an overview of other relevant actors who has been mentioned in interviews or found through secondary data. The following is a review of the key roles in the recycled fishing gear value chain. The fourth part presents the stakeholder relationships and value creation. Answers about the recycled fishing gear and the business opportunities and challenges is reviewed in part five. Lastly, findings about EPR implementation is presented in part six.

4.1 Presentation of the respondents

Table 4.1 shows the firms and interviewee positions.

Table 4.1

Firm	Type of firm	Position of Interviewee
Firm 1	Manufacturer and importer of fishing gear	Strategy and business development manager
Firm 2	Reception and logistics of waste	Top management
Firm 3	Recycling Facility	Laboratory Manager

4.2 Presentation of relevant actors

In addition to the firms we interviewed, we collected secondary information from other key actors in the industry. Table 4.2 shows the firms and the business functions.

Table 4.2

Firm	Type of firm
Firm 4	Fishing vessel
Firm 5	Fish farming company
Firm 6	Logistics and container company
Firm 7	Manufacturer with injection molding and further processing of all types of thermoplastics.
Firm 8	Cement manufacturer

4.3 Key roles in the recycled fishing gear value chain

This figure shows the key roles in the recycled fishing gear value chain, starting from the producer/manufacturer of new fishing gear, to the end consumers of plastic waste.

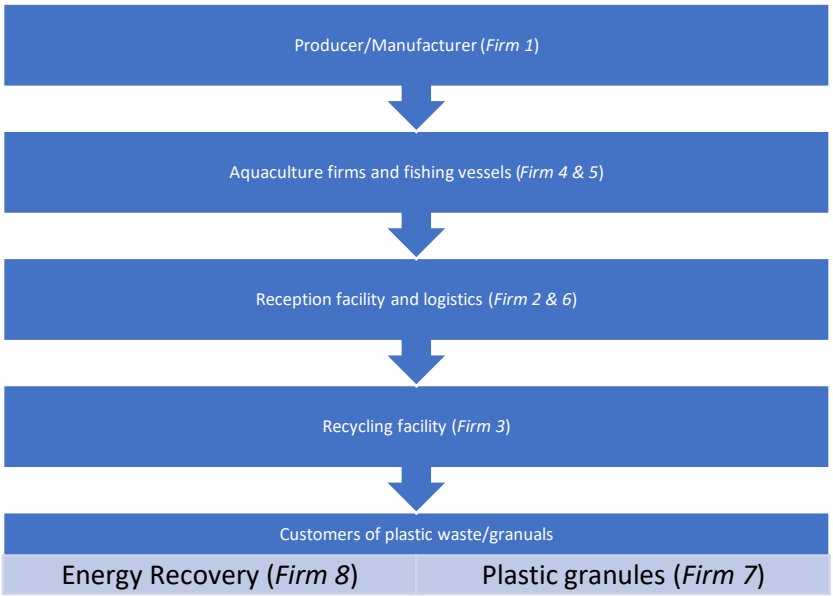

Figure 4.1: Key roles in the recycled fishing gear value chain

4.3.1 Producer/Manufacturer

The first important actor in the value chain of recyclable fishing gear is the producer/manufacturer, which is called *Firm 1*. It is an international company with different departments on several continents where they produce different types of gear and components for international partners. This equipment largely consists of different types of ropes in different sizes and lengths, depending on its purpose. *Firm 1* produces much of this rope themselves, which they further use to make bigger gear such as trawl nets, purse seines and fishing nets. The equipment is made according to the desired specifications from the customers (*Firm 4 & 5*) and delivered either to where the boats are located or they arrive at the manufacturer's facility and take them offshore.

4.3.2 Fishing vessels/Fish farms

In a typical fishing vessel *(Firm 4)* that operates with trawls, they use the equipment throughout the year, divided into two crew changes. Some of the larger vessels use two trawls at the same time when fishing and in addition have two extra pieces on board, in case something happens and they have to repair them. These trawl nets can typically last up to 2-3 years if maintenance is done along the way. A trawl net is pulled along the seabed and therefore has a large wear and tear, and must be replaced more often than a purse seine. A vessel that operates with purse seine fishes less days and is much less worn out by the fishing. The purse seine is used to fish species in larger shoals, often higher up to the sea level. If a purse seine is stored dry and without direct contact with sun and weather, it can last for several years compared to the trawl nets.

The equipment that may be replaced the most is fishing nets. On the biggest vessels, a net is often used only one season before it must be replaced. It is important to point out that not all parts of the gear are replaced; a net consists of a floating rope at the top and a sinking rope at the bottom, which makes the net stand vertically in the sea. Only the net itself between these ropes is changed annually, while the rope can be used for many years.

Another type of waste that has increased in recent years due to growth in the industry, is fish farms. Such farms are used in large numbers in several places along the entire Norwegian coast.

These farms are largely made of different types of plastic, both the net itself but also the rest of the facility with walkways are made of plastic. These farming nets are often bought for a certain amount, and it is common for companies to make an agreement on maintenance and washing of the equipment. The net can last from 2 years to 7-8 years depending on the type of net, maintenance, weather conditions and how exposed they are to ocean currents. In the past, it was more common for the net to be treated with copper to prevent kelp and growth. This proved to be harmful to the surrounding environment and is therefore a solution that is coming to an end.

4.3.3 Port Reception Facility

When the fishing vessels have worn out the fishing gear and want to get rid of it, they can deliver it to a waste reception. There are both government waste reception centers in addition to private reception centers, such as *Firm 2* that have been interviewed for this thesis. The people at such facilities have a high level of knowledge of various products and material qualities that are used in the industry. This knowledge is important for the work they do with disassembly and sorting of the various types so that a recycling plant receives good raw materials.

4.3.4 Recycling Facility

The waste is transported to a facility that has the facilities to process the specific gear. There are machines, production lines and different uses for the different types of waste that is delivered. Some types of plastic can easily be melted into granules immediately, while some must be added various additives before it becomes usable. The last resort is that the waste goes to energy recovery and is used for different processes depending on what is needed in the area around the plant. There is also some waste that does not have a suitable solution today and is therefore only stored in a landfill until a current production line can process it. Such storage takes up a lot of space and *Firm 3* has therefore used large areas to operate recycling solutions. They have a future plan to expand a new production line every two years due to high investment costs.

4.3.5 Recycled Plastic Customers and Energy Recovery

The materials that becomes granules is transferred to different manufacturers (*Firm 7)* to become new products. There are many different qualities of this granulate based on the waste used and the quality the customer wants for their production. *Firm 3´*s goal is to be able to deliver granules in the same quality as the ordinary raw material. While the focus on recycling and circular economy is growing, the probability of increased demand for recycled plastic is high. Not only is it better from an environmental point of view, but the companies that do use more recycled products will be able to market themselves as greener and more sustainable.

Unrecyclable waste is transferred to energy-recovery, which can be used in other industries. For example, in cement production (*Firm 8*), which is an energy-intensive process, marine waste from *Firm 3* is used. In addition, the waste is also used for district heating, which is an energy-flexible and water-borne system that utilizes renewable surplus energy, preferably from local resources such as biofuels, waste and waste heat from industry. This ensures the reuse of raw materials that would otherwise be wasted, which will be important to ensure the transition to a more circular economy and reduction of greenhouse gas emissions. The use of district heating also relieves the electricity grid and has for many years helped to phase out fossil energy use in construction and industry.

4.4 Stakeholder Relationships and Value Creation

Stakeholder relationships in the circular economy business occurred at two levels (Tapaninaho and Heikkinen 2022):

1) Create a conducive environment for circular economy
2) Circular economy business implementation

Within these two levels, we could break them down to five activities. These activities were knowledge sharing concerning circular economy, influence political decisions, develop the industry, create viable ecosystems and develop circular business models. In addition, six critical points for value creation was identified: Political, economic, sustainability, ecological, safety and control, and social.

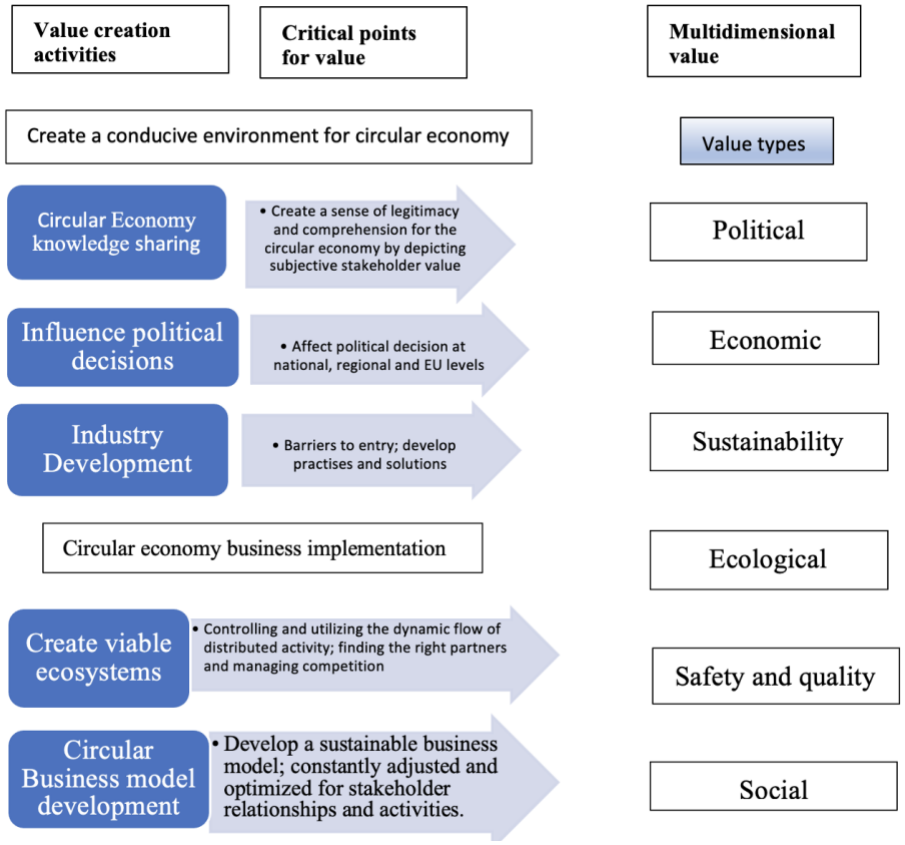

Figure 4.2: Stakeholder relationship for value creation in a circular economy. Adapted from (Tapaninaho and Heikkinen 2022)

4.4.1 Create a conducive environment for circular economy

Circular economy knowledge sharing, which refers to articulating the viability of circular economy opportunities, was critical in establishing favorable conditions for this subject in society.

Influence political decisions refers to active participation in national, regional, and local political decision-making processes in order to guarantee that regulatory conditions and political goals encourage circular economy.

By *industry development*, we mean that updating institutionalized practices, such as public procurement, is required. This is because procurement often prioritizes economic benefits over

sustainability and a circular economy. Additionally, for value creation, developing industry strategies and solutions to generate enticing marketplaces is vital. Starting a circular economy company takes time and money, which makes it difficult for some stakeholders to participate. Innovative actors can enter the market as partners and clients, as the industry and new circular economy solutions develop. In contrast, if the industry and market remain underdeveloped, value creation potential will be lost, technologies will stagnate, and circular economy-based products and materials would struggle to maintain a stable status and steady demand (Tapaninaho and Heikkinen 2022).

4.4.2 Circular economy business implementation

Create viable ecosystem. Local circular economy ecosystems were thought to be essential for putting circular economy business operations in place. Their development necessitated strong collaboration with city and regional leaders, as well as customers and partners. To establish a suitable scale for profitable operations, for instance, creating a waste ecosystem requires the collaboration of numerous regional and local players.

Circular Business model development. Aligning the business model with the circular economy ecosystem and emphasizing the importance of stakeholder relationships and cooperative value creation activities, are essential for value creation. Companies will not be able to combine sustainability and profitability goals, or create value for stakeholders and sustainability, without an optimal business model.

4.4.3 Multidimensional Value

Political value. Politics and the circular economy industry are linked by political value. Relationships between national and regional decision-makers and industry organizations were highlighted as having political value. It is important to mention that political value is dependent on future government program changes, and that it would not exist if circular economy is no longer on the political agenda. *Circular economy knowledge sharing, influence political decisions* and *create viable ecosystems* has a great deal of promise for assisting in the creation of political value.

Economic value. The profitability of circular economy businesses, new business opportunities, and the operation of the circular economy ecosystem are all linked to economic value. Moreover, market development, potential customers and partners, collaboration with national and regional stakeholders all have some sort of economic value.

Sustainability value. This type was created when societal-level sustainability goals was being addressed. While environmental, social, and economic factors all play a role in sustainability, it was emphasized here as a holistic value linked to societal sustainability goals, instead of optimizing one or more dimensions (Tapaninaho and Heikkinen 2022).

Ecological Value. Natural environmental benefits. The responsibility is to take care of and protect the environment. Reduce microplastic in the ocean, which is a threat to ocean sequestration, and the reduction of ghost fishing would most certainty have a positive ecological impact.

Safety and quality value. The activities at the operating environment level have the closest connection to safety and quality value. Stabilization of the waste-based circular economy industry necessitated major industrial development and political decision-making assistance. Knowledge sharing about circular economy have a strong potential of making a significant impact on this type of value.

Social value. The enhancement of people's current and future well-being is related to social value (Tapaninaho and Heikkinen 2022).

4.5 Recycled fishing gear

4.5.1 Design

Design for recycling shows that the manufacturer's responsibility is also about the recyclability of the packaging and the products that are sent out to the market. As stated by firm 2: *"If it is designed to be recycled, it is very simple".* If used packaging and goods are to become resources, manufacturers must, with their purchasing and design, make the circularity simple and logical for the rest of the recycling chain. The dialogue with the producers becomes important. It is challenging to identify the many thousands of different plastic qualities that are available without

marking. Instead of ten different types of plastic, you may be able to manage with five, and mark these so that they can be identified. *Firm 2*, which deals with the reception and transport of used fishing gear and various other waste, wanted more focus on the products having fewer types of plastic, with labelling and perhaps color codes.

4.5.2 Material Recycling

Material recycling is the most common way to recycle plastic today. In this process, the plastic is grinded and washed, heated, filtered and formed into pellets, which in turn are used to produce new plastic products. According to *Firm 1*: *"Much of the rope that has been recycled and granulated goes back into the production of walkways for fish farms".* During this process, the plastic loses quality every time it is recycled. The process can be repeated up to ten times before the quality makes the plastic not suitable for further recycling. Some plastic products are not suitable for material recycling, such as contaminated plastic and old plastic that are found in nature. In short: Plastics that are not pure plastics without contaminants are difficult to recycle materially.

4.5.3 Additives

Firm 3 is, according to them, perhaps the first facility in Norway to use additives in plastic recycling. They further say that: "*Additives can give just the right quality of the plastic even if it has been used before".* This is a solution where you add different substances to the plastic to give it different properties based on the quality it has and the customer's needs. For example, if the customer needs superior long-term thermal stability and durability, antioxidants can be added. Process stabilizers provide improved machinability in demanding applications with polymers designed for improved strength and durability. For the plastic to maintain its properties during prolonged outdoor exposure, light stabilizers can be added. The ability to simulate all relevant plastic applications in the laboratory is a big step in the right direction that will provide great opportunities in plastic recycling.

4.5.4 Reuse/repair and buy-back solution

Reuse means that things that have become redundant, outdated or unnecessary are reused or reshaped instead of discarded. This is in contrast to recycling, which means that things are picked apart into raw materials and reassembled or melted down into a new product (Rosvold 2021).

Some types of fishing gear are bigger investments than others and can be beneficial to repair instead of discarded. *Firm 1* says: *"We receive the purse seines and repairs them, then we write down where we have replaced a segment for information purposes. Our goal is to do the same with purse seine as with trawl"*. Equipment such as normal fishing nets are smaller investments and here only some of the gear is used several times. In these nets, there is a floating rope at the top and a sinking rope at the bottom. These can mostly be reused several times if you just replace the actual fishing net that is mounted in between.

4.5.5 Energy Recovery

Energy recovery contributes to renewable energy production, ensures that environmentally hazardous substances are removed from the cycle and contributes to reducing the total emissions of greenhouse gases. Waste that cannot be reused or recycled due to poor quality or environmental toxins is ensured good resource utilization through sorting of metals from the ash and through the recovery of energy. At the same time, the material quality of recycled raw materials is ensured, and thus energy recovery is an important contribution to the circular economy. *"With nylon net, it is best if you can reuse it as it is. The next best thing is if you can material-recycle it, and if you cannot, you may have to energy-recycle it"*, according to *firm 1*. During energy recovery, the waste is burned at a high temperature and the flue gas is purified according to strict requirements. Energy recovery is the conversion of waste into energy, into the production of district heating, electricity and industrial steam. The waste heat from such incineration is a source of about 50 percent of the district heat in Norway (AvfallNorge 2022).

4.5.6 Standardization

Firm 1 and *Firm 2* believe that more industry standards must be set for which materials are to be used in the products, as well as systems that makes it easier to separate them when recycled. *"It is a great challenge to know which substances a product is made of"*, according to *firm 2*. Furthermore, they say that: "*If you mix different materials in the same container, the resource is gone"*. This is because the job of separating them from each other will lead to much work and less profitability. If a fishing boat does not deliver the fishing equipment directly from the boat to the reception, but rather delivers it in a container or similar, it is important that the customer (the fishing boat) has the knowledge needed not to mix and destroy the good resources in the used equipment.

4.5.7 Deposit Solutions

The deposit scheme for plastic bottles is well-known, where customers pay a deposit every time they buy soft drinks, beer and similar items, and get this refunded when the packaging is returned to the store. The actual deposit amount must be specified on a deposit mark that is visible on the packaging. The purpose of the deposit scheme is to stimulate consumers to return packaging / goods so that they can be reused in their original form or recycled to save the environment from littering. This could also be used in the fishing industry as a motivating factor to get all the gear ashore, and then to a recycling reception. Such a solution also has some challenges according to firm 1: "*Deposit solutions leads to an increase in price for the customers*". The amount to be paid as a deposit on new sales will give the fishing companies and fishermen a greater cost of capital and tie up non-cash funds. On the other hand, the amount must be high enough, so that companies are inclined to hand in the gear. Another challenge is that if such a deposit solution is implemented in Norway, there must also be similar regulations in the EU or OECD countries, so that competition is equal between fishing vessels and manufacturers. It should not be possible to buy the gear in, for example, the Faroe Islands to escape the regulations.

4.5.8 Taxes and Fees

There are various ways to impose taxes on this plastic issue. And according to *firm 2:* "*We depend on the market to pay in some way"*. Either to finance the recycling work that comes at the end of the product's life cycle or to increase the demand for recycled plastic rather than new raw material. In order to reduce sales of new plastic, it may be possible to impose taxes on the first use of the material so that recycled plastic becomes more attractive. By doing this, we ensure that plastic products that can be recycled are collected and utilized in other products and therefore have a longer life.

4.5.9 Regulations

According to *Firm 2:"There will be certain requirements for reuse of plastic in new production".* To increase the demand for recycled plastic, the government can impose a requirement that, for example, x% recycled plastic must be used in new products. In this way, manufacturers may pay a higher price for this material, otherwise they may take responsibility for collecting plastic waste from the goods they have sold to the customer themselves. *Firm 2*, the reception, is convinced that such a regulation will come. This could create two different markets and prices for new and recycled plastic. The opportunity to make a profit on recycling will lead to the work required to collect being more organized and carried out professionally.

4.5.10 Receptions

For the fishing fleet along Norway's long coastline to be able to deliver its marine waste, there must be strategically located receptions that are approved and capable of managing the waste in the right way. *Firm 2* states*: "If there are arrangements for receptions, there is no problem, but at the moment there are too poor arrangements for taking the fishing equipment's ashore"*. As of today there are few such receptions, and gear must be transported long distances to other facilities that can process the waste.

4.6 EPR-implementation

Table 4.3 shows a summary of the EPR implementation opportunities and challenges.

Table 4.3: List of Opportunities and Challenges

Opportunities	Challenges
○ Deposit solutions ○ Develop new business models ○ Differentiated scheme/prizes for recyclable products ○ Buy-back solutions ○ Higher use of recycled materials in manufacturing, and increased resource efficiency ○ Potential secondary life of polluting materials ○ Create products too valuable to discard ○ Create a viable secondary material markets	○ Uncertainty in terms of regulations ○ Price increase, most likely for the consumers ○ Reception cost ○ Challenges for importer and supplier ○ Willingness to recycle ○ Bans, fines and taxes ○ Sorting and recycling materials ○ Export ○ Enforcement ○ Monitoring practices

4.6.1 Opportunities

The implementation of EPR will cause both opportunities and challenges for different actors in the recycled fishing gear value chain. An important issue to address would be to implement a deposit solution, where fishermen can deliver their fishing gear for recycling. How the system will work, and where these deposit facilities should be placed, will need some planning and governmental involvement. After having interviewed different actors, there is a common understanding that it should be differentiated schemes for different recyclable products. A buy-back solution could help the products last longer, because manufacturers could offer customers to buy back the used equipment so that they can fix it and resell it.

Higher use of recycled materials in manufacturing and increased resource efficiency is something most companies aims for, and is definitely an advantage going forward. This can lead to secondary life for polluting materials, which fits the sustainable circular business model innovation concept. Another opportunity worth mentioning is the fact that with EPR, there will be a differentiated tax scheme in relation to recycling, and this can lead to producers creating products that are too valuable to discard. The incentive to recycle is stronger than to discard, which in turn will help incentivize different actors to recycle. Lastly, the creation of a secondary material market could be seen as both an opportunity and a challenge, depending heavily on the incentives or benefits coming from the government. When compared to the utilization of new resources, the use of secondary (i.e. recycled) materials in manufacturing processes has significant environmental benefits.

4.6.2 Challenges

There are many challenges related to implementing EPR. Interviewees have expressed concern in terms of uncertainty regarding different regulations. As of today, there is a question mark about how these would impact the value chain as a whole. An increase in prices seems inevitable, and the most likely losers are the consumers.

The willingness to recycle must come from somewhere, and good incentives and benefits can help pushing in the right direction. It is also important to focus on the issues around perceived effectiveness, concern about the environment and the social pressure the industry is facing. This may be that the industry does not see great environmental intentions in introducing specific measures and that they believe there is a lot of work for little result. Companies are made up of people, and people have different views on the environmental challenges. Some are convinced that action must be taken, while some believe the exact opposite and that everything is just nonsense.

Enforcement is critical for accomplishing EPR objectives. For producers to act on environmental policy, they must have faith that other parties are following the same norms. For EPR to function well and earn producer´s trust and cooperation, a level playing field must be established. There is a relatively strong enforcement and judicial system in Norway, compared to the rest of the world.

If stricter regulations are introduced regarding EPR and the circular economy, it is reasonable to assume that Norway will follow these closely, while other and less regulated countries and states might take shortcuts and not enforce the rules as they should.

An assumption that taxes and duties can solve the problems around plastic waste is sensible, but the answers we are getting from respondents, is a common perception that costs imposed on the producer eventually end up on the consumer's price tag. Another challenge for importers and suppliers are if stricter requirements are set for manufacturers. They are dependent on an international standard so that, for example, large manufacturers in Asia follow the same regulations and standards. If EPR is not implemented as an international standard between trading countries, this can potentially lead to some suppliers/importers not being able to trade with specific manufacturers.

Gear producers are into international business (e.g., import raw materials) and export finished products (e.g., nets and components). The European Economic Area (EEA), which includes EU countries, Iceland, Liechtenstein, and Norway, makes it possible for Norwegian companies to trade in EU without certain boundaries. Implementing EPR in EU will help member states to comply with the directives in order to conduct trades. Other actors from Asia and USA are not included. It will be expensive to implement EPR, because someone must pay for receptions, enforcement and monitoring practices. Bans, fines and taxes are all available options, but the question raised by our respondents is how this will work in practice.

CHAPTER 5: Discussion

In this chapter, we will discuss theory and findings. The first part involves business opportunities, challenges and sustainable value creation. Part two concerns the role of the government and how policy can be a purposeful activity. Thirdly, we will discuss the possible effects of EPR implementation on value creation. In the end, we will present propositions on the effects of EPR implementation on sustainable value creation. Propositions (P1, P2, P3) in 5.2 and 5.3 is presented in its entirety in 5.4.

5.1 Business opportunities, challenges and sustainable value creation

When considering the business opportunities from our findings, we have established five key areas: *Reuse/repair, design, additives, material recycling and energy recovery*. Some of these findings, especially reuse, design, recycling and energy recovery, are important factors in the circular economy theories. As mentioned in chapter 2.1, the current approach in which resources are mined, turned into products, and then discarded is fading. In today's society, firms should try to recycle and reuse as much resources as possible. Theory from The Ellen MacArthur Foundation support this claim, stating that "*products are retained in circulation in the economy through reuse, repair, remanufacture, and recycling"*. The theory also claims that materials are thus kept in use and never go to waste, which according to our findings is not correct. Plastic can be material-recycled more than once, but when the plastic has been through this process many times, the quality deteriorates and will eventually become non-recyclable without additional chemicals. During an interview with *Firm 2*, it became clear that at one stage the recyclability of a product becomes impossible, and it will have to be discarded.

Design is perhaps one of the biggest opportunities for improvement and can have a major impact on the profitability of the recycling process. If the manufacturer makes a product with few types of plastic that can easily be separated from each other, much of the work is done. This is supported by theory from EMF (2017), maintaining that *designers must consider reuse, remanufacturing and recycling.* A reception, like *Firm 2*, can split the product apart easily and put the specific materials in different containers for further transport to a recycling facility like *Firm 3*. It is challenging, for example, if many different types of plastic are glued or melted

together, which consequently will require a lot of human labor to separate. The design is therefore very important.

Furthermore, with a good labelling system, the job of organizing the materials become more efficient and allows actors like *Firm 3* to know what treatment the various materials need to utilize the resources. If the industry continues to use as many types of plastics as before, the main challenge is to clearly distinguish between different materials, and additionally the separation process becomes more inefficient. The key to success is to make the job as simple as possible.

When the plastic is separated, and organized according to quality and type, the recycling plant can either use normal recycling methods or additives. With the additives method, they can achieve the desired quality by adding a specific mixture of chemicals. *Firm 3* make the plastic quality based on orders and demands from customers, and from the waste they have available. The recycled plastic coming from a plant like *Firm 3* will have a competitive advantage compared to traditional plastic, because it is recycled and reused. This claim is supported by theory from Porter (2001), stating that *"When a company does these strategically vital activities more cheaply or better than its competitors, it earns a competitive advantage"*. In today's industry and in the consumer market, this is very important and contributes to great marketing value in addition to the environmental aspect. It will therefore be possible to charge a higher price for a product that is "circular" compared to new plastic from oil products.

With today´s technologies, there will probably be a lot of plastic waste left in such poor quality that it will be more profitable to send it to energy recovery. The waste gets burned, then the energy is transferred back into the industry or to various heating for residents in the area, also known as distinct heating. Energy recovery is better than landfill, because of resource utilization. If the waste is not environmentally harmful to burn, this is the last resort for the plastic waste. As long as the industry manages to get the plastic recycled many times, with and without additives before it goes to energy recovery, it is a huge improvement from previous practice. It is important that the waste that is to be recycled or incinerated is utilized locally for the greatest possible benefit, without shipping costs and environmental emissions.

Figure 5.1 illustrates circular economy in the fishing gear industry. Fishing gear is made at the producer/manufacturer, utilized and then dropped at a port reception, where materials is separated based on further use. After entering the recycling facility, some resources becomes granules that can be applied for other products. The remaining waste can be used in energy recovery, which in turn can be used in industry to run further production. Theory claims that *"a circular economy redesigns materials to be less resource-intensive, and repurposes "waste" to create new materials and products"*. This fits the illustration.

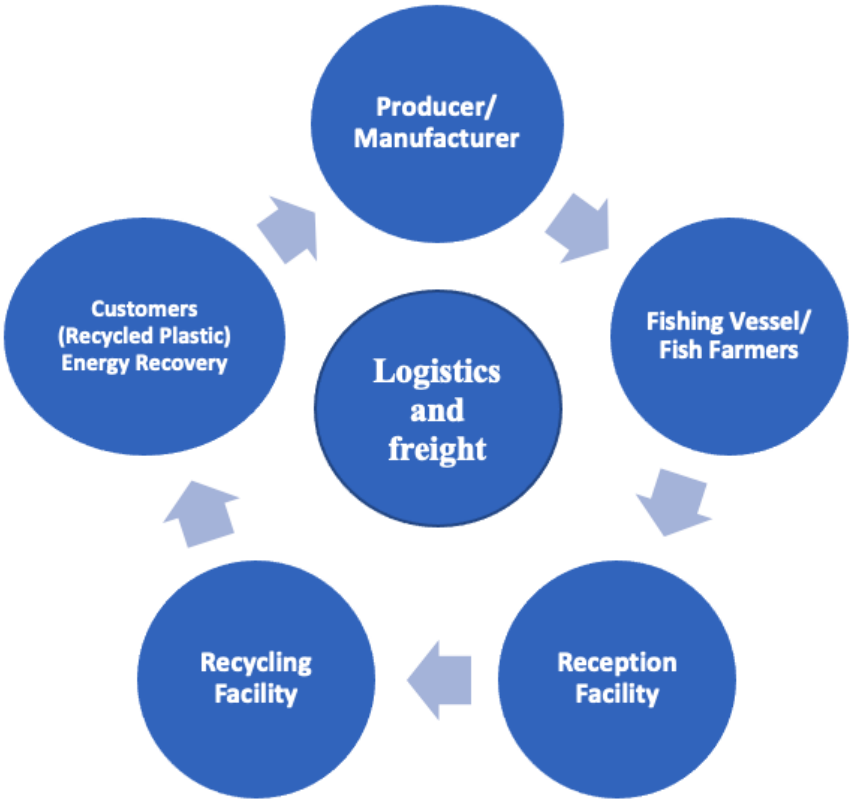

Figure 5.1: Illustration of circular economy in the fishing gear industry.

5.2 The role of Government and policies

Governmental policies are described as a government's purposeful activity to create new transaction patterns or institutions, or to change existing patterns within existing institutions (Smith 1973). A differentiated tax solution was put forward as a possible solution by our respondents, depending on how much of the product that is recyclable, and how much resources it requires to recycle it. If you combine this with a policy that the producer must have a certain amount of recycled plastic in new products, there will be a demand for "circular" plastic. This demand can result in a price difference between new and old (recycled) plastic, and therefore will contribute to more people choosing to deliver the plastic to an approved recycling plant. An exhausted plastic product will probably have a higher residual value by such regulations and the collection work will be organized by the forces of capitalism. Smith (1973) states that western bureaucracies in general are relatively efficient and effective in policy implementation, so this differentiated tax solution is not an unrealistic suggestion.

A major challenge for plastic today is that it does not end up in waste or recycling facilities. There are huge amounts of plastic both in nature and in the ocean space. Greater measures must therefore be taken to motivate companies to have their waste delivered at an approved facility. A deposit solution where you get back a fixed amount for the specific gear or a price per ton will incentivize people to deliver the waste. This amount must be paid when the product is sold for the first time, and can have a negative impact on the fishing fleet business and aquaculture industry. This is because greater capital costs and liquidity challenges occurs. It is important that the deposit is costly enough for companies to realize the value in delivering the product, but not so expensive that it destroys the dynamics of the industry.

The maritime industry is international and companies trade across national borders and continents. It is therefore important that any solutions, such as deposit solutions, are integrated into international trade so that the competition rules are equal for all parties. If the operation of the fishing fleet or aquaculture industry becomes more expensive in Norway due to EPR measures, these companies will probably lose competitiveness against international companies that are not affected by such regulations.

Norway has a huge coastline with a diversity of different fishing vessels and work boats. This also places greater demands on more recycling centers and treatment facilities, because there are currently very few facilities such as *Firm 2* and *Firm 3* along the coast. Consequently, vessels will have to travel longer distances than optimal to deposit their waste. Not only does the environmental effects loses its value, but the costs of depositing are bigger than the return. The benefits for both the environment and the vessels vanishes.

The importance of logistics and shipping costs is crucial to understand why we need several smaller facilities along the coastline. The industry is dependent on a well-functioning system that can be defended in both a business perspective and an environmental perspective. This means that longer transportations leads to more emissions, but also increased transportation costs, which is what we want to prevent. Based on the above we propose that:

P1: Government policies will impact EPR implementation.

P3: Government policies will indirectly impact/influence the value creation potential of the industry through EPR

See figure 5.2

5.3 Possible effects of EPR implementation on value creation

In order to make the best possible use of the products and the plastic they consist of, reuse and repairs are key factors. This is perhaps the first important step in a process to make the best use of the resource and extend its life. Performing repairs that make the product´s life longer will extend the period before the materials must be recycled. If the manufacturer makes it easier or cheaper to repair than to discard, it will be an important EPR implementation. There are often huge prices on spare parts and repairs for used products, and sometimes it is more profitable to just buy a new product.

If manufacturers combine reuse and repair with buy-back solutions, the manufacturer will through this take a greater responsibility over the life of the products it delivers, and in addition get a closer collaboration with its customers. Prices for repairs and buy-backs will play an important role for customers, and as a consequence companies may need to change their cost-

structure and revenue streams in the business model. Presumably, they have to make new sales less important for the business, and charge their customers in other ways, like leasing or renting. The recycling processes where the plastic waste is melted down into new products and resources, affects the quality and can only be done a certain number of times. For example, using parts of the fishing net for other things such as football goals, hammocks, fences for animals and farms or protective nets around golf courses, gives a product new life by adding very little labor.

Standardization was mentioned by our respondents as an important EPR implementation, and they suggested that we need a reduction in the number of standards for the materials used in the industry for simplicity. The situation today bears the mark of too many, and smaller companies can struggle to keep up. The various EPR implementations that may come will give the producers additional work, which in turn will lead to increased costs for them. These are likely to fall on their customers and the consumers. It will therefore be a bit misleading that it is the producers who takes the full responsibility, but rather that they take responsibility for organizing and burdening other players in the value chain.

Plastic is generally a cheap material in relation to how easy it is to use and shape into what you want. If plastic had been more expensive, it would probably have affected its use, and manufacturers would have looked at whether other alternatives could have been better. Based on the above we propose that:

P2: EPR Implementation will impact the value creation potential of the industry

See figure 5.2

5.4 Proposition on the effects of EPR implementation on sustainable value creation

EPR implementation will have impact on the value creation potential of the recycled fishing gear industry. Our analysis of the data shows that government policies determine how the EPR scheme would be implemented, which will further impact the value creation potential of the industry. The analysis of the data, its structures and the propositions are presented in Figure 5.2.

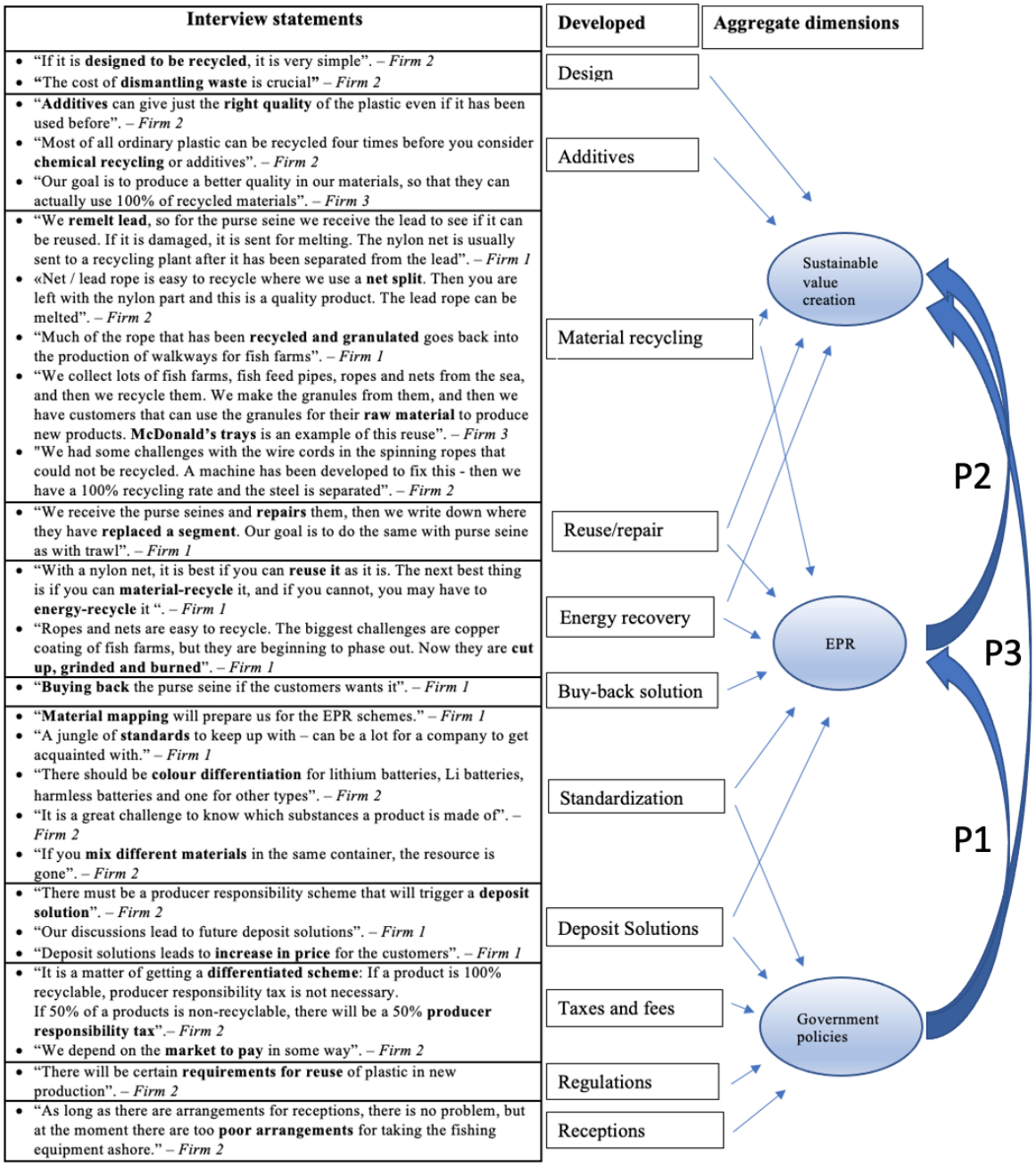

Figure 5.2: Interview statements, data analysis and propositions

CHAPTER 6: Conclusion

This chapter is the concluding remarks of the thesis. A summary of findings will first be presented, follow by contributions to theory and different implications. At the end, we will discuss limitations of the study and future research.

6.1 Summary of findings

Findings shows that there are five key roles in the recycled fishing gear value chain: Producer/manufacturer, fishing vessels, port reception facility, recycling facility, and recycled plastic customers. The producer makes various fishing equipment for the different fishing vessels and the aquaculture industry, based on the customer's wishes and needs. They make the gear that's best compatible and effective for the vessels. The fishing vessels and fish farming companies buy the equipment and make various minor repairs to it themselves when it is damaged or slightly worn throughout its lifespan. It is normal for fishing equipment to need maintenance due to a lot of wear and tear in the sea and seabed.

When the gear is worn out and it is time for replacement, the fishing vessels and aquaculture companies must deposit the equipment at an approved waste port facility or reception. The reception dismantles and sorts the waste according to quality and type of material. They have good knowledge of which materials are used in the industry and therefore sort efficiently. It is important that the materials are sorted according to standards when delivered to a recycling facility. This is because mixed materials affect the quality. The plastic that is of good quality is converted into various granules for further use in new products, while the plastic that is old and of poor quality will go to energy recovery in various forms. This could be, for example, industry that needs energy or heating of households. Energy recovery is today the last resort to utilize plastic and waste of poor quality that cannot be recycled.

We found that stakeholder relationships and value creation occurred at two levels:
1) Create a conducive environment for circular economy
2) Circular economy business implementation

We established five activities within these two levels:

- Knowledge sharing concerning circular economy
- Influence political decisions
- Develop the industry
- Create viable ecosystems
- Develop circular business models

In addition to this, six critical points for value creation was identified: Political, economic, sustainability, ecological, safety and control, and social.

For recycled fishing gear, we developed five sustainable value creation factors in terms of opportunities and challenges: Reuse/repair, design, additives, material recycling and energy recovery. Material recycling, reuse and repair are typical circular business models. If producers place greater focus on designing their products in a way that enables recycling to be done more efficiently, it will contribute to higher value creation in the value chain of recyclable plastic. In terms of governmental actions that should be considered, we identified standardization, deposit solutions, taxes and fees, regulations and port receptions as possibilities.

We identified a list of opportunities and challenges for EPR-implementation, and we found that deposit solutions are an important issue to address in terms of where to place these. Additionally, a differentiated tax solution was suggested by our respondents, depending on how much of the product that can be recycled. Higher use of recycled material in manufacturing, and increased resource efficiency, was identified as an opportunity. Challenges relates to uncertainty in terms of regulations, price increases, enforcement, willingness to recycle and costs associated with receptions.

6.2 Contributions to theory

6.2.1 Contributions to stakeholder

The stakeholder theory states that pursuing stakeholder interests entails maximizing the value provided for all parties involved. Stakeholders are important in value creation, and the quality of the relationships between the various stakeholders in the cluster/industry impact the value creation potential of the industry. For example, good interaction and relationship between the stakeholders (gear producers, recyclers, logistics and waste companies, the local municipalities, the local government) will endow to the advantage of the waste recycle fishing gear industry. Our study makes important contributions to stakeholder theory as follows:

- This study adds to the stakeholder relationships in the circular economy business, and found that it occurred at two levels. Firstly, by creating a conducive environment for circular economy. Circular economy knowledge sharing is important, meaning that we create a sense of legitimacy and comprehension for the circular economy by depicting subjective stakeholder value. Secondly, by implementing circular economy business. This means creating a viable ecosystem, including controlling and utilizing the dynamic flow of distributed activity, managing competition and finding the right partners. Lastly, develop circular business models which is constantly adjusted and optimized for stakeholder relationships and activities.
- This study contributes by exploring the factors that help explain how the different roles of value chain actors contributes to sustainable value creation in the recycled fishing gear industry. Identified factors, such as the work on design and additives, are key contributions from a sustainable value creation perspective. This is because it extends the product life cycle, and contributes to reuse of materials.
- The study extends the limited research done on stakeholder theory and their relationships and value creation potential

6.2.2 Sustainable value creation and EPR

Bocken (2014) defines sustainable value creation as a company strategy that maximizes long-term shareholder value by seizing opportunities and minimizing risks connected with economic, environmental, and social changes.

- Our study makes important contributions to the literature on sustainable value creation. This study found a knowledge gap in theoretical frameworks in relation to sustainable value creation and EPR. The thesis will add to how sustainable value creation and the implementation of EPR is connected. Figure 5.2 illustrates propositions, which shows that government policies will impact the EPR implementation. Furthermore, it will impact the value creation potential of the industry, and lastly, findings show that government policies indirectly impact the value creation potential of the industry through EPR
- The thesis reveals weaknesses in the producer responsibility scheme, because there is a perception that the costs will end up on the producer, but it will most likely be the end-consumers who pays the price. Rather than being responsible for the cost themselves, as is the intention of the scheme, they are more likely to distribute the costs associated with EPR further down the value chain.
- Our study has also identified and catalogued the sustainable value creation strategies **(see figure 5.2)** relevant to the recycled fishing gear industry. Our study shows that achieving sustainable value creation also requires government interventions. Government interventions through policies are likely to have a stronger impact on the industry. For example, a policy such as a mandatory use of recycled marine plastics (e.g., 2% content) together with virgin plastics will likely boost the demand for plastic granulates by manufacturers of plastic products.

6.3 Practical and managerial implications

The findings of this study provide valuable managerial and policy instruments that can help the value creation potential of the industry. Based on statements in the interviews and secondary information from relevant sources, we have the following recommendations for the actors in the marine plastic industry and its recycling:

- The manufacturers of the various fishing gear must address the design and standardization challenge. The equipment must be designed so that the various materials, preferably as few as possible (standardization in the industry), can be easily separated from each other. Furthermore, it must be marked which materials have been used so that the recycling reception can sort them efficiently.
- Manufacturers must take a bigger responsibility for the gear they sell, in order to last as long as possible before they must be recycled. They can achieve this by buying back used gear when the vessels are buying new gear - then repairing the old one and selling it again. They can also take the initiative to make repairs of the gear cheaper and thereby make the threshold for buying a new gear higher.
- The fishing vessels and the fish farms must take greater responsibility for their used gear being sorted and delivered to reception facilities that can utilize the plastic resources the best way possible. This means that different fishing gear and materials should not be mixed together so that the recycling becomes inefficient.
- The waste receptions must have several smaller receptions along the coast so that the fishing fleet and fish farms easily can deliver their used gear to the most relevant facility that can benefit from it. They should also make direct contact with the fishing fleet to get them to deliver the waste to their facility.
- Our study also makes important contributions to international business. The EEA makes it possible for Norway to be part of the EU 's single market. The implementation of the EPR in member countries of the EU and EEA will influence how firms transact business among each other. EPR measures should not apply only in the EU, but include international actors from USA and Asia as well.

6.4 Policy implications

Based on statements in the interviews and secondary information from relevant sources, we have the following recommendations for the government and authorities to take remedial action against marine waste in the fishing industry:

- The authorities should implement a differentiated tax policy where the producer or their customer must pay a tax for the proportion of non-recyclable waste the products consist of. This amount will go to the financing of the receptions and the recycling process required for utilizing the resources again.
- The government can introduce a deposit solution with a big enough deposit, so that the customers of the fishing gear are incentivized to deliver the waste to an approved reception, for them to get back the deposit.
- A minimum requirement of recycled plastic in new products, with the intention of increased demand for used plastic.
- The authorities should arrange for several smaller waste facilities along the coast. If operated by private actors, subsidizing could be an option. This depends on how the industry eventually finances the recycling processes discussed in the thesis.

Policy formulation and implementation is important for the success of the industry (Van Meter and Van Horn 1975). If the implementation of extended producer responsibility is going to succeed, the government must take responsibility moving forward and implement the necessary measures to achieve the goal of less marine pollution.

6.4 Limitations and Future Research

The time constraint is a relevant limitation to mention for this study. Given that we only have six months to finish the paper, we had to prioritize and allocate our time to what we thought was most important. One of the researchers were an exchange student in the prior semester, which was a bit troublesome in relation to getting as good of a start on the thesis as possible. This was because exams in foreign countries often is set up in January and February, which meant that this thesis had to be delayed for a couple of weeks. The exams led to us not having the possibility to meet in person before February.

The sample size of firms interviewed is low, as there are only three interviewees. We had imagined getting more responses on our requests sent to different firms, but unfortunately, we got rejected or got no response at all. To compensate for this, we used secondary data to acquire enough knowledge about other relevant firms, even though we did not have the chance to interview them. In addition to the sample size, we can question the openness and objectivity of respondents. When we did not have the opportunity to interview the manager, we got the feeling that this subordinate was somewhat cautious about answering some questions.

Lack of previous research on EPR implementation is a limitation in terms of secondary data. It has not been conducted enough research on the effects and impacts this will have on businesses and producers. Organization for Economic Co-Operation and Development (OECD) have some guidelines and reports on EPR, but as of today they are more than 20 years old, and as we know the world changes a lot during this time.

Finally, we got the sense that many firms in generally is poorly informed about EPR. During interviews, it was required for us to explain and teach them more about the concept. This maybe led to weak answers about the subject, as they did not fully understand the implementation of EPR concept, and the potential challenges and opportunities that followed. Future research should consider using more companies to provide more insight on the issues understudies in this thesis. For example, quantitative studies with a large sample of different stakeholders can also help share more light on firms' attitude and expectations of EPR implementation.

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8.0 Appendix

8.1 Interview Guides

8.1.1 Producer/Manufacturer of Fishing Gear

1. Fortell litt om hvordan dere jobber med bærekraft, både på kort sikt og på lang sikt.
2. Hvem er deres viktigste interessenter? Hvordan samarbeider dere med disse?
3. Innenfor avfallshåndtering er utvidet produsentansvar (EPR) en strategi for å legge alle miljøkostnadene knyttet til produktet gjennom hele produktets livssyklys til markedsprisen for det aktuelle produktet. Kan du si litt om hvordan dette fungerer hos dere?
4. Når vi er inne på produsentansvar: Hvordan påvirker dette generelle operasjoner, opplevd kundeverdi, kostnader, inntekter osv.
5. Det er jo alltid en haug med problemer og utfordringer I verden. Hva er deres hovedutfordringer per nå?
6. I forhold til sirkulærøkonomi og sirkulære forretningsmodeller, kan du fortelle om hvordan dette ser ut hos dere? Vi tenker på resirkulering, reparering og gjenbruk. Både i dag og i fremtiden.
7. Til slutt lurer vi litt på internasjonale operasjoner. Har dere utenlandske kunder og partnere? Er det blitt vurdert å ekspandere til utlandet?

8.1.2 Reception Facility

1. Fortell litt om hvordan dere jobber med bærekraft, på kort sikt og på lang sikt.
2. Hvem er deres viktigste interessenter? Hvordan samarbeider dere med disse?
3. Innenfor avfallshåndtering er utvidet produsentansvar (EPR) en strategi for å legge alle miljøkostnadene knyttet til produktet gjennom hele produktets livssyklys til markedsprisen for det aktuelle produktet.
4. Kan du si litt om hva dere tenker rundt dette for fiskeutstyr som garn og tauverk? Kan det være en mulig løsning på problemet?
5. Når vi er inne på produsentansvar: Hvordan påvirker dette generelle operasjoner, opplevd kundeverdi, kostnader, inntekter osv.
6. Hva ser dere på som deres største utfordringer for avfallshåndteringen nå?
7. Hvordan er systemet for innlevering av fiskeredskaper? Kommer båtene direkte til dere eller får dere fra andre mottak?
8. Har dere avtale med en produsent/leverandør for brukt utstyr? Hvordan fungerer dette evt?
9. Hva gjør dere videre med plasten etter dere har behandlet den?
10. Hva er det mest vanlige fiskeutstyret dere får inn?
11. Og er det noe utstyr som er mer utfordrende å imot enn andre?
12. I forhold til sirkulærøkonomi og sirkulære forretningsmodeller, kan du fortelle om hvordan om hvordan dette ser ut hos dere? Vi tenker på resirkulering, reparering og gjenbruk. Både i dag og i fremtiden
13. Til slutt lurer vi litt på internasjonale operasjoner. Har dere utenlandske kunder og partnere? Er det blitt vurdert å ekspandere til utlandet?

8.1.3 Recycling facility

1. Fortell litt om hvordan dere jobber med bærekraft, på kort sikt og på lang sikt.
2. Hvem er deres viktigste interessenter? Hvordan samarbeider dere med disse?
3. Innenfor avfallshåndtering er utvidet produsentansvar (EPR) en strategi for å legge alle miljøkostnadene knyttet til produktet gjennom hele produktets livssyklys til markedsprisen for det aktuelle produktet.
   Kan du si litt om hva dere tenker rundt dette for fiskeutstyr som garn og tauverk? Kan det være en mulig løsning på problemet?
4. Når vi er inne på produsentansvar: Hvordan påvirker dette generelle operasjoner, opplevd kundeverdi, kostnader, inntekter osv.
5. Hva ser dere på som deres største utfordringer for avfallshåndteringen nå?
6. Hvordan er systemet for innlevering av fiskeredskaper? Kommer båtene direkte til dere eller får dere fra andre mottak?
7. Har dere avtale med en produsent/leverandør for brukt utstyr? Hvordan fungerer dette evt?
8. Hvordan behandler dere de ulike plasttypene/produktene?
9. Hva gjør dere videre med plasten etter dere har behandlet den?
10. Hva er det mest vanlige fiskeutstyret/plasten dere får inn?
11. Er det noe utstyr/plast som er mer utfordrende å ta imot /bearbeide enn andre?
12. Til slutt lurer vi litt på internasjonale operasjoner. Har dere utenlandske kunder og partnere? Er det blitt vurdert å ekspandere til utlandet?

8.2 Summary of Answers

8.2.1 Producer of Fishing Gear

Interview question	Summary of the answer
How do you work with sustainability in the organization both in the short term and in the long term?	They have a sustainability group in the company that consists of employees across the entire group. They went out with an application process, where they wondered who in the company was interested in shaping the future of the company with sustainability as a focus area. Then they received a good number of applications from many different countries, since they are a global company. There are eight of them currently working on the company's ESG strategy and setting up the ESG strategy. They started by addressing all the ESG factors, everything from wood chain to littering, energy consumption and a whole bunch of factors. They did a materiality analysis of all the factors where they saw which one is most important to them, their stakeholders and their customers. Based on this, they are left with the most important factors and use these as a starting point to create four ESG focus areas.
Who are your most important stakeholders and how do you work with them?	Customers in general, and their owners. They are owned by a private equity company and their suppliers. They also have some focus on what most people think about the fishing and aquaculture industry. Unfortunately, these industries are not always presented as well in the media as we prefer to see. But they point out that the customer is seen as the most important stakeholder.
Within waste management, extended producer responsibility (EPR) is a strategy for adding all the environmental costs associated with the product throughout the product's life cycle to the market price of the product in question. What do you think about this for fishing equipment such as nets and	It has not been decided yet and there is still a lot of uncertainty about the measures. The work they do on material mapping will prepare them for such an arrangement that they themselves know what they can use the material for when it comes back to them. Then it is important to find business models that take this into account. There they already have something on a purse seine, where they take back the seine if the customer wants it. Then it is important to look at the other segments as well.

ropes? Could there be a possible solution to the problem?	
When it comes to producer responsibility: How does this affect general operations, perceived customer value, costs, revenues, etc.?	A possible deposit solution comes up when they discuss the future. But they say it may need to be worked on more within the organization and discussed more. They have thought of it as a possible solution / measure that can work, but which is not beneficial to a fisherman or the customer, so it can be a burden for the customer in terms of capital.
In terms of circular economy and circular business models, can you tell us about how about what this looks like in your organization? We think about recycling, repair and reuse - both today and in the future.	They say that the material handling project is probably the main foundation in this. There they get an overview of how they can reuse each individual material, at the same time as they must look at several new solutions.
What do you see as your main challenge(s) right now?	One challenge that they are a little aware of is the uncertainty of the requirements that are coming. They´ve got this EPR and then they have the EU taxonomy. The interviewee work to create standards for the industry. There are also many stakeholders, where everyone wants to make the standard themselves and then it becomes difficult to know which of them to take into account. First and foremost those one is required to take into account, but to be ahead they must follow everything else that happens and. It's a small jungle of standards to keep up with. Can be a lot for a company to get acquainted with.

8.2.2 Reception Facility

Interview question	Summary of the answer
How do you work with sustainability in the organization both in the short term and in the long term?	The company has zero emissions at all its facilities and says that if you do not have this as the main focus for your business in this industry, then you have to find something else to do. They also work closely with the Norwegian Environment Agency to provide input and suggestions for what needs to be done about the recycling problem, what works and what does not work.
Who are your most important stakeholders and how do you work with them?	Players in the industry who use fishing gear, processing plants and the Ministry of the Environment are mainly the network. They also have a dialogue with the municipal / state waste facility.
Within waste management, extended producer responsibility (EPR) is a strategy for adding all the environmental costs associated with the product throughout the product's life cycle to the market price of the product in question. What do you think about this for fishing equipment such as nets and ropes? Could there be a possible solution to the problem?	The producer responsibility scheme will trigger a depsit solution. The suppliers know this and are very worried about how it will turn out. They have to post it and possibly get it back on the sales page right away. Or that it will be free to submit it, or that there will be a subsidy scheme to process it. The reception has a cost of receiving and processing the fishing gear and they also have a selling price that varies with the market. So therefore, they know approx. what this grant should be. A while ago, this had to be between NOK 1500-2000 per ton, but we have heard of others who say NOK 6000 per ton. This can be placed on the manufacturer so that you pay what may cost society to make up for. But a differentiated scheme where it considers how large a share is recyclable will also be possible. Then it turns out that if 50% is recyclable = approx. NOK 3,000 per ton.
When it comes to producer responsibility: How does this affect general operations, perceived customer value, costs, revenues, etc.?	

What do you see as your biggest challenges for waste management now?	They say they do not really have anything special they are struggling with; they have been doing it for 30 years. They have followed the development closely and have been a little ahead. You can recycle anything, bere design makes it easy. This is what is decisive for how expensive it is to pick it apart again.
What is the system for handing in fishing gear? Do the fishing vessels come directly to you, or do you get them from other receptions?	If a boat is going to throw away some plastic equipment today, they can choose between delivering it to the landfill or this reception. At the landfill, they have to pay a price of approx. NOK 2,500 if it has to go to landfill, but if it can be recycled, the price is around half per tonne. They can also choose to deliver it to the recycling centre if it can be recycled and is not mixed with lots of other waste. If it is mixed with a lot of other things in a container, the profit goes into that extra work.
Do you have an agreement with a manufacturer / supplier for used equipment? If so, how does this work?	They have some collaboration with suppliers, but it's mostly about how to make good arrangements for the product's life cycle and nothing special about handing in equipment. It is the boats themselves that deliver it to the facility. But they do some work to collect the waste from customers as well. In collaboration with another company, they have developed a container that is specially developed to collect marine waste from fishing and aquaculture.
What do you do next with the plastic after you have treated it?	This company only receives and collects the plastic waste and forwards it to its partner for further handling. Their job is to collect it, possibly arrange collection at the customer.
What is the most common fishing equipment you get in? And is there any equipment that is more challenging to receive / process than others?	The most common for most places on our coast are nets (breeding cage) and mooring ropes for fish farming. This rope requires both washing and other things due to algae but is not impregnated as some farmed nets are. The impregnation is about to be phased out. In fact, a separate course og treatment was built for these nets with our partner since they previously only collected nets at landfills. It is now chopped/crushed up and burned in the oven.

In terms of circular economy and circular business models, can you tell us about how about what this looks like in your organization? We think about recycling, repair and reuse - both today and in the future.	
Do you have foreign customers and partners? Has it been considered to expand abroad?	Their partner who processes the waste has some exports, but they themselves have little to do with foreign countries. But it must be said that they have had some foreign fishing companies that have wanted to deliver their fishing equipment to their facility.

8.2.3 Recycling Facility

Interview question	Summary of answer
How do you work with sustainability in the organization both in the short term and in the long term?	The goal is to recycle the plastic from marine industry, mostly from the fishing industry, but a little from offshore industry. Most of the plastic recycling worldwide is working with bottles or household packing but this company specifically works with the marine industry. The goal is to produce a good product that their customers can reuse to produce the same material that's used in the marine industry. So that is the sustainability goal.
Who are your most important stakeholders and how do you work with them?	Cooperates with gear suppliers, but not that much with their customers.
What do you see as your biggest challenges for waste management now? How do you process the different types of plastic / products?	From their point of view, there are many. Among other things, because there was no such company before, there can be many types of plastic. When you collect plastic, the quality is not the same, some are new, and some are old. The quality can be both good and bad. Raw materials in the future can be much better, because companies know that they should send their waste for recycling as their plant. They also want an overview / table and a standard as they know about the age of the waste. The other thing is that when there are differences in quality, it is difficult to produce stable quality. Sometimes they think they need to add some additives to improve the quality, but at the same time it is difficult due to differences in raw materials. They have one production line, which was originally for HDPE - this could be pipes, for example. It is difficult to use this for ropes for example, the material is different, and the washing system is different. Another challenge is that they must have separate lines for each product. They have recently ordered a new line for ropes, so in the future they will have two lines. One for rope (mixture of PE and PP) and one for HDPE. The plan is to add one production line each year, so in the future they may have five to six lines for each product. And a separate line for testing material.
What is the system for handing in fishing gear?	They collect some of the waste themselves, in addition they have some companies such as (Reception) who send the materials to

Do the boats come directly to you or do you get from other receptions?	them. They also have a mobile shredder north. They constantly pick up raw materials and send it to us.
Do you have an agreement with a manufacturer / supplier for used equipment? How does this possibly work?	They have some large customers where they have agreements that if they sell something to them, they make products and give it to their customers, they can recommend to their customers that when the products have expired, they can send it back to the recycling plant. It's not mandatory, but they are doing it now. This is their type of agreement.
What do you do with the plastic after you have processed it?	They make plastic granules which they sell / send to various customers who use it in their new products
What is the most common fishing equipment / plastic you get in?	From marine industry, its ropes and nets. A lot of completed fishing nets.
Is there any equipment / plastic that is more challenging to receive / process than others?	They choose what they can recycle, and are collecting what hopefully can be recycled in the future on the background of new production lines
Do you have foreign customers and partners? Has it been considered to expand abroad?	Yes, they have some in Eastern Europe. Now they are working with a company from Czech Republic

8.3 Information Letter and Declaration of Consent

Vil du delta i forskningsprosjektet «Circular Business Models for fishing gear recycling»:

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor formålet er å finne et svar på følgene forskningsspørsmål: **«How can companies by integrating circular business models utilize marine plastic litter?».** I dette skrivet gir vi deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Formål

Målet med denne masteroppgaven er å undersøke hvordan man ta i bruk sirkulære forretningsmodeller for å skape verdier av plastavfall fra fiskeredskaper.

Hvem er ansvarlig for forskningsprosjektet?

NTNU i Ålesund er ansvarlig for prosjektet.

Hvorfor får du spørsmål om å delta?

Valget av informanter har vært styrt av forskningsspørsmålet.

Hva innebærer det for deg å delta?

Under intervjuet vil flere temaer bli diskutert med deg. Hensikten med intervjuet er å finne ut hva som kan gjøres med blant annet produksjonen, bruken, produktene og håndteringen av plastavfallet fra fiskeredskapene etter de kastes. Dette for å kunne identifisere bærekraftige og verdiskapende løsninger på problemet rundt plastavfall i havet og på land.

Det er frivillig å delta

Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykket tilbake uten å oppgi noen grunn. Alle dine personopplysninger vil da bli slettet. Det vil ikke bli noen negative konsekvenser for deg hvis du ikke vil delta eller senere velger å trekke deg.

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger

Vi vil bare bruke opplysningene om deg til formålene vi har fortalt om i dette skrivet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket.

Hva skjer med opplysningene dine når vi avslutter forskningsprosjektet?

Opplysningene anonymiseres når prosjektet avsluttes/oppgaven er godkjent, noe som etter planen er 20.06.2022. Anonymiserte data skal slettes etter at prosjektet er fullført og resultatene publisert som etter planen er 01.01.2023.

Dine rettigheter

Så lenge du kan identifiseres i datamaterialet, har du rett til:

- innsyn i hvilke personopplysninger som er registrert om deg, og å få utlevert en kopi av opplysningene,
- å få rettet personopplysninger om deg,
- å få slettet personopplysninger om deg, og
- å sende klage til Datatilsynet om behandlingen av dine personopplysninger.

Hva gir oss rett til å behandle personopplysninger om deg

Vi behandler opplysninger om deg basert på ditt samtykke.

På oppdrag fra NTNU i Ålesund har NSD – Norsk senter for forskningsdata AS vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Hvor kan jeg finne ut mer?

Hvis du har spørsmål til studien, eller ønsker å benytte deg av dine rettigheter, ta kontakt med:

Lennart Tennfjord Alnes (masterstudent) lennarta@stud.ntnu.no tlf: 91388101

Even Helle (masterstudent) evenhel@stud.ntnu.no tlf: 48307676

Richard Glavee-Geo (veileder) rigl@ntnu.no tlf: 70161288

Vårt personvernombud: Thomas Helgesen ved thomas.helgesen@ntnu.no tlf: 93079038

Hvis du har spørsmål knyttet til SND sin vurdering av prosjektet, kan du ta kontakt med:

- NSD – Norsk senter for forskningsdata AS på epost (personverntjenester@nsd.no) eller på telefon: 55 58 21 17

Med vennlig hilsen

Lennart T. Alnes	Even Helle	Richard Glavee-Geo
(master student)	(master student)	(veileder)

Samtykkeerklæring

Jeg har mottatt og forstått informasjonen om prosjektet *University-industry collaboration - opportunities and challenges when collaborating on business internships,* og har fått anledning til å stille spørsmål. Jeg samtykker til:

- ¨ å delta i personlig intervju

Jeg samtykker til at mine opplysninger behandles frem til prosjektet er avsluttet

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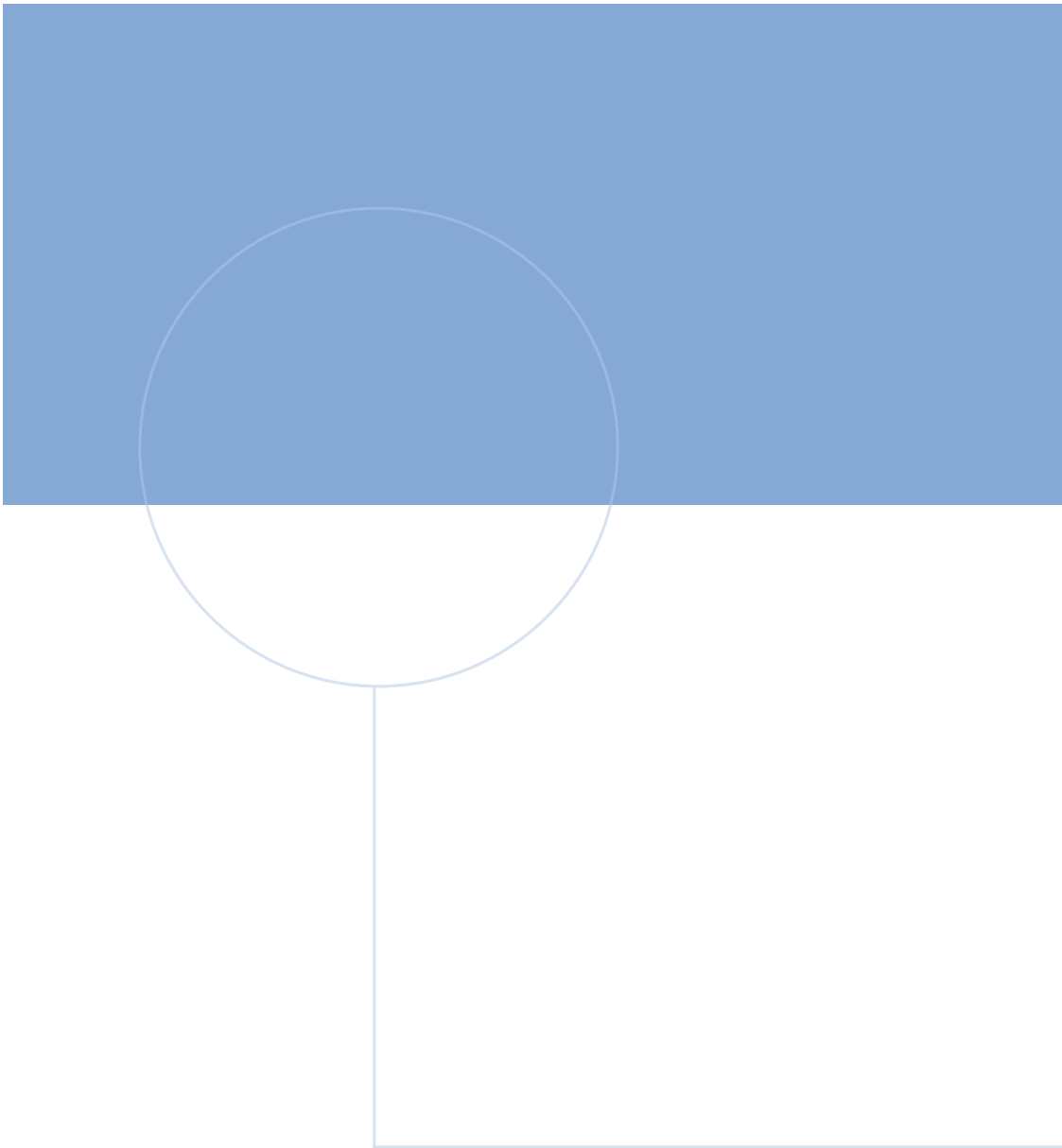
(Signert av prosjektdeltaker, dato)



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