Chapter 4
Circular Business Models for SMEs in the Fishing Gear Industry

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Abstract Recycling plastic materials including fishing nets, ropes, and components (FNRCs) through the business models of SMEs and microenterprises can ensure both economic and environmental benefits. The aim of this chapter is to explore how a circular business model for SMEs in the fishing gear industry can be realised and to provide increased understanding of the circular business model processes. The study examined the development of circular business models and practices of circularity by companies in the fishing gear industry. We applied a qualitative research design and developed frameworks to evaluate the practice of circularity. The qualitative analysis and findings of the cases provided unique insights on the level of circularity of SMEs within the marine plastic recycling value chain in the north-western part of Norway. The main outcome of this research was the proposed framework for a circular business model for the fishing gear industry.

Keywords Environmental concern · Recycling · Waste fishing gear · Circularity · Local innovation systems · Sustainability

4.1 Introduction

The world has awakened, understanding that the currently used *take-make-dispose* extractive industrial model of production is less efficient in resource utilisation. The concept of the circular economy wishes to move away from economic growth driven by the consumption of finite resources and design a model where what once was considered waste, is now seen as a resource (Kraaijenhagen et al. 2016). Whereas the traditional model of industry has a ceiling of growth, a circular business model is based on designing out waste and pollution, keeping products and materials in use, and regenerating natural systems (Ellen MacArthur Foundation 2020). The business model is a tool that describes the rationale of how an organisation creates, delivers,

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and captures value (Osterwalder and Pigneur 2010). Circular business models incorporate a triple bottom line approach, which consider a wide range of stakeholders' interests, including environmental and social issues (Bocken et al. 2014). A fundamental question for any eco-innovative company is how to deliver value to its customers in a way that is profitable and less resource intensive (Jensen 2018).

Fishing nets, ropes, and components (FNRCs) are often lost or discarded in the oceans, or sent to end-of-life collection, where only some of the material and components are recycled. The rest is either disposed of in a landfill, or by means of incineration (Deshpande et al. 2020). Ghost fishing gear comprise approximately 10% of the total marine litter, but is the major source of microplastics littering the oceans, and constitute 75% of all plastic litter in excess of 20 cm in size (Laville 2019). US national ocean service (National-Ocean-Service 2020) identifies typical sources of marine litter which includes: (i) littering, dumping, and poor waste management practices; (ii) storm water discharges; and (iii) extreme weather events (National-Ocean-Service 2020). The objective of this chapter is to explore, and to highlight how a circular business model for SMEs in the fishing gear industry can be accomplished. We provide an increased understanding of the circular business model processes that small- and medium-sized enterprises (SMEs) undertake using a case study approach. In the next section, we present the theoretical frame of reference derived from a review of the literature on circular economy and circular business models. This is followed by the methodological approach where we present the cases studied.

4.2 Theoretical Background

4.2.1 Circular Economy

The concept of circular economy is very innovative, timely, and novel (Ghisellini et al. 2016; Kraaijenhagen, et al. 2016). It provides an economic model where the main goals are to adopt sustainable economic growth, enhance global competitiveness, and generate jobs. For the circular economy to become mainstream, radical and systematic innovation is needed (Manninen et al. 2018). At present, most of the business modelling tools and methods lack at least some of the identified and needed elements for innovating business models in a circular economy. The traditional model of *Take—Make—Waste* causes many environmental problems that will eventually reach a sustainability dead-end as the earth's resources will be exhausted (Antikainen and Valkokari 2016). The circular economy offers extensive and exclusive business opportunities to the existing and new actors available in the economy (Ellen MacArthur Foundation 2020). In a circular economy, the closed loops consist of two supply chains: one is the forward chain and the other one is the reverse chain (Wells and Seitz 2005). In a reverse chain, a recovered product re-enters the forward chain (Wells and Seitz 2005). According to the Ellen MacArthur Foundation (2020),

> A circular economy is a systemic approach to economic development designed to benefit businesses, society, and the environment. In contrast to the 'take-make-waste' linear model, a circular economy is regenerative by design and aims to gradually decouple growth from the consumption of finite resources.

Murray et al. (2017) defined circular economy as:

> an economic system wherein planning, resourcing, procurement, production and reprocessing are designed and managed, as both process and output to maximise ecosystem functioning and human well-being.

Kraaijenhagen et al. (2016) states that:

> Circular economy is an economy in which stakeholders collaborate in order to maximize the value of products and materials, and as such contribute to minimising the depletion of natural resources and create positive and societal and environmental impact.

The main goal of the circular economy is to prolong product life cycles through various activities such as: repair, maintenance, reuse, redistribution, refurbishment, remanufacturing, recycling, cascading and repurchasing (Lüdeke-Freund et al. 2019). The Ellen MacArthur Foundation (2020) proposed an outline of the circular economy. According to this model, the circular economy consists of three major principles: firstly, preserve and enhance capital by controlling finite stocks and balancing renewable resource flows; secondly, optimise the use of resources by circulating products, components, and materials at the highest utility at all times in both technical and biological cycles; and thirdly, foster system effectiveness by revealing and designing out negative externalities (Ellen MacArthur Foundation 2020).

4.2.2 Circular Business Model

A circular business model can be defined as the foundation of how an organisation creates, delivers and captures value with and within closed material loops (Mentink 2014). A Circular business model is actually one type of sustainable business model, and regarded as a subcategory of business models (Antikainen and Valkokari 2016). 'The idea of a circular business model is that it does not need to close material loops by itself within its internal system boundaries, but can also be part of a system of business models that together close a material loop in order to be regarded as circular' (Mentink 2014). According to Bocken et al. (2014), there are eight archetypes for the development of sustainable circular business models: maximise material and energy efficiency, create value from waste, substitute with renewables and natural processes, deliver functionally rather than ownership, adopt a stewardship role, encourage efficiency, re-purpose the business for society/environment, develop scale up solutions. It is important to emphasise that:

> Circular business models are by nature networked: they require collaboration, communication, and coordination within complex networks of interdependent, but all actors or stakeholders are independent and not influenced by one another. (Antikainen and Valkokari 2016).

The challenge of re-designing business ecosystems is to find the *win–win* setting that helps find a balance between the self-interests of involved actors and thereby influence and facilitate their actions in order to cooperatively shape the sustainable circular business model (Antikainen and Valkokari 2016). Osterwalder and Pigneur (2010) proposed a framework for sustainable circular business models based on the ideas and the structure of the business model canvas and other tools, and studies on the circular economy and sustainability. The framework includes the idea of continuous repetition with sustainability and circularity evaluation of the business model which consists of 3 levels: business ecosystem level, business level, and sustainability impact (see Fig. 4.1).

These features are needed for the purpose of gaining factual data about sustainability of the business model along with optimising the processes and understanding the dynamics of the processes required. For instance, change in one link in the supply chain may dramatically influence the whole model. The sustainability part of this evaluation can be carried out by using the evolving literature of life-cycle assessment tools. The circularity perspective focuses on visualisation of the model for the purpose of understanding the essential actors, the relationship among them, the cycle stages, and the flows of material and information. For example, three environmental strategies—closing, narrowing, and slowing the loop within circularity (Bocken et al. 2014; Kraaijenhagen et al. 2016; Lüdeke-Freund et al. 2019).

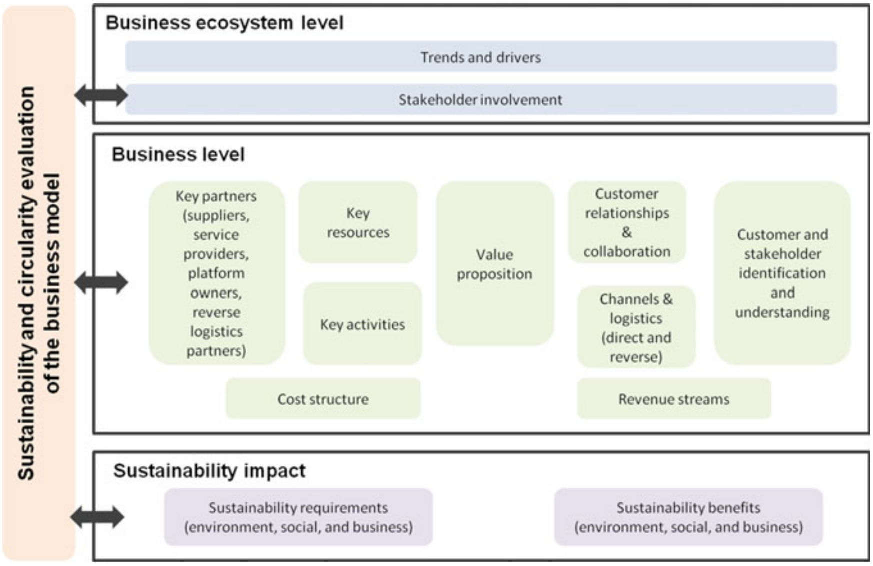

Fig. 4.1 Framework for circular business model
Source: Antikainen and Valkokari (2016)

4.3 Research Design and Methodology

Selecting a research methodology depends on the research paradigm and the objectives of the study (Guba and Lincoln 1994). In this study, we used an exploratory, qualitative, multiple case study. The major benefit of the qualitative approach is that it provides a depth and richness of data, which is difficult to attain through quantitative research (Voss et al. 2002; Yin 2011). A qualitative case study is a desirable research approach for realists whose goal is to describe and explain a phenomena, capturing the appropriate level of complexity (Bhaskar 2014). By using such a case study method, researchers can get a holistic view and explore social processes in rich and complex detail. In this process, contextual variables that affect actors' behaviour will be observed and identified (Lindgreen et al. 2020).

4.3.1 Case Selection

Case selection or sampling is an important methodological choice in case study research (Miles and Huberman 1994). Sampling in qualitative research involves two actions. The first action is to set boundaries that define aspects of the target case(s) that can be studied within the limits of time and budget. The second action is to create a sample frame that has a potential for uncovering, confirming, or qualifying the basic processes or constructs that underpin the study (Miles and Huberman 1994). Accordingly, we chose Norway as the research setting for two reasons; the first is the feasibility of obtaining rich qualitative data within time and budget constraints, the second is that the Blue Circular Economy (BCE) project's mission is to generate sustainable business opportunities in the Northern Periphery and Artic (NPA) region (Peck 2020), where Norway appears to have the biggest fishing industry (Charter 2017). Our study is based on five cases: two recycling firms which recycle plastics into raw materials, one firm which produces the recycled plastic materials, one firm which is trying to transition into using mainly recycled materials, and the last one is the customer of the firm which is trying to make the transition. Table 4.1 summarises the key characteristics of the selected cases, and Appendix 1 provides case profiles.

4.3.2 Data Collection and Analysis

Data analysis in case studies is carried out in two steps, the first of which is the within-case analysis. Here, the researcher documented how the data from the individual informants within each company were handled, with respect to how specific research topics were addressed. This is generally accomplished by coding, in which the raw data are converted or coded to understandable components, which can be more easily compared across informants (Eisenhardt 1989). A figure is presented,

Table 4.1 Overview of the case firms

Case number	Name of firm	Specialisation	Sourcing location	Customer segment	Market location
Firm # 1	Ørskog Plast Industri AS	Plastic production	Norway (Ålesund)	Construction industry	Scandinavia
Firm # 2	PLASTO AS	Plastic production	Norway (Åndalsnes)	Aquaculture industry	Global
Firm # 3	NOPREC AS	Plastic recycling	Norway (Ottersøy)	Recycled plastic manufacturers	Nordics
Firm # 4	REPLAST	Plastic recycling	Norway (Frei)	Recycled plastic manufacturers	Nordics
Firm # 5	AKVA Group	Aquaculture	Norway (Klepp)	Aquaculture operations	Global

which shows how the coding is done, and how themes and patterns within the data are identified using a coding scheme. The coding scheme itself is included. A table is included that shows how the data were interpreted and the coding of case-study interviews was developed. This coding and identification process could be supported by different qualitative research-based software (Lindgreen et al. 2020). In this study, semi-structured interviews with a set of open-ended questions were used to collect data. Different interview guides (Appendix 2) were prepared for the different categories of firms. Open-ended questions were used to create a dialogue and discussion with the interviewer. Because of the COVID-19 pandemic, all interviews were conducted through Skype. The questions were kept as short and specific as possible. Leading questions and questions with a strong positive and negative association were avoided. With permission, the interviews were recorded to avoid biased interpretations and conclusions. This allowed for more accurate transcriptions. After conducting and transcribing the interviews, the interviewees were given the opportunity to review the transcript and make any revisions if necessary. The analysis was performed in four stages: evaluation, examination, coding, and categorisation. NVivo, the software for qualitative data, was used to complete the whole process. NVivo facilitates handling a large amount of qualitative data in a very useful way (Zamawe 2015).

4.3.3 Data Validity and Reliability

To increase the validity of the findings and to reach a quantifiable consensus point of what characterises a circular business model for SMEs in the fishing gear industry, a Delphi study was performed. Delphi may be characterised as a method for structuring a group communication process, so that the process is effective in following a group of individuals to deal with a complex problem. To accomplish this structured communication, the following is provided; some feedback of individual contributions of information and knowledge, some assessment of the group judgement or view; some opportunity for individuals to revise views, and some degree of anonymity for the individual responses (Hallowell and Gambatese 2010). The techniques applied in Delphi are to achieve a single consensus upon an emerging topic area or subject for which there is a contradiction or indeed controversy from the Delphi expert panel (Day and Bobeva 2005). For this study, respondents were selected based on their participation in the ‘Blue Circular Economy: Converting waste fishing gear nets into business opportunities’ workshop held at NTNU in Ålesund on 27 November 2019. The questionnaire was sent to 23 participants. Their positions were Founder, Project Manager, Regional Manager, Sales Manager, Quality Manager, Business Advisor, Vice-Rector, Professors, Director, Scientific Assistant, and Researchers. Interview participants were excluded from the Delphi study. To ensure reliability of the data during triangulation phase, the analytical approach was based on categorisation and aggregation of themes, which were derived from the case interviews, and compared with relevant literature (Eisenhardt 1989). Before that, the initial findings derived from the primary data analysis were also compared with the basic features of circular business model developed by the Ellen MacArthur Foundation (Yin 2011).

4.4 Case Analyses and Findings

4.4.1 Plastics Material Flow: High Level of Circularity—Model 1

To show how different firms are interconnected as well as how plastics materials flow throughout the life cycle of the products, three models were developed. The models created were inspired by the Ellen MacArthur Foundation’s conceptual model for circular plastics economy (MacArthur et al. 2016). In model 1 (see Fig. 4.2) plastic producing firms (e.g. Ørskog Plast Industri AS, denoted by firm #1 in model 1) use both recycled plastic materials as well as non-renewable virgin plastic materials in their production. Virgin plastic materials represent approximately 10% of the total plastic inputs, while recycled materials make up the remaining 90% of the materials. The firms use injection moulding as the method of production. If there is an error in the production phase and the product comes out flawed, the firms regranulate the products and reuse all materials again, with no wastage. The products are made for stabilising rebars for concrete construction, which means the products are sold to construction firms. When the firms have finished laying the concrete, depending on which stabiliser type they purchased, they either twist the product out of the concrete and dispose of it, or leave it standing in the concrete. If the product is left in the building, the product is not disposed of until the demolition of building. They were not involved in the disposal phase and did not know which method of disposal their customers used at the end-of-life their products. Whether the products end up incinerated, landfilled, or recycled, depends on which waste management station the

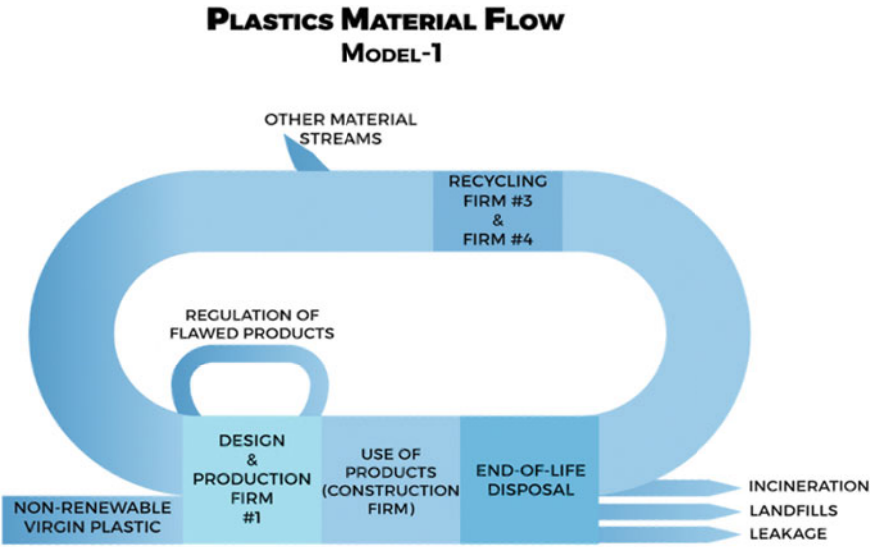

Fig. 4.2 Plastics material flow: high level of circularity—model number 1 (researchers' own model)

firm delivers to, as there are substantial differences in the handling of waste between regions. The assumption was that the products were disposed of by the local waste management stations, and it was supported by the interviews of Ørskog Plast Industri AS, who believed that it was the most likely method of disposal.

NOPREC and REPLAST AS (denoted by Firm #3 and firm #4 respectively in the model 1) are recycling firms, specialising in recycling plastics and collect plastic fractions. These firms are usually supplied plastic fractions from the waste management stations, which are not equipped to handle the recycling process. The waste management stations would otherwise landfill or incinerate the plastic materials, had the firms not been there as an alternative. The recycling firms receive plastic fractions which are defined or undefined. The defined batches are plastic materials which consist of the same plastic type. The undefined plastic batches are a collection of several different plastic types in one and the same batch.

As the recycling firms receive the plastic fractions, the first step of the process is to sort and clean the materials. Both firms have individually developed routines and technology for sorting the materials. The waste materials are sometimes also washed to remove pollutants from the plastic material fractions. When the materials are clean and sorted, the firms regranulate and process the materials, producing plastic pellets. These pellets are then ready to be used as inputs for plastic manufacturing. Both NOPREC and REPLAST AS can recycle nearly 100% of the plastic materials they collect. Pollution, poor sorting, and composite materials are still recyclable, but these factors do negatively contribute to the quality of the recycled plastic materials. As the recycled plastic materials are produced, the firms sell them to plastic manufacturers who are able and willing to use it in their production. Some of the materials are sold to plastic producers, which are also customers of both NOPREC and REPLAST AS, while the rest of the materials are sold to other plastic manufacturers. Plastic-producing firms use almost 90% recycled plastic materials as their input, which ensure a high level of circularity in practice.

4.4.2 Plastics Material Flow: Medium to Standard Level of Circularity—Model 2 and 3

There are other kinds of plastic producing firms (e.g. PLASTO AS, denoted by firm #2 in models 2 and 3) mostly used non-renewable virgin plastic materials in their manufacturing process at their early stage. For example, in 2019, PLASTO AS used mostly non-renewable virgin plastics material in their manufacturing process and they had a few pilot projects with plastic recyclers (e.g. NOPREC and REPLAST AS, denoted by firm #3 and firm #4 in the model 2 and 3), in which they were able to test if recycled plastic materials were viable alternatives. The firm wished to start using recycled materials in larger volume, but they needed consent from their main customers (e.g. AKVA Group, denoted by firm #5 in models 2 and 3) before they could do so.

The aquaculture firms have stringent standards for the quality of the equipment they use and have not yet granted permission for recycling materials being used in their equipment. In 2021, PLASTO AS and AKVA Group had come up an official agreement to use more than 40% recycling materials in their manufacturing process. By doing this, they have transformed themselves from the medium level circularity (see Fig. 4.2) to standard level circularity (see Fig. 4.3) in practice. These kinds of plastic-producing firms also use injection moulding to make plastic products. Most of the manual labour in the factory has been automated, meaning the products are never touched by human hands in production. If any products have any flaws during the production period, the firms regranulate the products and reuse the materials with no wastage.

The customers of these kinds of plastic producing firms purchase the products from plastic producers and then deliver these products as well as any other equipment needed, to aquaculture firms. The aquaculture firms operate the fish farms, and if any equipment is damaged, the plastics producing firms collect the equipment and repair it. When the equipment reaches end-of-life, plastic producing firms are called on. The plastic producing firms then regranulate the equipment on site. The materials are then brought to their own facilities. This is the case for most equipment, as the aquaculture firms are often obligated to document that they have been 'responsible' in their disposal of equipment. On a few occasions, plastic recycling firms are not called on to collect the equipment, it is directly sent to the waste management stations due to low landfill fee, where the equipment might be landfilled, incinerated, or sent to recycling firms. The equipment used by the fish farmers which has the shortest life span is the feeding tubes. Most feeding tubes use air for the propulsion of fish feed, which wears

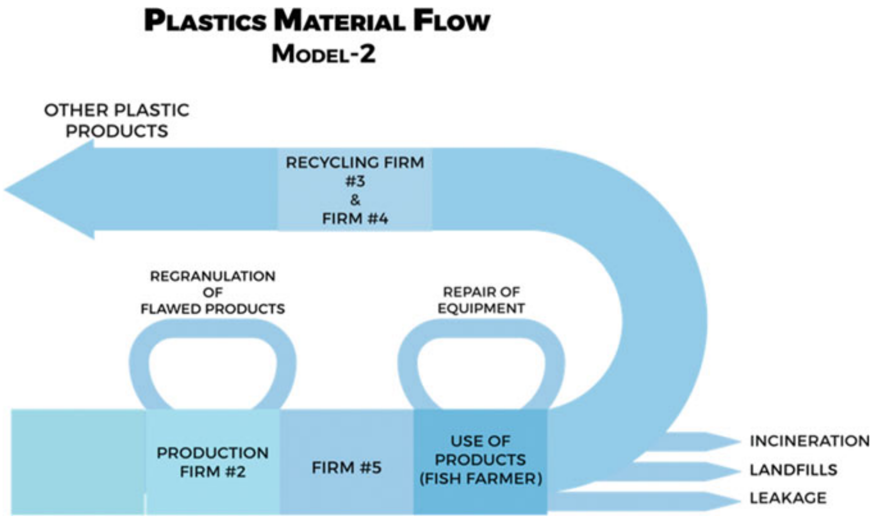

Fig. 4.3 Plastics material flow: medium level of circularity—model number 2 (researchers' own model)

down the plastic tube. Consequently, there is some leakage of microplastics during the lifespan of the tube. At the time of this study, the customers (e.g. AKVA Group) of plastic-producing firms were conducting a project to investigate and measuring the leakage. The case company has also developed a system (using tubes) that makes use of water for propulsion, which should cause less leakage and increase the lifespan of the tube.

The plastic materials end up at the facilities of plastic recycling firms through the transportation of the plastic fractions by the recycling firms, or by waste management facilities sending it to them. Once the plastic fractions are delivered at the facility, they are sorted and cleaned, and then made into small pellets. The product is then ready to sell to the plastic manufacturers, who use recycled plastic materials (this is represented by 'other plastic products' both in Figs. 4.3 and 4.4). Table 4.2 shows the summary of the findings.

4.5 Circular Business Model for the Fishing Gear Industry

Currently, there are a lack of frameworks for creating circular business models in the fishing gear industry. The current tools do not offer sufficient understanding for the changing business environment and the need for adjusting the current value chains. Besides, the impact of the circular business models should be evaluated through the value creation for all stakeholders (Antikainen et al. 2013). Through this study, a framework for a circular business model (Antikainen and Valkokari 2016; Costello

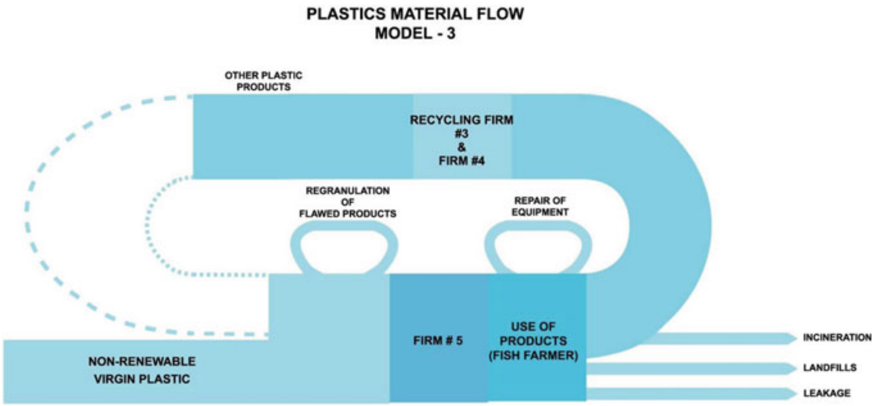

Fig. 4.4 Plastics material flow: standard level of circularity—model number 2 (researchers' own model)

Table 4.2 Plastic material flows in different levels of circularity

Features	*Model 1 (**HIGH** circularity in Plastic material flows)*	*Model 2 (**MEDIUM** circularity in plastic material flows)*	*Model 3 (**STANDARD** circularity in plastic material flows)*
Recycled plastics materials	Use ***high*** level of recycled plastics material s	Use ***low*** level of recycled plastics materials	Use ***medium*** level (almost 50%) of recycled materials
Non-renewable virgin plastics materials	Use ***low*** level of non-renewable virgin plastics materials	Use ***high*** level of non-renewable virgin plastics materials	Use ***proportionately low*** level of non-renewable virgin plastics materials
Method of production	Follow ***injection moulding*** as the method of production	Follow ***injection moulding*** as the method of production	Follow ***injection moulding*** as the method of production
Amount of wastage	***No*** wastage is available after production	***No*** wastage is available after production	***No*** wastage is available after production
Collaboration with recycling firms	***Yes***, have collaboration with several recycling firms	***Yes***, have collaboration with several recycling firms	***Yes***, have collaboration with several recycling firms
Practice of circularity	***High*** level of circularity ensured	***Medium*** level of circularity ensured	***Standard*** level of circularity ensured

and Osborne 2005) for the fishing gear industry is proposed. The framework (see Fig. 4.5) can be considered as a good way for communicating a business model to all related stakeholders.

4.5.1 Business Ecosystem Level

The problems and challenges in the fishing gear industry are threefold: environmental-, social-, and economically oriented (Peck 2020). There is an urgent need to reduce the environmental impacts from the fishing gear industry by using recycling and reusing techniques in the production systems, supply chain management, and logistics (Peck 2020). After identifying all the problems and challenges that the fishing gear industry face, it is essential to map out the involvement level among all stakeholders with each other (Lüdeke-Freund et al. 2019). The relationship with each stakeholder is expected to be trustworthy, direct, close, regular, transparent, and maintain good product quality (Ellen MacArthur Foundation 2020).

4.5.2 Business Level

Key resources involve the identification of physical, human, financial, natural, and technological capital or solutions needed by an organisation to carry out its operation. These resources can be acquired or developed by the organisation or its key partners (Osterwalder and Pigneur 2010). Sustainable and green business solutions, eco-innovation, blue circular economy, 3D-printing technologies, and injection moulding are considered as the key resources for the fishing gear industry (Jensen 2018). Upcycling FNRCs into sunglasses, socks, clothes, skateboards, toys and surfing and fishing accessories and repurposing FNRCs into bracelets, key rings, necklaces, dog leashes, bikes, garden accessories and mats are the most innovative and sustainable solutions of FNRCs of fishing gear industry and can be seen as the outcomes of its key resources (Charter 2018). A unique circular value proposition helps in accelerating the transition of a firm towards circularity and to overcome all the challenges (Antikainen and Valkokari 2016). The unique circular value proposition for the fishing gear industry is employing multiple life strategies for fishing gear with product life-extension, modular design, reuse, repair, refurbishing, and remanufacturing (Peck 2020). The growing awareness and extensive media coverage on environmental issues, for example climate change, environmental pollution, and the use of natural resources, as well as the increase in consumer consciousness, are the growing forces that encourage all types of industry, including the fishing gear industry, to restructure its current business model and its customer segments (Antikainen and Valkokari 2016; Kraaijenhagen et al. 2016; Mentink 2014). The fishing gear industry has three types of customers; producers or manufacturers, recyclers, and aquaculture cluster (Jensen 2018). To create a unique circular value proposition, defining the key resources is not enough; mapping out all stakeholders that can be influenced or have the capability to influence the industry as a whole is important (Daou et al. 2020). For the fishing gear industry this unique circular value chain consists of four parts; universities and research centres, business units (e.g. manufacturers, recyclers, waste management companies), government units (e.g. municipalities and authorities), and civil society organisations, associations, and volunteers (e.g. beach cleaning organisations).

Firms in the fishing gear industry could promote their brands and products through various channels, such as the firms' own websites; social media platforms like Instagram, Facebook, and Twitter; campaigns like TV or billboards; online advertising platforms like Google ads or YouTube ads; direct sale, local and international trade fairs, conferences, webinars, and seminars and so on (Peck 2020). Estimating the costs of activities and the amount of resources needed for the business operations, is certainly a major responsibility (Osterwalder and Pigneur 2010). The associated costs of the fishing gear industry can be divided into two parts: fixed costs such as capital investments, research and development, depreciation, administration, disposal cost, etc. and variable costs (e.g. maintenance, labour, marketing, promotional, lifespan costs etc.) (Peck 2020). The revenue streams of a business organisation refers to the different types of income and flows generated from the value created and delivered to the market (Osterwalder and Pigneur 2010). The revenue streams of the fishing gear industry consist of selling end-of-life fishing gear to recyclers, lease agreements, incentivised return and sharing resources/platforms (Peck 2020).

4.5.3 Sustainability Impacts

The discussion regarding environmental foresights and circular economy has received special consideration when the European Commission published an action plan for the circular economy in December 2015 (Manninen et al. 2018). Considering environmental issues and responses to the environmental challenges are equally important to the responses against economic and social challenges (Kraaijenhagen et al. 2016). Some of the environmental foresights for the fishing gear industry are environmental regulations such as the Extended Producer Responsibility (EPR) schemes (Peck 2020), an EC action plan for the circular economy (First Circular Economy Action Plan 2015) and the United Nations SDGs (Sustainable Development Goals 2015). Highlighting the social foresight is as important as identifying environmental foresight (Daou et al. 2020). One of the key challenges is designing business models in such a way that it enables the firms to capture economic value for itself and delivering social and economic benefits as well (Schaltegger et al. 2012). Also, identifying social foresights and impacts through a framework and translating them into a competitive advantage helps a firm to drive sustainability innovation forward (Lüdeke-Freund et al. 2019). Some identified social foresights for the fishing gear industry are: Consumers' awareness of environmental issues and the treatment of fishing gear, customers' attitudes, and trends towards environmental and eco-friendly products, introducing new products' portfolio from waste and new entrepreneurial spirit (Charter 2018). Business model innovation is the novel way of creating, delivering, and capturing value that is achieved through a change of one, or multiple components in the business model (Osterwalder and Pigneur 2010). It is apparent that radical innovations and disruptive business models are needed to

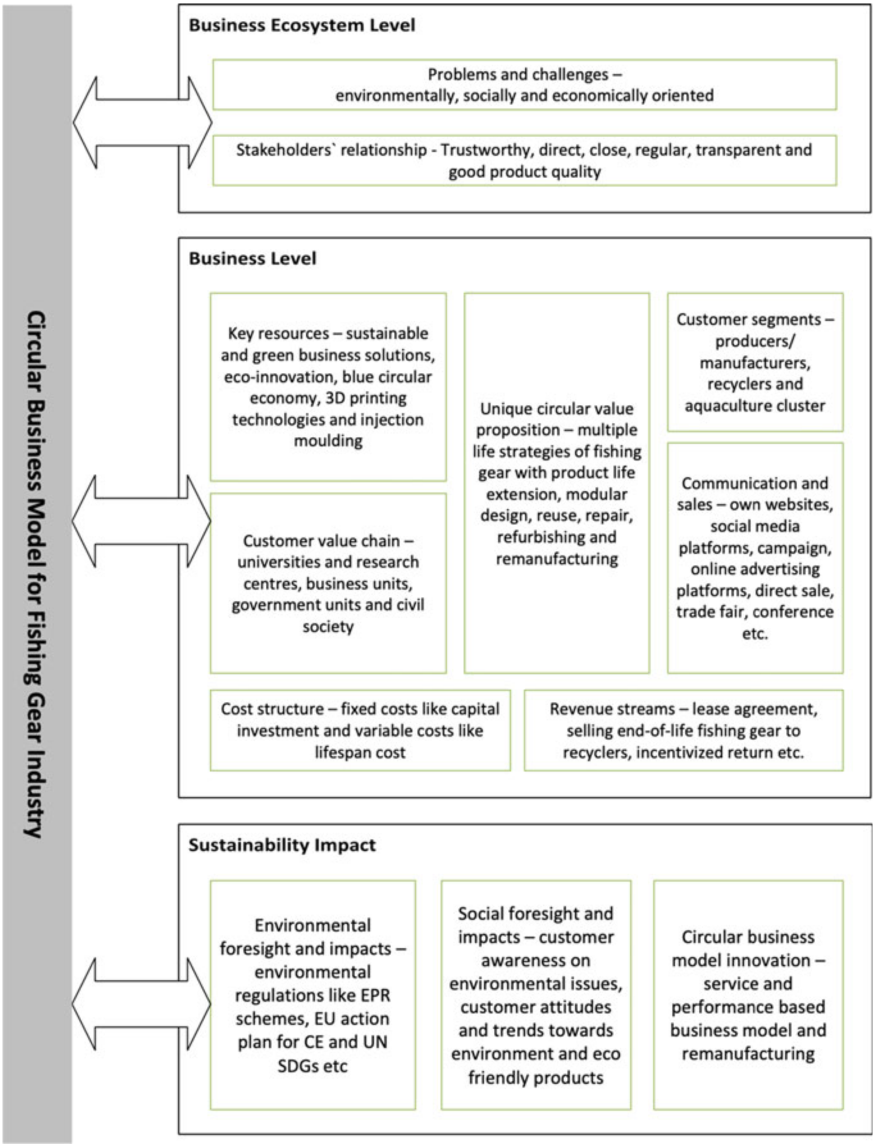

Fig. 4.5 Conceptual framework of circular business model for fishing gear industry. *Modified from* Antikainen and Valkokari (2016)

tackle current challenges and move towards the circular economy model (Boons et al. 2013). Service and performance-based business models and remanufacturing (Peck 2020) are the circular business model innovation for the fishing gear industry.

4.6 Conclusion

The objective of this chapter was to explore how circular business models for SMEs in the fishing gear industry can be achieved and to provide increased understanding of the circular business model processes of SMEs using the case study approach. The study applied a qualitative research design to explore the treatment of fishing nets, ropes, and components (FNRCs) in the context of circularity and therefore, developed a framework to evaluate the practice of circularity in the fishing gear industry. The findings from the case analyses provided unique insights on the level of circularity of SMEs within the marine plastic recycling value chain in the north-western part of Norway. Though the findings should be interpreted in the context of the limits inherent in qualitative research, the study sets the directions for future research.

Firstly, the study sample is limited to five Norwegian case firms; therefore, one should be cautious in generalising the findings. There might exist geographic biases in the conceptions of fishing gears and approaches towards circularity. The same is true for specific industry backgrounds. The criteria for the firms to be classified as SMEs was whether they had less than 100 employees (Iversen 2003). However, it could be an avenue for future research to use firms of different sizes and larger samples from other countries as well. Secondly, the findings are based on perceptions and understandings of the circular business model aspects when targeting SMEs in the fishing gear industry, which may restrict external validity. Thus, we invite future research to test our proposed models on firms from other industries. Such research can complement the findings of the study and offer a more nuanced and holistic understanding of the practice of circular business models for SMEs in other industries. Thirdly, although all types of players of the fishing gear industry (e.g. manufacturers, suppliers, and the customers) are included in the study, the complexity and degree of criticality of product portfolios are not accentuated. Therefore, caution should also be exercised in interpreting and generalising our findings. Finally, we encourage more research to continue regarding circular business models for SMEs in the fishing gear industry by focusing on the three levels; business ecosystem level, business level, and sustainability impact, which has been the central point and focus of the present study.

Appendix 1 Case Profiles

Case 1—Ørskog Plast Industri AS—Ørskog Plastindustri is one of the Scandinavia's leading manufacturers of plastic products for the construction industry. They produce among other things, reinforcement chairs, spacers, cones, and plugs. Their products are produced in recycled polyethylene / polypropylene (PE / PP). The company was established in 1986 and is located at Sjøholt in the Ålesund municipality of Møre og Romsdal, in the western part of Norway, approximately 40 kms from Ålesund city centre. The company is conducting their business in across Scandinavia and looking for agents or representatives to expand their business all over Europe. The contract details are: ØRSKOG PLASTINDUSTRI AS, Måsøyra 1, 6240 ørskog, Norway; telefon: 70 27 00 86, e-mail: post@oplast.no.

Case 2—Plasto AS—Plasto AS is another manufacturer of plastic products which started its journey in 1955. It is located in the city of Åndalsnes in the West of Norway. The company has around 40 employees. Most of the customers are based in Norway with several in the local area of Åndalsnes. However, through their customers' products, their high-end components are spread internationally. Up until the early 2000s, the company was dependent on the automotive company as a low-margin supplier to a car manufacturer. But financial difficulties resulted in a changed business model, going from standard components at low margins, to innovate and customized products at higher prices. At present, their strategy is centred on research-based innovation with special emphasis on networks and external collaboration. The company is renowned for its open attitude and willingness to commit resources to research and development (R&D) projects in collaboration with universities and research institutes. The contract details are: Raumavegen 43, 6300 Åndalsnes, Norway; telephone: T: + 47 71 22 01 00; e-mail: firmapost@plasto.no.

Case 3—NOPREC AS—In the summer of 2017, Norwegian Plastic Recycling AS (NOPREC) launched the brand-new granulation line at Matmortua. After testing and fine-tuning the plant, high-quality plastic raw material is now produced from discarded fish firms, feed bags and hoses from the aquaculture industry and ropes, plastic cans, and other plastic waste from the fishing industry. The facility is co-located with Containerservice Ottersøy AS on Matmortua. This makes it possible to control and track the waste from the time it is reported by the customer until it is transported out as plastic granules, finished recycled raw material. The company also run research and development (R&D) projects with small and large partners and want to contribute to driving the Norwegian circular economy forward by driving plastic waste from Norway back into Norwegian plastic production. Their contact details are: Matmortua, Foldavegen 6012, 7940 Ottersøy, Norway; telephone: + 47 743 97 333.

Case 4—Replast AS—Replast AS was established in 2017 as a project group, the company springs from a long-term vision of being able to recycle plastic waste where it is generated. The company recycles plastic in various formats. They work directly with manufacturers, collectors, municipalities, and private actors. The firm is also part of several research projects that will further, and improve, the qualities of reproduced raw materials within this industry. They work closely with several players and manufacturers to increase the quality and credibility of using reproduced material. This is something they believe is absolutely necessary for today's requirements for quality and volume to match manufacturers' needs in the future. The firm comes from the western part of Norway, and their contact details are - Replast AS, 114 Husøyvegen, Frei, Møre og Romsdal, 6520, Norway, Phone: + 47 413 99 540, E-mail: post@replast.no.

Case 5—AKVA Group—AKVA group is present in all markets with offices in Norway, Chile, Denmark, Scotland, Spain, Greece, Iceland, Canada, Australia, and Turkey. AKVA Group is a unique partner with the capability to offer both sea-based and land-based aquaculture operations with complete technical solutions and service. It is a global technology and service partner that deliver technology and services that help solve biological challenges within the aquaculture industry. The contact details of the company are: Plogfabrikkvegen 11, N-4353 Klepp stasjon, Norway, mail address: P.O. Box 8057, N-4068 Stavanger, Norway; phone: + 47 51 77 85 00.

Appendix 2 Interview Guide Questions Operationalising Circular Business Model Themes

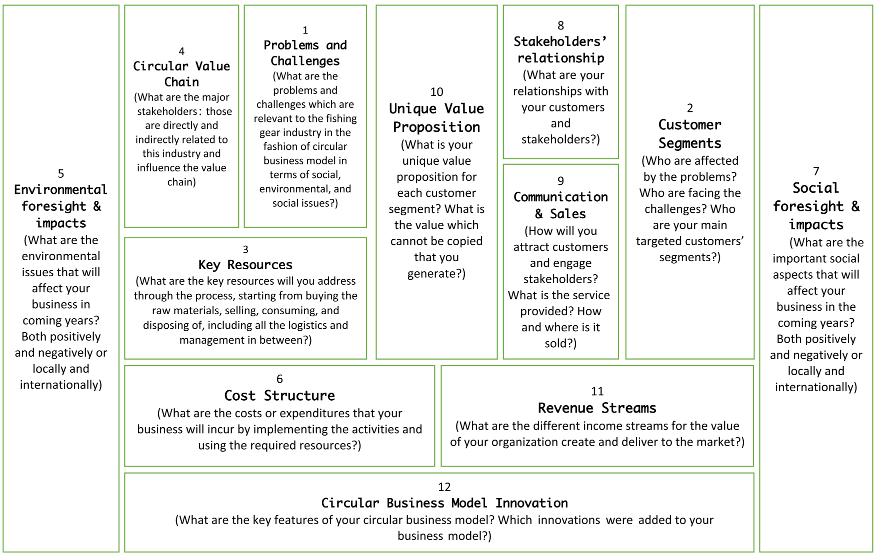

Figure: Researchers' own Circular Business Model Canvas for Fishing Gear Industry inspired by Osterwalder & Pigneur's business model canvas

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