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CIRCULAR BUSINESS MODEL AS AN ENVIRONMENTAL SOLUTION TO DE-CARBONIZATION

Case: Cruise Ship Market of Wärtsilä Oy

International Business
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ABSTRACT

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Decarbonization is becoming one of the global concerns, especially for those companies which are operating in manufacturing and heavy industry. The transition from a linear business model to circular business model, therefore, is considered as one of the solutions to the matter. This research aims at studying the circular business model adopted by one of the most influencing actors in Finnish heavy industry, Wärtsilä.

The research mainly employed the theory of circular economy and circular business model in order to directly approach the subject of the study. Basically, the qualitative method was applied through interview and desk research due to time constraint and limited materials on similar research.

The results presented in this study is based on the interview conducted with the managing director in the maritime solution of Wärtsilä. Therefore, the quality of the results are reliable and can be a well-grounded resource for further projects or academic studies.

Keywords CBM, Circular Business Models, Circular Economy, Environmental solution, decarbonization, cruise ship market, Wärtsilä

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Thanks to the support of Supervisor Thomas Sabel, the contribution of Mr. Vesa Marttinen who is the Managing Director, Eniram at Wärtsilä Voyag, Wärtsilä Finland Oy, the help of Lecturer Teemu Myllylä, and Lecturer Kodjovi Lotchi, the research is done successfully. Without them, there might be huge obstacles in acquiring qualitative data for the thesis.

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1 -INTRODUCTION

1.1 Background of The Study

Circular Economy is becoming more widely accepted as a feasible solution to the issue of sustainable growth. It is hoped that an economic system that minimizes resource input and waste, pollution, and energy leakage out of the system would reduce negative effects while maintaining development and prosperity. This research analyses the long-term feasibility of circular business models (CBM) and circular economies of scale, which are needed to put the idea into practice at an organizational level and proposes a structure for incorporating CBM and circular supply chain management for long-term growth. The study was created using theoretical backgrounds and a case study – Wärtsilä Finland Oy. Closing loops, slowing loops, intensifying loops, narrowing loops, and dematerializing loops are all examples of how different circular business models drive circular supply chains in different loops. The complexity of the circular supply chain and the value proposition of the established circular business models differ. Circular market and circular supply chains, according to our study, aid in achieving sustainability goals.

Sustainable development aims to meet current needs without jeopardizing future generations' abilities to fulfil their potential (WCED 1987), thereby taking into account resource constraints in the face of human development (Meadows et al. 1972; Meadows, Randers, and Meadows, 2004), as well as synergies and trade-offs between economic, environmental, and social priorities (Meadows et al. 1972; Meadows, Randers, and Meadows, 2004). (Elkington 1997). The United Nations proposed 17 sustainable development goals (SDGs) to be reached by 2030, based on the previous Millennium Goals, including problems such as poverty, gender equality, and sustainable cities, among others (United Nations, 2015).

The philosophy of the Circular Economy is gaining momentum as a full or partial solution to these problems to counter sustainable growth (Geissdoerfer et al., 2017a). It is hoped that environmental impact can be minimized without compromising development and prosperity with an economic system that minimizes resource input and waste, pollution, and energy leakage out of the system (Bakker et al., 2014; European Commission, 2014;

Evans, 2009; Webster, 2015). According to Andersen (2007) and Su et al., the concept of Circular Economy was first proposed by David Pearce in 1990. (2013).

With the emergence of technology revenue mechanisms that accompanied the emergence of e-commerce in the 1990s, the business model model became prominent (Magretta, 2002; Osterwalder and Pigneur, 2005; Zott et al., 2011). It was first used in this sense to pitch investors clear yet detailed business concepts in a short period of time (Knyphausen-Aufseß and Meinhardt, 2002).

1.2 Thesis Focus and Significance

As the demand and awareness in environmental sustainability grows, the issue of controlling and minimizing the GHG emissions is substantially important. Particularly for the companies in heavy manufacturing industry, adopting appropriate business model can help creating values and reducing waste more effectively. The thesis topic is built with the focus on analyzing and solving those matters.

The scope of research covers the theme of adopting CBM, from the enterprise perspective, in the period of transition from linear economy to circular economy with the aim of decarbonization in heavy industry. Wärtsilä is selected as the case study. The CBM of the company for its cruise ship market will be analyzed and discussed to identify a contemporary solution to the demand of minimizing GHG emissions.

This thesis will contribute to the awareness in the importance of circular economy business model in improving the environment and social sustainability. Also, its practical value is developed through suggestions of possible solutions for the case company. The insights into the value creation process of CBM are generated. This can be reliable sources for further academic research.

1.3 Objective of The Study

Circular economy is based on the principle of putting private industry to work in the pursuit of a more sustainable society. In this context, the idea of Failed Value Exchanges is critical; it indicates that by realizing value that is either lost, wasted, not internalized, or

not provided amid consumer demand, businesses may theoretically support society while obtaining a competitive advantage (Yang et al., 2016). We see business model development as a crucial tool for incorporating these improvements into organizations because of the structure's usefulness in evaluating, structuring, organizing, and interacting in the face of increasing complexity of organizational configurations and a rising number of stakeholders (Doleski, 2015; KnyphausenAufsess and Meinhardt, 2002).

We describe business models as simplistic representations of the elements of a complex organizational structure and their interrelationships based on these comparative approaches. It defines the organization's value proposition, value development and distribution, and value capture, as well as concentrating on research, preparation, and communication in the face of growing complexity. Several other methods consider the organizational context and value network to varying degrees (Geissdoerfer et al., under review).

The definition of circular business models (CBM) is a term used to define business models that are adapted for the Circular Economy by integrating elements that slow, narrow, and close resource loops, allowing the resource input into the organization and its value to be segregated (Bocken et al., 2016).

The value creation and distribution aspect are arguably the most significant difference between traditional business models and those designed for the Circular Economy. We investigate an effective circular business model for Wärtsilä Öy which improves the environmental issues by reducing decarbonization in the cruise ship market.

The main questions of the research are:

- Which CBM has Wärtsilä as an equipment manufacturer applied to its cruise ship customers?
- What are the benefits and challenges in the process of adopting its CBM?
- Is there any suggestion on a new CBM that Wärtsilä should apply or on the improvements for the company’s current business model to minimize GHG emission?

1.4 Structure of The Thesis

The thesis is divided into five principal parts with a Reference List of materials used during the research, and the Appendices of empirical questions for the interview.

Part 1 – Introduction: The thesis topic is introduced on a general level in order to provide a common knowledge on the topic and explanation on why the topic is significant to be concerned. This part is done through sub-sections of preliminary background information where the topic is placed in a broader context, the thesis scope and relevance, its importance and values contributed to the related fields, the objectives and research questions, finally an overview of the thesis structure.

Part 2 – Theoretical Framework: The most relevant theories and key concepts are defined, discussed, and analyzed in order to establish the foundation for approaching the practical study as well as interpreting results. In this thesis, the reviewed theories focus on Circular Economy and Circular Business Models.

Part 3 – Empirical Study: In this section, the methodology of how the research is conducted will be presented in order to assure the extent of the research validity and reliability. This covers the subjects of research types, data collection methods, and analysis of the case study which is Wärtsilä.

Part 4 – Results: The main findings are reported with objective and concise observations as the answers to the research questions that were discussed in the Introduction. The results are described with the support of both literature and empirical studies.

Part 5 – Discussion and Conclusion: This last part of the thesis explains and evaluate the meaning, importance, and relevance of the results, presenting the connection with theoretical framework and the research objectives. The implications for International Business are interpreted, together with a summary of the thesis, its limitations, and further suggestions for future research.

2 THEORETICAL BACKGROUND

2.1 Two Types of Economy Models

- **Concept (Methods of Implementation) and Drivers**

Circular development is an economic, social, and environmental production and consumption model with the goal of creating a circular society (ICLEI Africa, 2021). To protect society from pollution, it aims to create recyclable and renewable capital (ICLEI Africa, 2021). The aim is to be able to create a circular model rather than a linear and wasteful one (L'économie Circulaire, 2020). The circular economy is at the heart of this modern way of life. The goal is to help economies and communities in general become more self-sufficient, resilient, and aware of environmental issues. Closing loops by recycling and remanufacturing; slowing loops by increasing the working life of goods and products; and narrowing loops through using natural resources and goods more effectively within the linear system (e.g., houses and cars) are all part of the circular economy (McCarthy, Dellink and Bibas, 2018).

For policymakers and a broad variety of stakeholders, the circular economy now reflects a modern socio-economic paradigm. It's all about finance, creativity, and competition in the circular economy. As such, it entails improvements in production and use models, eco-design, and integrated planning in addition to waste management and recycling. Industry, universities, and governments should encourage creativity to address the Anthropocene's accumulated legacy waste (such as plastic in the oceans) (Stahel, 2010). Despite this, most businesses prioritize waste management in their internal processes and invest less in product design to maximize reuse, repair, or maintenance (EEA, 2019). Cities and countries, on the other hand, often misinterpret the circular economy as a synonym for recycling, overlooking the structural perspective. The collective capacity to transform to a circular economy, an economic model that uses energy and materials rather than using them up, is the answer to the major challenges cities and regions pose in terms of resource supply, GHG pollution, and waste generation (OECD, 2019).

The circular economy has the potential to contribute to long-term growth. The circular economy approach is a fascinating implementation vehicle for Sustainable Development Goal (SDG) 12, which pledges for more sustainable and responsible consumption and production patterns, by encouraging a rethinking of business models that include producing more robust and recyclable products, reusing resources in the production cycle, and fostering more responsible consumption. Furthermore, it is equally essential for achieving SDGs 6 (water), 7 (energy), 11 (sustainable cities and communities), 13 (climate action), and 15 (sustainable development).

Climate change, global agendas, and economic shifts are significant factors for surveyed cities and regions to move to a circular economy, according to the findings of the OECD Survey on the Circular Economy in Cities and Regions (OECD Survey, 2020) (Figure 1).

The ecosystem (73%), structural (52%), and socio-economic factors all play a role in the transition to a circular economy (changing economic conditions, 51%). Furthermore, work growth (47%), private sector initiatives (46%), new business models (43%), technological innovations (43%), and research and development (R&D) (41%) all contribute to the circular change (Figure 2). “Climate change,” “zero waste,” and “innovation” are the highest ranked keywords respondents identify with the circular economy in cities and regions.

Figure 1. Map of cities and regions surveyed

Note: Based on the 51 cities and regions that completed the OECD Survey on the Circular Economy in Cities and Regions. Source: OECD (2020), *OECD Survey on the Circular Economy in Cities and Regions*, OECD, Paris.

Note: Results based on a sample of 51 respondents that indicated the drivers being "Very relevant" and "Relevant". Source: OECD (2020), OECD Survey on the Circular Economy in Cities and Regions, OECD, Paris.

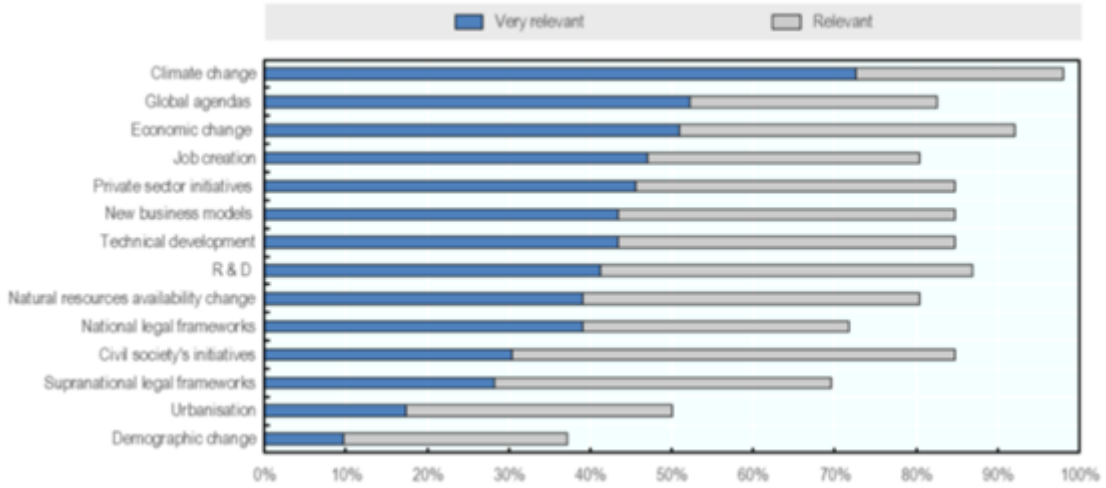


Figure 2. Drivers of the circular economy in surveyed cities and regions

The circular economy is a business philosophy that is related to sustainable development and the green economy, but goes beyond them. Indeed, rather than focusing solely on reducing industry's environmental effects and waste, it seeks to manufacture products and services by focusing on the long-term management of raw materials and energy sources ((L'économie Circulaire, 2020). In other words, the aim is to make the economy as circular as possible (Ellen Macarthur Foundation, 2021), by considering new processes and strategies for resource optimization, usage, and waste (ICLEI Africa, 2021). The definition of the circular economy, on the other hand, remains a point of contention since there is no single, official definition, leaving space for various interpretations. Both concepts, however, agree on the value of planning, manufacturing, and consuming in a sustainable manner. Its goal is to move our society toward a more circular economy while balancing environmental, economic, and social concerns. The circular economy is constructed on

seven core principles: sustainable procurement, eco-design, industrial and territorial ecology, the economy of functionality, responsible use, lifetime extension, waste reduction, management, and recycling (Le Mercredi, 2020).

In collaboration with economic actors, consumers, people, and civil society organizations, the Circular Economy Action Plan offers a future-oriented agenda for achieving a cleaner and more sustainable Europe. Its aim is to accelerate the transformational change demanded by the European Green Deal while building on circular economy actions already in place since 2015 (COM, 2015). The strategy would ensure that the regulatory system is simplified and made ready for a long-term future, that potential opportunities from the transition are maximized, and that people and companies are burdened as little as possible. The plan lays out a series of interconnected policies aimed at establishing a clear and consistent product policy structure that will make sustainable goods, services, and business models the standard, as well as change consumption habits so that no waste is created in the first place. This product policy structure will be gradually implemented, with main product value chains receiving priority attention. Additional steps will be implemented to minimize waste and ensure that the EU's internal market for high-quality secondary raw materials is well-functioning. The EU's ability to take responsibility for its waste would be bolstered as well. By working alone, Europe would not be able to make transformative reform. At the global level (SWD, 2020), the EU will continue to lead the way toward a circular economy, using its authority, experience, and financial capital to help achieve the 2030 Sustainable Development Goals. The strategy seeks to ensure that the circular economy benefits individuals, countries, and communities, contributes completely to climate neutrality, and fully utilizes the potential of science, creativity, and digitalization. It envisions the continued creation of a sound monitoring system that will help to measure well-being in ways other than GDP.

- **Difference between Circular Economy and Linear Economy**

From the beginning of the industrial revolution to the middle of the nineteenth century, the industrial model has been based on LE (Linear Economy) as the cultural and economic driver of our civilization.

The industrial revolution was characterized by a one-best approach or linear model of production and use, in which goods are fabricated from raw materials, sold, used, and then discarded as waste, from the industrial revolution to the middle of the 900s. Many countries in southern Europe deposit their garbage in open landfills. Businesses are finding ways to reuse goods or their components in order to restore some of their valuable material, resources, and labor inputs as part of their search for a major increase in resource efficiency across the economy. As previously stated, LE and production are described as businesses that gather natural and agricultural resources and extract materials, then use those materials to produce a commodity that is sold to a customer who then discards it as waste when it is no longer required. In reality, approximately 65 billion tons of raw materials entered the economy in 2010, with this figure projected to rise to about 82 billion tons by 2020 (Ellen MacArthur Foundation, 2012). So, how many times will this economy be sustained dependent on a single shot? Plenty of fiscal, cultural, and social indicators point to the fact that the linear current economic system is in serious trouble.

Other indicators say that the linear model's influence is diminishing businesses are giving more attention to financial patterns than to output. In relation to both of these various factors, there is a growing presence of literature review regarding the limits of LE. Some focus points have been established in the literature, particularly in relation to financial crises linked to linear production crises. Meanwhile, research on global problems and linear economies has highlighted a few key points. Both methods illustrate the fact that linear markets and development have hit their limits.

The circular and linear systems vary in how value is generated and sustained. The standard “take-make-dispose” step-by-step strategy is followed in a linear economy. This implies that raw materials are collected, then converted into useful items before being discarded as waste. In this economic system, value is produced by creating and selling as many times as possible.

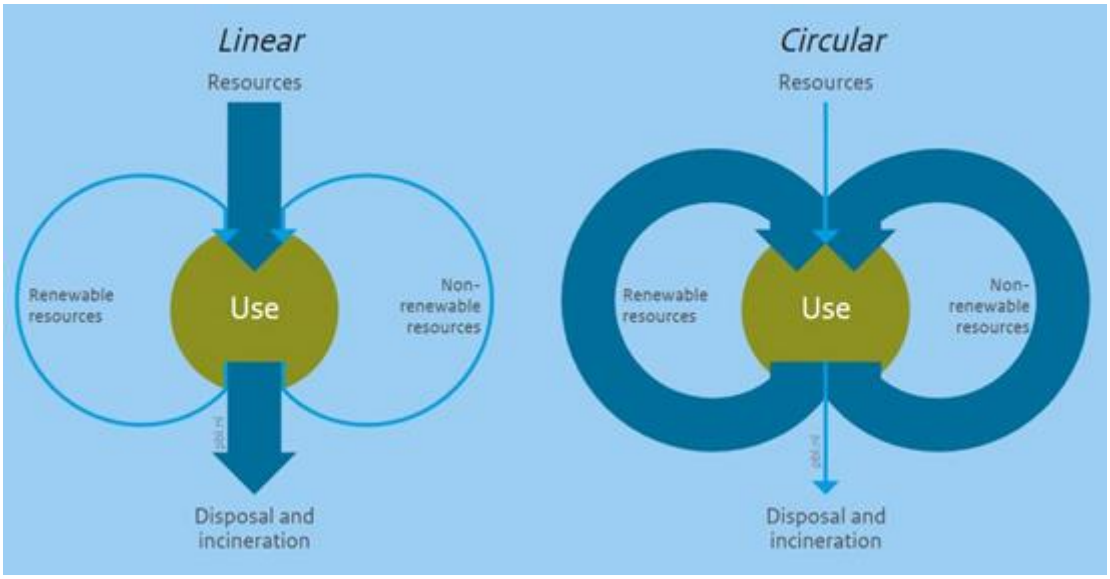


Figure 3. The large reuse of raw materials in a circular economy (PBL, 2019a)

The integration of two distinct models is obvious: the circular economy business model naturally requires a deep change in the organization of production and application of usage habits in order to enable free flow of goods in the economy for longer industrial processes, through instruments such as re-design and stimulating a cascade use of materials. As reported in Europe 2020, pointed literature, and as recalled in some foundation reports [CE], a chance to rethink our economic future should be developed understanding circular economy. Specifically, literature beginning with the cradle-to-cradle approach, followed by industrial ecology, natural capital. Sustainable architecture, progressive resource productivity, biomimicry, by-product synergy, computational food chains, and industrial symbiosis are all related terms. Many of these analysts and economic viewpoints have stressed the value of moving from a linear to a circular economy.

There are many industries adopting a circular economy, especially textile industry, construction industry, automotive industry, logistics industry, agriculture and furniture industry. In the textiles industry, a circular economy refers to the process of continuously recycling clothes and fibbers to re-enter the economy as much as possible rather than ending up as waste. Circular campaigns, such as apparel rental start-ups, are gaining popularity in the EU and the United States. Rental providers use a circular business model to rent out casual apparel, baby wear, and maternity wear. Palanta uses a 'pay as you rent'

model (Palanta, 2020), while Rent The Runway and Le Tote use fixed monthly subscriptions. One of the world's biggest waste producers is the building industry. The circular economy appears to be a viable option for reducing the industry's environmental effects. Construction is critical to the European Union's and its member states' economies. It supports 18 million direct jobs and accounts for around 9% of the EU's GDP (European Commission, 2016). The use of non-renewable resources and the production of contaminant residues, both of which are increasing at an alarming rate, are the primary causes of construction's environmental effects (Journal of EU Research in Business, 2018). The circular economy is gaining traction in the automotive industry. According to a 2016 Accenture study, the circular economy could redefine competitiveness in the automotive sector in terms of price, efficiency, and convenience, doubling sales by 2030 and lowering cost base by up to 14%. So far, it has mostly manifested itself in the use of recycled-content components, remanufacturing of car parts, and examining modern car design. Several statistics suggest that freight transport will increase globally, affecting the environmental impacts of global warming potential and posing a challenge to the logistics industry. However, the Dutch Council for the Environment and Infrastructure (Dutch acronym: Rli) has proposed a new framework under which it suggests that the logistics industry should provide other services (Nicole et al, 2016). The Netherlands plans to transition to a fully circular economy by 2050, which includes a change to circular agriculture (kringlooplandbouw). By 2030, this transition would have resulted in a "sustainable and strong agriculture." Since the majority of items in the furniture industry are passive durable, adopting strategies and business models that prolong the lifespan of the products (such as repairing and remanufacturing) has lower environmental impacts and lower costs (Kaddoura et al, 2019). Companies like GGMS are helping to promote a circular furniture approach by refurbishing and reupholstering pieces for reuse.

Towards the Circular Economy: Economic and Business Rationale for an Accelerated Transition was published in 2013. The study, commissioned by the Ellen MacArthur Foundation and produced by McKinsey & Company, was truly revolutionary to look at the economic and business opportunities for moving to a restorative, circular model. The study details the potential for major benefits across the EU using product case studies and economy-wide research. It claims that by 2025, a subset of the EU manufacturing sector

will save $630 billion in net materials costs, boosting economic activity in the areas of product production, remanufacturing, and refurbishment. Skills in circular design and development, new business models, skills in creating cascades and reverse cycles, and cross-cycle/cross-sector collaboration are all listed as key building blocks in the transition to a circular economy in Towards the Circular Economy (Ellen MacAuthur Foundation, 2013). In 2015, WRAP and the Green Alliance published a study titled "Jobs and the Circular Economy: Job Development in a More Resource Productive Britain," which looked at various public policy scenarios up to 2030. It is estimated that without any policy changes, 200,000 new jobs will be generated, resulting in a 54,000 reduction in unemployment. A more ambitious policy scenario could result in the creation of 500,000 new jobs and a permanent reduction of 102,000 jobs.

- **Circular Economy in Finland and Europe**

- Circular Economy in Europe

The EU's latest circular action plan paves the way for a more environmentally friendly and sustainable Europe. In March 2020, the European Commission approved a new circular economy action plan (CEAP). It's one of the cornerstones of the European Green Deal, the EU's latest plan for long-term development. The EU's move to a circular economy would relieve pressure on natural resources while also generating long-term growth and employment opportunities. It's also a requirement for meeting the EU's 2050 climate neutrality target and halting biodiversity loss. The new action plan details strategies that span the entire product life cycle. It aims to avoid waste and keep capital used in the EU economy for as long as possible by focusing on product design, promoting circular economy processes, and encouraging sustainable consumption. It implements legislative and non-legislative initiatives that are aimed at areas where EU action adds real value.

The European Union has been concerned about environmental change problems since 2006, and has translated these concerns into directives and regulations. In this regard, three essential laws should be mentioned: The Ecodesign Framework Directive; The Waste Framework Directive; The Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation. The European Union's Ecodesign Directive (Directive

2009/125/EC) provides a mechanism for establishing mandatory ecological standards for all 28 Member States' energy-using and energy-related commodities. Its current scope includes more than 40 product classes (such as boilers, lightbulbs, televisions, and refrigerators), which account for roughly 40% of all EU greenhouse gas emissions. The Ecodesign Directive's goal is to require energy-using product (EuP) manufacturers to reduce energy usage and other negative environmental impacts during the design stage. While the Directive's primary goal is to minimize energy use, it also aims to enforce other environmental considerations such as the use of materials, water, polluting emissions, waste management, and recyclability. The Waste Framework Directive (WFD) is a European Union directive enacted on June 17, 2008, that aims to "protect the environment and human health by preventing or reducing the negative effects of waste generation and management, as well as by reducing overall resource use impacts and improving resource efficiency." The WFD's aim was to lay the groundwork for the EU to become a recycling society. The European Waste Hierarchy is one of the WFD's functions. REACH (Registration, Evaluation, Authorization, and Restriction of Chemicals) is a European Union regulation that became effective on December 18, 2006. REACH is a European Union regulation that regulates the manufacture and use of chemical substances, as well as their possible effects on human health and the environment. REACH regulates all chemicals imported or manufactured in the European Union. The European Chemicals Agency will oversee the REACH system's technical, scientific, and administrative aspects. REACH's aim is to enhance the conservation of human health and the environment by identifying chemical substances' intrinsic properties. At the same time, the EU chemicals industry's creative capacity and competitiveness should be enhanced.

- Circular Economy in Finland

Circular Economy is not a new topic in Finland, but it is hot global concern. Being aware of this, Finland has realized its opportunities and potentials from the early days and has conducted ambitious plan as well as roadmap in order to achieve favourable outcome.

According to an independent Finnish Innovation Fund, Finland national economy can reach a value potential of EUR 1.5 – 2.5 billion owing to circular economy by 2030. (Sitra 2015: 3)

Paper industry and modularity in production created energy efficiency, being typical example for success stories of circular economy in Finland. Recycling waste and use of side streams seemed to be the focus areas of value creation. However, it should be maintenance, reuse or remanufacturing which provide the best opportunities as it was proved that recycling is not processed until there is no other method of value recovery found (Sitra 2015: 3). Therefore, prevention measures of value loss are more prioritized compared to maximizing the value created from waste.

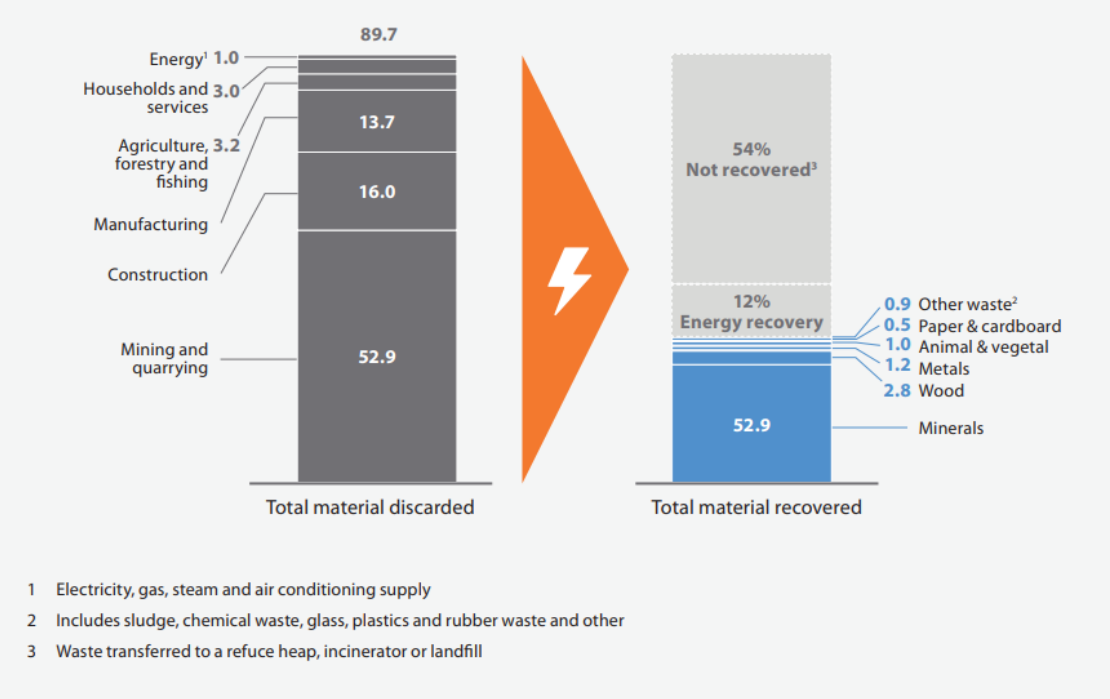


Figure 4. Total waste collected in Finland 2012 (Million tonnes)

The amount of waste produced in 2012 in Finland is estimated under 90 million tonnes, however more than half of which (54%) is not reused or recycled, nearly 12% of which was used for energy, and the rest 34% of which was reused (Statistics Finland 2012). This number was low compared to the average amount of collected waste which was reused in other developed countries (40%) (Figure 4).

In the latest update information from Statistics Finland, the total amount of waste generated in this country in 2018 was 128 million tonnes, increased by 11 million tonnes from 2017. Mineral waste accounted for the largest amount of waste collected (Figure 5).

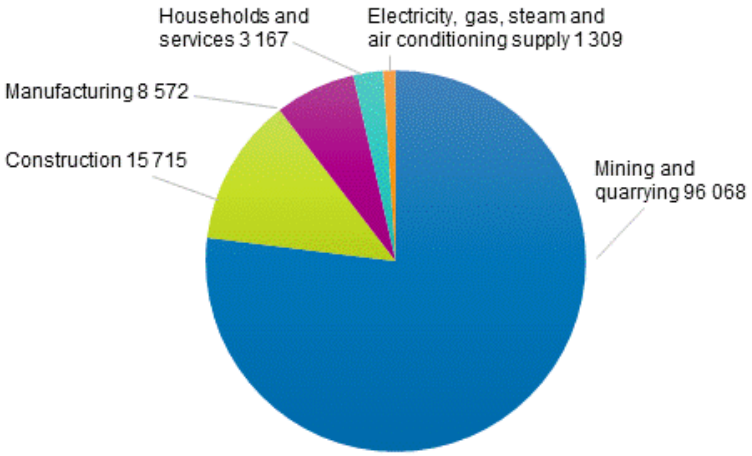


Figure 5. Total waste collected, by sector and type 2018 (thousand tonnes)

Mineral waste is also the type of waste mostly reused or recycled. It can be utilized as material or in earthworks (Statistics Finland 2018). Other than mineral waste, 61% of total waste was treated for energy recovery, around 30% was used for material recovery, and 5% was ended up at landfills (Figure 6).

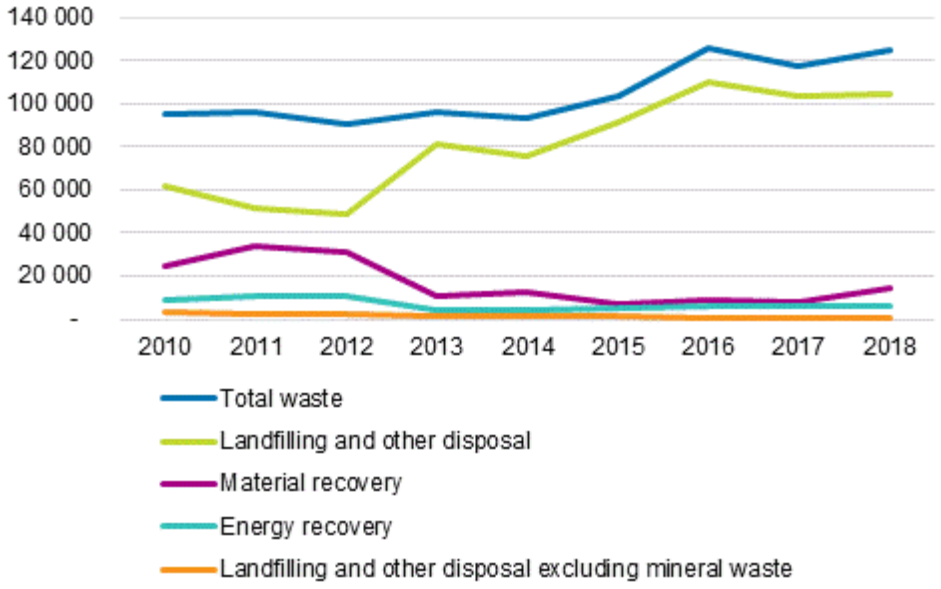


Figure 6. Methods of waste treatment 2010-2018 (thousand tonnes per year)

Sitra indicated that value is lost mainly in these three leakage points. Firstly, in the production stage, the value is lost because of "sub-optimal material efficiency". Secondly, the value can be lost in several economic activities namely consumption or use. Finally, it also can be lost even in the recycle stage of raw material since the product could still be reused. Therefore, the way in which value is saved effectively is substantially important.

Circular economy has become one of the strategic programmes of the Finnish Government as it helps stimulate the "sustainable economic growth, creation of new jobs, funding of public services and social security" which are main concerns and objectives of the Government. Finland gains the advantage of being leader in bioeconomy, cleantech, and innovation investment creating favourable environment for the operation of circular economy.

In terms of national promotion and support for circular economy, there are companies, agencies, universities and institutes which actively operate and collaborate with large budgets.

One of them is commonly mentioned, Sitra, working under the Finnish Parliament. The aim of the organization is to encourage economic growth, wealth and sustainable welfare of Finnish society. Its cooperative partners vary from companies, municipalities, to households and public administration. Sitra vision and goals are established and attained through providing societal training and foresight, serving the purpose of improving future knowledge, preparing for change and promoting cooperation.

Tekes is a Funding Agency for Innovation of the Finnish Government. The organization invests in research, development, and innovation (RDI) through R&D projects with other enterprises, universities, and research centres in order to exploit enduring potential benefits for the national economy and society.

Motiva Ltd is a Finnish state-owned enterprise (SOE) that promotes the use of green energy in communities covering companies and consumers. Together with its subsidiary,

Motiva Services Ltd, this SOE supplies consultancy and training services, and administers the establishment of the Energy Efficient Agreement.

Motiva created partnership with Sitra in developing FISS (Finnish Industrial Symbiosis System). FISS is a resource-efficient model adjusted based on the success of NISP which is a British National Industrial Symbiosis Programme (Figure 7). The aims of FISS involve reduction in usage of natural resources, value creation through waste reuse, and increasing new business opportunities and collaboration for energy efficiency and cleantech.

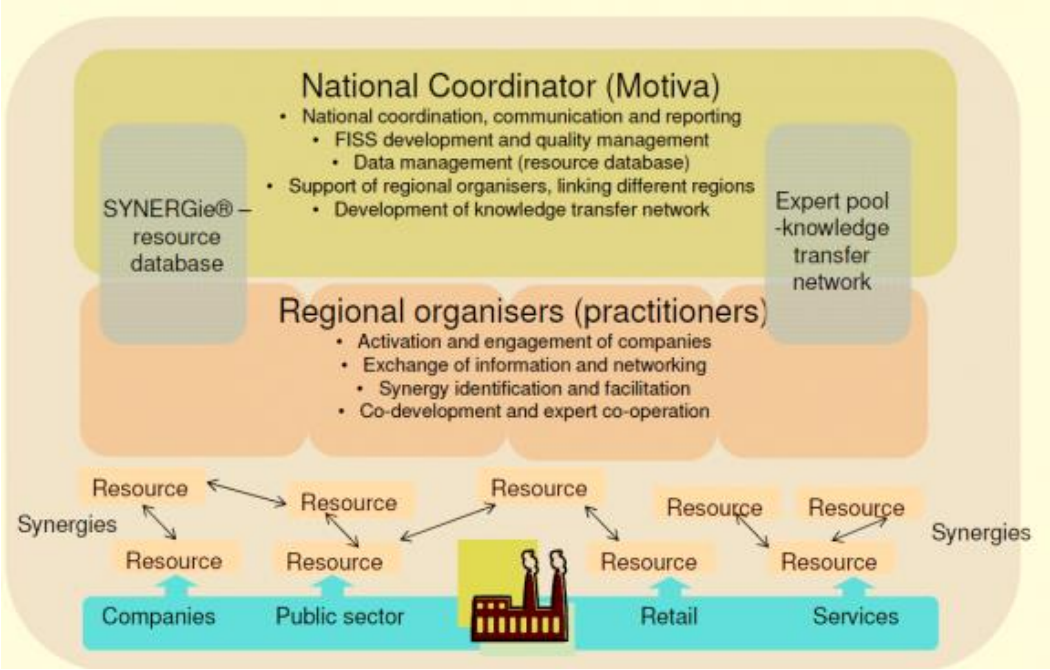


Figure 7. Finnish Industrial Symbiosis System (Paula Eskola, Motiva Oy)

The core of industrial symbiosis in the Kujala Waste Centre in Lahti is Päijät-Häme Waste Disposal Company (PHJ). The company collaborated with Lahti City in order to strengthen the operations of Kujala Waste Centre and generate renewable energy (Figure 8). Its strategy in 2020 is addressed to support the key goal of increasing value added. Doing so, the collected waste can be treated and turned into “saleable products”. The objective of PHJ is to enable 50% of total municipal waste recycled meanwhile the amount of bio-waste is increased within cost effectiveness.

At PHJ, material is recycled, and energy is recovered, opportunities for new businesses are provided. Its landfill gas is used by Lahti Energia company for serving energy to the premises of PHJ and Hartwall which is a nearby beverage producer (FISS 2015).

Under the Paris Agreement on Climate Change and the Agenda 2030 Sustainable Development Goals, Finland followed its strategic programme to promote circular economy in terms of resource efficiency and carbon neutralization in numerous international policy forums. This is illustrated through an event of trade promotion services by the Team Finland, where the knowledge and network with the global actors in circular economy are provided to the companies and exporters. Also, a session was organized in the WCEF2019 with the collaboration between Finland and the African Development Bank in order to support circular economy transition in developing countries, help tackling social issues and creating jobs.

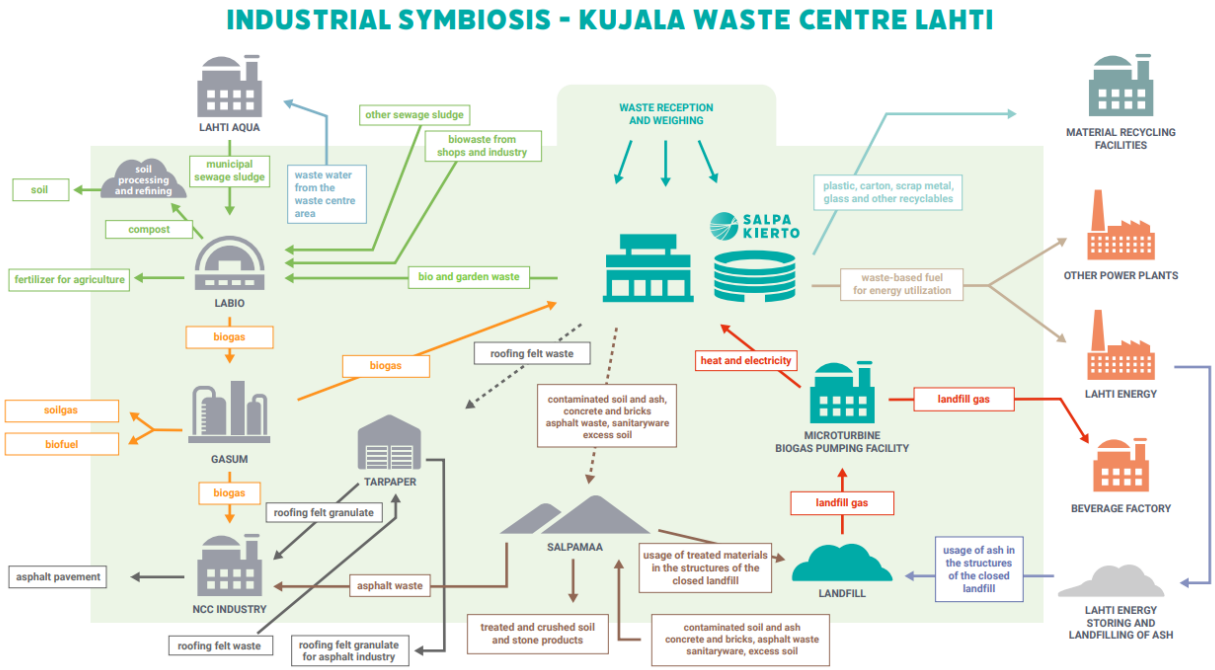


Figure 8. Kujala Industrial Symbiosis, Finland (Salpakierto, 2021)

- **Potential Benefits**

- Environmental Dimension

The scarcity of basic resources such as oil, copper, silver, cobalt, and lithium is getting more severe and estimated to be depleted in the next five to ten decades. Besides this issue, water is considered of an environmental concern. It is predicted that in 2050, at least 40 percent of the world population will be at risk of suffering from serious shortage of water. The threat of greenhouse gas emissions caused my human also increases and ruins the nature lives of the ocean, forest, and atmosphere. Together with the environmental issue of waste generation, these matters can affect adversely the geopolitical tensions and instability (Anquilar-virgen, 2010).

According to the study of Cambridge Econometrics & BIO Intelligence Service (2014), 25% of GHG emissions can be reduced by 2030 when the EU's resource productivity is improved by 3%. Particularly, in the sectors of food, textiles, and furniture, implementation of circular economy approaches can help avoid 56.5 Mt to 96.5 Mt (Million metric tonnes) of GHG emissions by 2025 and 74.6 Mt to 115.0 Mt by 2030, estimated by the European Environmental Bureau EEB (2014). This organization also indicates that reuse in those sectors could save the water-use of 26.1 Ml to 52.2 Ml by 2025 and 34.8 Ml to 60.9 Ml by 2030.

In the research of Ellen MacArthur Foundation & SYSTEMIQ (2017), there are three sectors in which the value chains accounted for 80% of resource use and 60% of consumer spending. They are mobility, food, and built environment sectors. The circular economy in these sectors can bring benefit of decarbonization nearly 48% by 2030 and 83% by 2050, according to the Ellen MacArthur Foundation & McKinsey Center for Business and Environment (2015). Also, the GHG emissions by the primary-material consumption can be minimized around 32% by 2030 and 53% by 2050.

A potential benefit of 2% to 4% cutback in total annual GHG emissions in the EU can be achieved through developing resource efficiency in the sectors of food services, food and drink, manufacturing, fabricated metal products, and hospitality (Lawton et al., 2013).

In the strategies towards circular economy mentioned by Wijkman & Skånberg (2015), at national level, integrating these strategies effectively can help reduce 68% in CO2 emissions in Finland by 2030.

The main benefits of transition to a circular economy, overall, include the cutback in raw materials use, carbon and GHG emissions, and the minimization of waste (Chileshe et al., 2016). Circular economy strategies in materials efficiency and resource productivity can mitigate global emissions by 333 out of 918 billion tonnes from 2015 to 2100 (Figure 9).

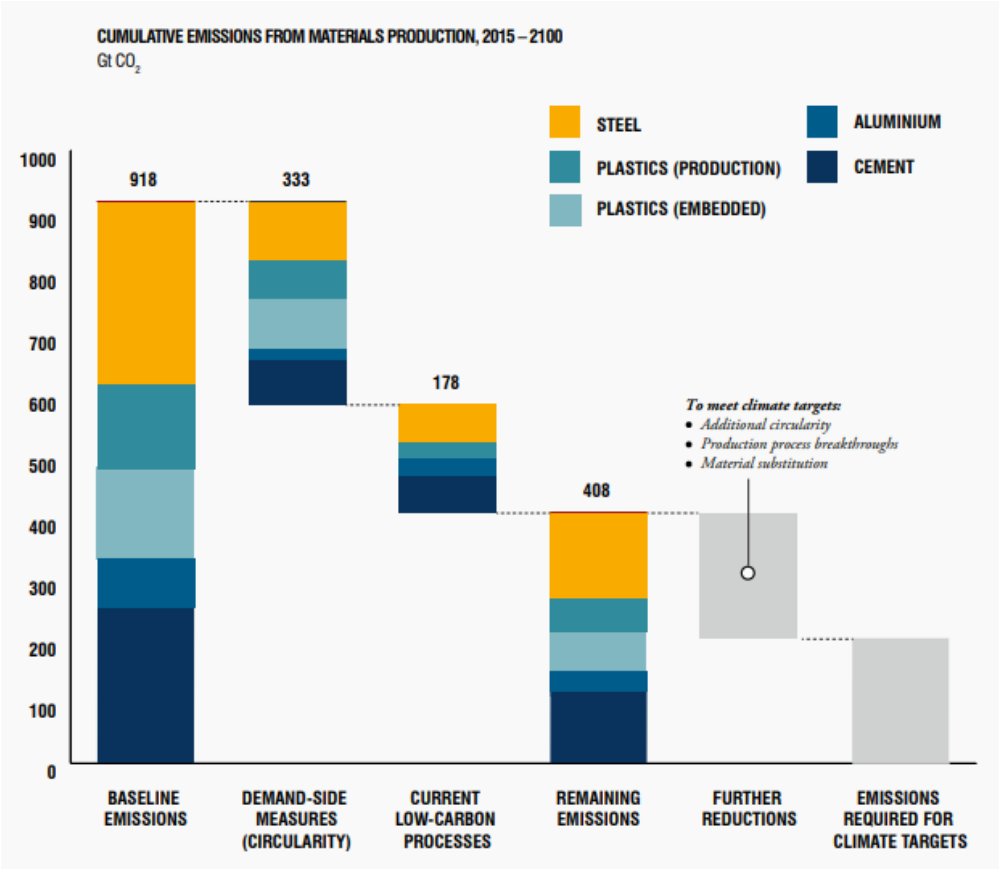


Figure 9. Global emissions cutback from 2015 to 2100

- Economic Dimension
  - Growth of Economic

In the rapidly shifting global context, the “take, make, waste” economic model is becoming unsustainable. Circular economy is considered as essential to transform complex chal-

lenges into opportunities in order to strengthen financial and economic value for businesses and society. It is stated that the potential value gained in reshaping the economic system equals to 4.5 trillion dollars, by 2030, on a global scale (Lacy et al., 2015).

Based on the research of European Commission, 17% to 24% reduction in the use of new raw material by 2030 can positively lead to 630 billion euro saving annually for the European Industry. This result can be accomplished when the raw materials and resources through the supply chain materials are used efficiently.

Another potential benefit of circular economy is job creation. Cambridge Econometrics & BIO Intelligence Service (2014) indicated that it is strong possibility two million jobs are additionally created in 2030 if the resource productivity, at the EU level, increases by 2%. This positively impacts the EU GDP. However, that number of resource productivity improvement should not exceed 2.5%. Otherwise, it can cause net costs to GDP because of further expenses caused by abatement options. At the national level, circular economy provides opportunities for thousands of jobs created. Specifically, in Finland, there will be 75000 additional jobs (Wijkman & Skånberg, 2015).

The European Union, according to Ellen MacArthur Foundation, could annually save 1000 billion euro by 2030 based on the current state of circular economy development. New technologies and business models, if implemented in circular instead of linear economy, can help save the costs in mobility, food, and built environment sectors, from 900 billion to 1800 billion euro annually by 2030.

- A new economic system and stronger collaboration among enterprises

Ellen MacArthur defined the circular economy as an “industrial economy that is conceptually regenerative and reproduces nature in actively improving and optimizing the systems through which it operates.” The waste through the value chain is optimized and treated as a new entry in a cycle of the same or different process. In other words, this necessarily needs close collaboration among businesses, as well as public administration and research institutes. The companies are moving towards an economic system where their actions will have influences on the surrounding environment and other economic actors.

- Products improvement and saved production costs

In the context of circular economy, sustainable design is regarded as important factor attributable to extent of product durability. Maximum life cycle of a product can save the EU 700 billion per year in the sectors of consumer goods. If the production costs are effectively minimized, approximately 245 billion to 604 billion Euro is saved according to European Parliament (2016). These benefits are also dependent on the quality of the labour skills and education for the transition to the new model and economy.

- Business competitiveness

There is an increasing awareness of the customers concerning the making process and impact of the products to the environment. The companies operating in circular economy not only help protect the environment but also be able to address societal challenges. They, therefore, have gained competitive advantages and opportunities of entering new market with innovative and sustainable products and services (Figure 10).

Figure 10. Competitive Agility Framework (Lacy et al.,

- Operational Dimension

The customer purchasing intention is uncertain because there are still negative opinions about quality of remanufactured products (Hazen et al., 2016). Hence, the quality and attractiveness of products with lower price for the customers need more efforts from the marketing operation (Linder and Williander, 2017). In a survey for the companies to evaluate their expected benefits of Circular Economy, the results indicated that the highest expectation to achieve is reduction in waste generation (Figure 11). This means that their top priority is improving efficiency in their manufacturing operations.

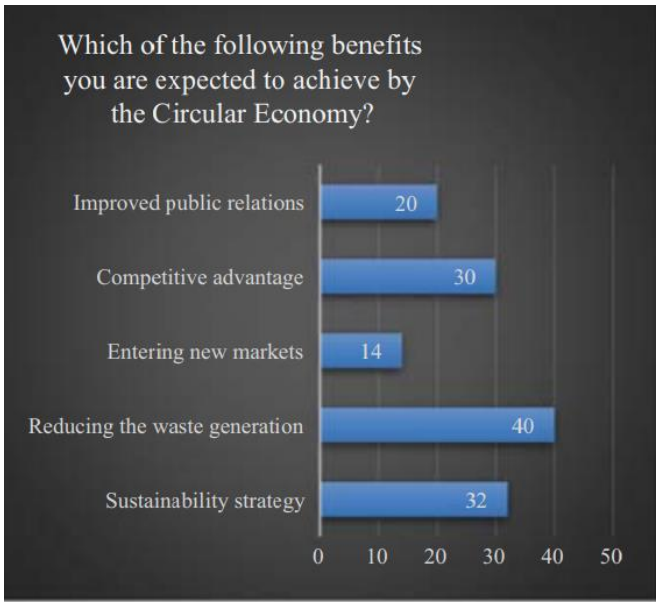


Figure 11. Expected benefits to gain in CE

- Social Dimension

There is still limited resource and literature in the social aspects of circular economy. And most of those mentioned advantages and impacts are side-effects instead of intended benefits (Hong et al., 2015). According to Morgan and Mitchell (2015), demand in mid-level skilled and high-skilled positions will escalate. This, as a result, potentially lead to reduction in regional unemployment and disparities among different income groups. Roughly 11% of disposable income will grow in favour of families.

The circular economy saves the costs of primary resources through activities of, for instance, repair and maintenance, which help decrease the impacts of congestion and GHG emissions (Ellen MacArthur Foundation, 2017).

Figure 12 illustrates a comprehensive circular economy process and its effects in different sectors and value chains, which was developed by Vasileios Rizos, Katja Tuokko and Arno Behrens (2017).

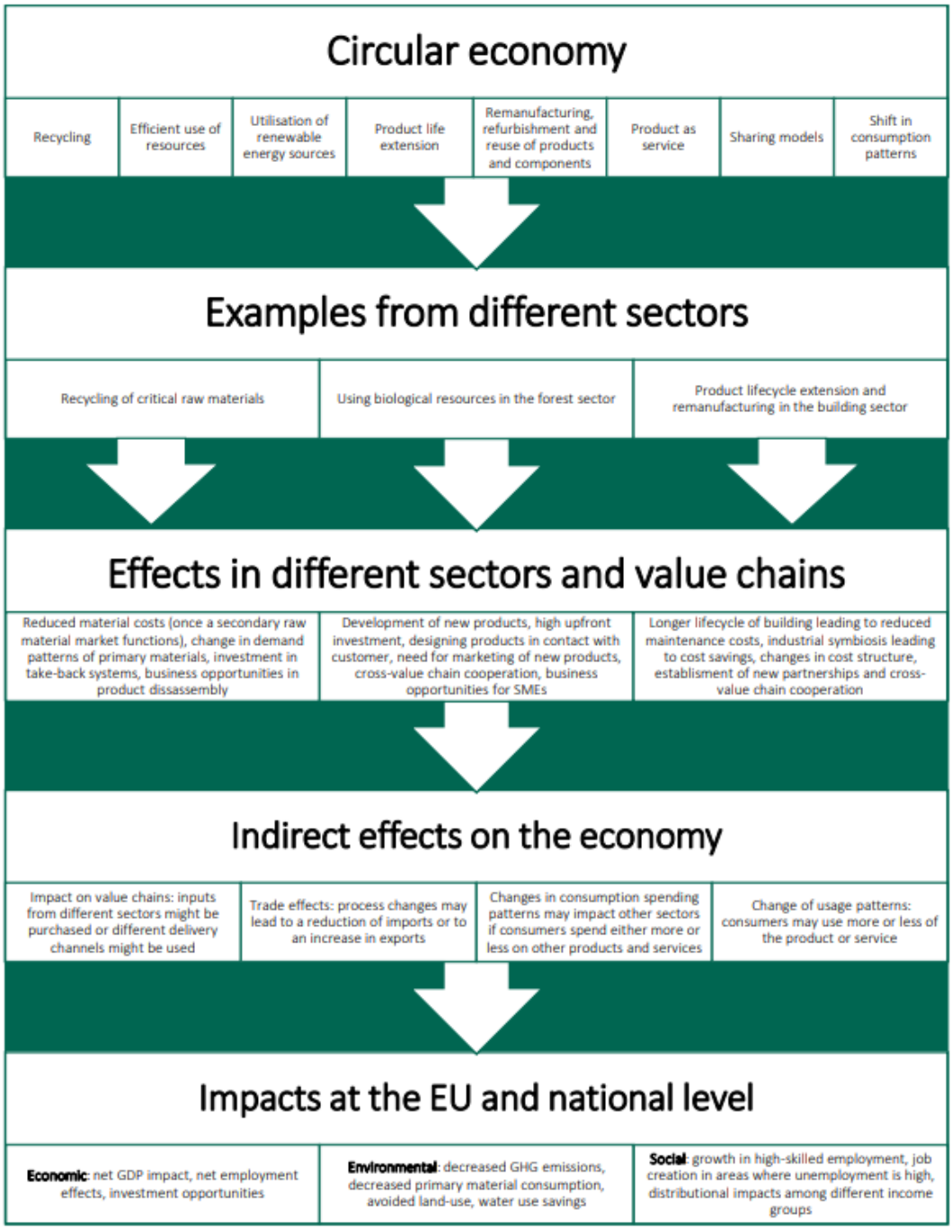


Figure 12. Effects and Impacts of Circular Economy on sectors and value chains.

- **Challenges and Barriers**

Despite the fact that CE provides numerous benefits, public knowledge of CE is low (Su et al., 2013; Naustdalslid, 2014; Benton et al., 2015; Winans et al., 2017). While governments and businesses all over the world have undertaken to engage in CE activities in recent years, there is still a lack of understanding of the term and its values (Benton et al., 2015). As a result, a comprehensive public education should be delivered across various channels. This could be accomplished by advertising on television, magazines, newspapers, and billboards, government policy, the introduction of new business models, and other means to present CE opportunities and inspire society to participate, as public participation is critical to CE's success (Geng and Doberstein, 2008). Human and institutional capabilities are typically lacking, limiting public education availability. Because of a scarcity of trained professionals in the field of CE, organizations and governments are unable to effectively introduce it to the general public (Benton et al., 2015; Su et al., 2013; Li and Yu, 2011).

According to some studies, most consumers are more concerned with the appearance of items when making purchases. They are unconcerned about their long-term viability and environmental impact, preferring a product with a more appealing appearance to one made from scrap (Pomponi and Moncaster, 2017; Naustdalslid, 2014). This lowers the market for remanufactured goods, and low consumer acceptance makes CE strategies difficult to sustain. Furthermore, a consistent flow of materials is needed to keep the loops circulating so that old goods and parts can be reused in remanufacturing operations. Companies do this by entering into arrangements with consumers to restrict their use and guarantee a return. However, studies show that many consumers tend to keep using their goods after their contracts expire and are therefore hesitant to substitute them (Park et al., 2010). As a result of these conditions, the smooth flow of materials is disrupted, waste production increases, and CE operations are hampered.

Government regulations, on the other hand, play a major role in determining how businesses will proceed in the future. The regulatory mechanisms in most regions are disjointed. The roles of governments and local governments in CE implementation are unclear. This complex structure contributes to weak local government transparency and the

development of an ineffective legal system, as several studies have shown (Benton et al., 2015; Geng and Doberstein, 2008; Su et al., 2013; Li and Yu, 2011; Naustdalslid, 2014; Winans et al., 2017). As a result, it would be impossible to enact the requisite CE laws and regulations. Because of the fractured nature of the legal system and, as a result, the lack of policy support, companies find it difficult to implement CE. As a result, rather than take chances, businesses tend to stick to their current strategies, limiting CE's expansion. Furthermore, many governments lack a thorough understanding of CE procedures (Geng and Doberstein, 2008; Benton et al., 2015; Naustdalslid, 2014). They are unable to take the lead, direct businesses, or make acceptable laws because they are unaware of the advantages of CE. As a result, they are unable to define a specific vision, priorities, objectives, targets, or metrics (Pan et al., 2015). In addition, policymakers' lack of sophisticated knowledge of CE prevents the creation of uniform frameworks for performance evaluation, data collection, measurement, submission, and punishment (Su et al., 2013). Furthermore, government-imposed taxes and fees serve as an impediment. In most countries, current tax regulations do not encourage the introduction of CE; rather, they discourage businesses due to the financial burden (Geng and Doberstein, 2008; Benton et al., 2015; Naustdalslid, 2014).

In the manufacturing sector, there are several economic obstacles to CE. CE is an expensive procedure that necessitates a significant upfront investment (Liu and Bai, 2014). It does not, however, pay off immediately; rather, it has a long-term economic return. Having term limits put on managers causes them to be unable to engage in CE activities, causing them to invest in other company operations instead (Liu and Bai, 2014; Benton et al., 2015; Park et al., 2010). Companies stop implementing CE despite their willingness to do so due to a lack of financial support structures and tax incentives built into budgetary programs from banks and governments (Geng and Doberstein, 2008; Liu and Bai, 2014; Su et al., 2013). It is a costly procedure that, with the exception of large corporations, cannot be afforded. Government support is needed to transform the current linear economy model to a closed loop model, and it is the duty of governments to build an atmosphere conducive to CE implementation. CE also necessitates collaborative business models in order to maintain a consistent supply of products and satisfy consumers. Companies, however, are unable to devise a faster input system to change their operations due

to a lack of accurate knowledge (Su et al., 2013; Pomponi and Moncaster, 2017; Winans et al., 2017; Pan et al., 2015) and the high cost of developing eco-industrial chains (Liu and Bai, 2014). On the opposite, they engage in inappropriate behavior that reduces their profitability. Additionally, the high costs and risks associated with CE may have an effect on a company's financial situation. Companies avoid remanufacturing processes as a result of these uncertainties, which raise concerns about their long-term viability and profitability.

CE also faces a number of environmental challenges, as there are insufficient environmental protection systems and facilities available both within government agencies and within academic institutions, and those that do exist are largely ineffective (Govindan and Hasanagic, 2018; Su et al., 2013; Geng and Doberstein, 2008). The available incentives for promoting greener practices and conserving water, electricity, and materials fall short of what is needed (Geng et al., 2009; Su et al., 2013). Many businesses depend on old technology machinery and equipment because they lack the financial resources to replace them with newer models. As a result, the amount of energy consumed and emissions generated by machinery and equipment that treats environmental wastes is much higher (Geng and Doberstein, 2008; Naustdalslid, 2014). There are insufficient methods for landfilling and incineration (Gregson et al., 2015). As a result, these practices result in significant environmental losses that cannot be reversed. Furthermore, due to current regulations, scavenger and decomposer companies lack the capacity to build new fields (Geng and Doberstein, 2008). Many governments do not have sufficient incentives or tax breaks to encourage waste recycling. In the end, the amount of materials recovered is insufficient to satisfy the demand of remanufacturing firms, requiring them to use virgin materials. These examples demonstrate that there are several obstacles to effective CE implementation.

2.2 BUSINESS MODEL

2.2.1 Definition

The aim of the business model, according to Hedman and Kalling, is to identify all key components that a company's business requires to be effective (Hedman & Kalling 2003:49). A successful company has a viable business model. Developers must realize that a business model is simply a guide for a company to understand how it can produce sales at a reasonable cost. The business model also shows how the organization can capture and generate value (Gambardella and McGahan 2010: 263). Business strategy is less generic than business model, as any good business model creator understands (Teece 2010: 179).

It is important to recognize that the word "business model" differs from "strategic." Long-term goals and vision are included in strategy. Short-term targets and an action strategy are included in the business model. There are three ways in which a business model varies from a plan, according to Chesbrough and Rosenbloom (2002). To begin, the aim of a business model is to build a model that revolves around creating and delivering value to customers. The second distinction is between creating value for the company and creating value for the stakeholders. The aim of a business model is to provide value to customers while also generating revenue for the company. The level of awareness is the third distinction. The expertise in the business model is cognitively constrained, and it is focused on early performance. The expertise at the strategic level is focused on meticulous theoretical calculations (Chesbrough and Rosenbloom 2002: 536).

One of the most important functions of the business model is to turn technological inputs into economic outputs. Feasibility or output are examples of technical inputs. The value proposition, industry, value chain, value network, expense, benefit, and competitive 14 strategies are all part of the business model. Technical inputs are converted into economic outputs, such as value, price, and benefit, by using a business model (Chesbrough and Rosenbloom 2002: 536). According to Chesbrough and Rosenbloom, a business model

has six functions: market segmentation, value proposition, cost structure with benefit potential, value chain structure, and mapping the company's strategic strategy and value network (Chesbrough and Rosenbloom 2002: 533-534).

The meaning of a business model is difficult to define since each author has their own interpretation and definition of the concept. Besides that, any business model has many common elements and components that need to be present in order for the model to be efficient. When putting those business models together, it is visible that main goal is to find a way for businesses to build and produce value for customers while still generating money for the company.

2.2.2 Sustainable Business Model Aspects

A business model is a structured management tool that is critical to an organization's success (Baden-Fuller and Morgan, 2010) and is regarded as a general representation of the enterprise (Amit and Zott, 2010). Current business models are often based on creating, delivering, and capturing economic value, rather than social or environmental value (Evans et al., 2017). However, long-term sustainability of the company depends on sustainable growth, so business model creativity is required to generate long-term sustainable value (Ludeke-Freund, 2010). As a result, businesses that do not adapt their business models to meet the needs of sustainable development will find it more difficult to achieve a competitive edge (Rana et al., 2017). The gradual creation of some components of a plan aimed at meeting demand from a changing market is referred to as business model innovation (De Reuver et al., 2009). Business model innovation, on the other hand, can refer to a complete overhaul of an existing model (Johnson et al., 2008).

The conceptualization of a business model for sustainable companies, according to Stubbs and Cocklin (2008), involves a combination of sustainable activities and aims to generate value for all stakeholders, both now and in the future. This can be accomplished by reducing environmental effects, fostering community development through business practices, and generating economic benefit for all stakeholders, not only shareholders. Businesses need to consider the resources available to facilitate the sustainable business mod-

eling process in order to create new business models that incorporate sustainable development principles. One of the most widely used methods for business models by professionals is the Business Model Canvas. Osterwalder and Pigneur (2010) suggested an instrument that can be used to gain insight into the elements of a business model and how they affect value development (Joyce and Paquin, 2016).

The tool focuses primarily on the organization's internal dimensions, such as what it offers and how it delivers products and services to market. Despite the fact that the model assists businesses in finding a common ground between their objectives and benefit, experience has shown that social and environmental ideals are abandoned due to the model's emphasis on increasing economic value (Joyce and Paquin, 2016). As a result of the criticism, a range of sustainable business model tools have been created that incorporate sustainable development concepts. The Triple Layered Business Model Canvas is one of the most common (Joyce and Paquin, 2016).

2.2.3 Business Model Canvas

Osterwalder and Pigneur (2010: 15-51) have created a very simple business model definition that consists of nine distinct blocks. These blocks explain the business process and provide a straightforward response as to how to start a business and what functions a company requires to generate revenue. The canvas business model was developed by Osterwalder and Pigneur. Canvas constructs all nine blocks for a single sheet, as shown in Figure 13 and Figure 14. Canvas business model elements are key activities, key partners, key resources, customer relationship, channels, customer segments, revenue streams, cost structure and value proposition.

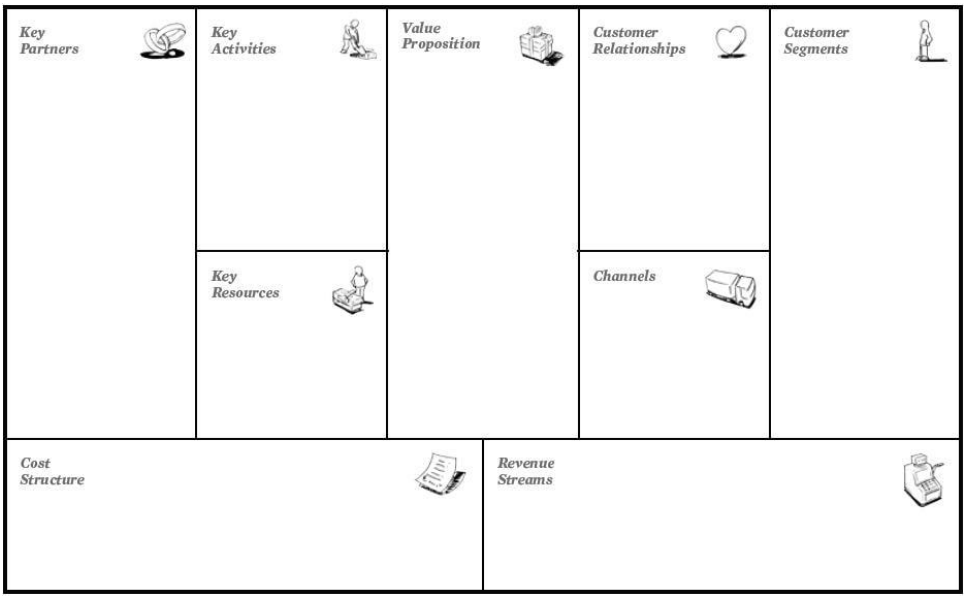


Figure 13. Osterwalder's and Pigneur's (2010:44) Business Model Canvas concept

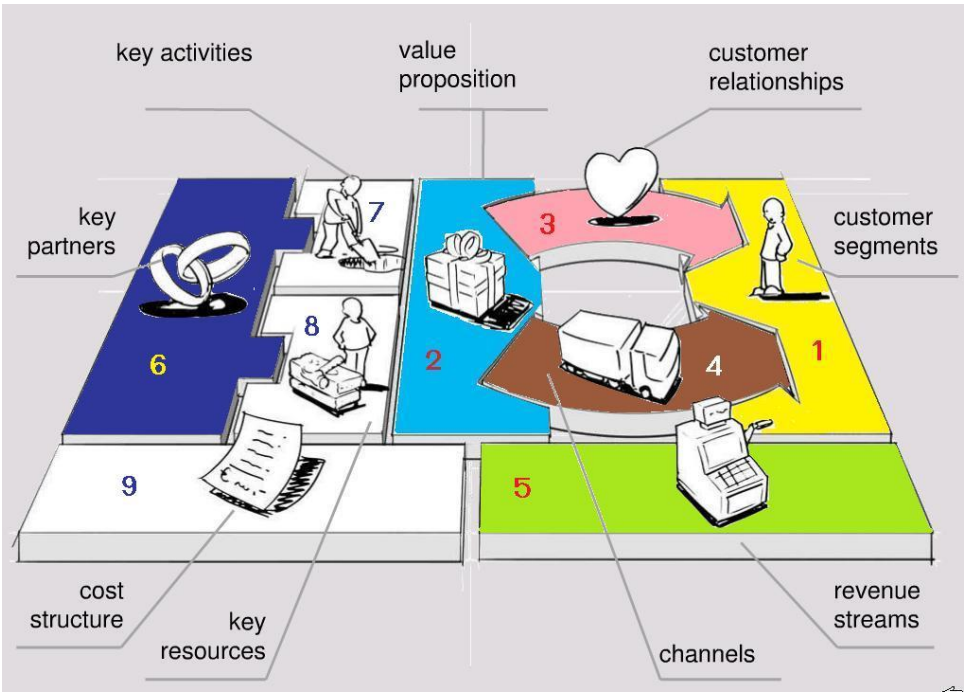


Figure 14. Osterwalder's and Willeyr's Business Model Canvas Generation

Customer value proposition (CVP) is the most important factor, according to Johnsson et al (2008), and precision is the most important attribute of CVP if a business wants to be

competitive. Precision refers to how well it meets the customer's requirements. Companies should have value to their customers. At the same time, they could create value for themselves. The main purpose of the profit formula is to explain how a business captures profit for itself.

- **Customer Segments Block**

The customer segments block identifies the various individuals or entities that an agency wishes to meet and represent. Customers are the lifeblood of every company. A business can divide customers into distinct segments based on common needs, habits, or other characteristics to better serve them. One or more, large or small customer segments can be described by a business model. A company should decide which segments it will represent and which segments it will disregard. Following this decision, a business model can be carefully built around a thorough understanding of particular consumer requirements.

The number of segments in a business model is determined by the company's size and demand. Typical markets categories are niche markets, mass markets, multi sided markets, diversified business and segmented markets. The business model in retail markets focuses solely on mass and is focused on large quantities. Actually, one big client group is the subject of the value proposition, customer relationship, and channels. The consumer markets are the polar opposite of niche markets. Customers in niche markets are a select community of people who have a particular need. The task of the company is to meet consumer needs and satisfy them (Osterwalder and Pigneur (2010), p. 21).

Segmented markets seem to have different demands and issues than the rest of the economy. There are various divisions within the markets, each with its own set of problems and requirements. In such markets, the business model must classify various consumer segments and develop a model to serve those segments. In diversified markets, the business model's aim is to represent two distinct client groups, each with a unique puzzle. Finally, there are multi-sided markets, in which a business model serves two or more interdependent consumer segments (Osterwalder and Pigneur 2010: 21).

The customer's position in the service business model is closely linked to value creation. Customers must be segmented into separate classes based on their characteristics. By combining customer behaviors and profiles, a company can determine the business model criteria for the products and services it provides to consumers. The kind of company has an impact on the types of characteristics it would have. The features of business to business and business to customer are different (Wirtz 2011: 125-127,152-154).

- **Value Propositions Block**

The value propositions block defines a collection of goods and services that add value to a particular customer segment. Customers choose one business above others because of the value proposition. It meets a customer need or solves a customer problem. Each value proposition is made up of a carefully curated set of goods and/or services that are tailored to the needs of a particular customer segment. The value proposition is an aggregate, or package, of benefits that a business provides to its customers in this context. Some value propositions are revolutionary, presenting a novel or disruptive offering. Others can resemble existing market offerings, but with additional features and attributes.

Understanding the customer's expectations is the most critical task from a value standpoint. When a business considers its importance to the consumer, it should consider the effect of its product or service on the customer and the entire buying process. Many different tools are available to identify and design the company's value proposition. The Osterwalder et al. (2014) Value proposition canvas model is one choice. The model's basic concept is to scan all possible consumer values. Following the scanning process, businesses must choose the principles for which they will concentrate their efforts. The first step is to explain the customer's work, pains, and benefits, which are represented by the model's right side. Customer job(s) describe what the customer is attempting to accomplish. The term “pains” refers to a variety of issues that customers face while trying to complete a task. Gains is a term used to describe the advantages and desires of consumers. The value map is on the model's left side. Products and services, gain creators, and pain relievers are the three levels of the value map. The value mapping process begins with a description of the product or service that the organization will provide to the consumer, as well as how that product or service alleviates the customer's pain. Gain creators

explain how the client can benefit from the company's service or product. Figure 15 show the Value proposition model.

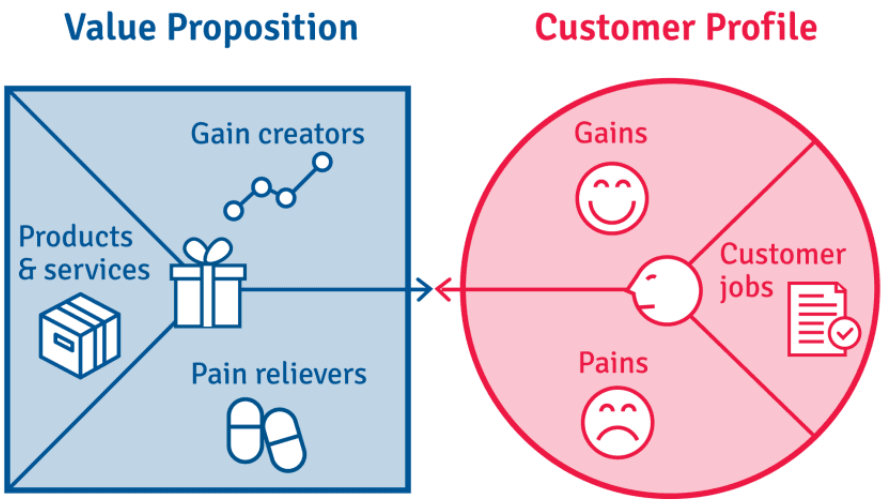


Figure 15. Value Proposition Canvas by Osterwalder et al. (2014)

- **Customer Relationships Block**

The customer relationship block defines the form of client-company relationship. The type of service or product determines the level of customer relationship. Self-service, dedicated personal assistance, personal assistance, communities, automated service, and co-creation are the six forms of customer relationships defined by Osterwalder and Pigneur. Customer relationships are critical from the standpoints of client acquisition and retention, both of which are driving factors in this business model block (Osterwalder and Pigneur 2010: 28-29).

Relationship management is an essential activity, and most businesses employ some sort of customer relationship management. It will specify how the organization has structured customer-company relationships. Relationship practices based on the customers' purchasing habits (Wirtz 2011: 152-154). (Wirtz 2011: 152-154). Companies must also consider why consumers purchase their product or service and what they want. At the same time, companies need to consider what consumers want from a relationship because this will affect the type of relationship they have (Parviainen 2008: 144-156).

- **Channels Block**

The Channels block defines the company's communication and distribution method for the customer's value proposition. Since these activities are the company's interface with customers, contact, delivery, and sales are the most relevant channels. The assessment, recognition, distribution, after-sale, and purchase phases are all included in the channel block. The aim of consumer awareness is to increase their understanding of the company's product or service. The aim of the evaluation is to assist customers in evaluating and comprehending the company's value proposition. The aim of a transaction is to enable a consumer to purchase a particular product or service from a company. The aim of delivery is to provide value to the customer. The final stage is after sales, which involves providing help to the end customer (Osterwalder and Pigneur 2010: 26-27).

Finding the best way to meet their consumer segments and integrating the best overall solution is the cornerstone of channel design. Channels must be cost-effective while still incorporating consumer routines. Typically, organization use partners. Company channels, on the other hand, make decisions based on financial concerns. It is critical to comprehend the meaning of channels because an uninformed consumer would not purchase a company's product or service, even though it is the best solution (Osterwalder and Pigneur 2010: 27).

- **Revenue Stream Block**

The cash flow from various segments that generate the business is referred to as the revenue stream. When a business understands what value each client segment is willing to pay, it can generate revenue streams from all of them. For various services and products, the business normally has variable streams and pricing strategies. Different types of revenue sources exist, ranging from fixed price to dynamic approaches. Each potential stream has its own set of variables (Osterwalder and Pigneur 2010: 30-33).

According to Girotra & Netessine (2014:98), the business model is a collection of key components which earns its revenue to the company. The aim of business model innovation is to reduce costs while increasing revenue for the company. The key to successful innovation is to strike a balance between costs, risks, and revenue.

The form of revenue stream will be determined by the company's product or service. Indirect, direct, independent, or transaction-dependent revenue streams are all possible. Typically, a company's revenue stream plan describes the various revenue forms that the company has, along with fees and provisions. The revenue stream should derive from all three segments: the business, the consumer, and the suppliers. When a business decides the right selling price for a product or service, the ability and capacity to pay of its consumers is paramount (Wirz 2011: 129-133).

- **Key Partners Block**

Without business partners, hardly an organization can thrive in current economy. Companies nowadays have their own partner network that allows them to connect with other businesses. In a business model, the key partnership block defines the types of key partners that a company will need. In most cases, businesses have several partners that are divided into various levels of collaboration. The company's desire to form partnerships with other businesses is influenced by value development or cost savings. The block of key partners describes the company's entire network of suppliers, which they required to complete the value creation process. Part of those partners is normally crucial to the business model of the organization.

To improve their business operation, the company will expand their relationship and form various alliances. For example, the goal of forming an alliance is typically to reduce risks, outsource work, or gain more resources (Osterwalder and Pigneur 2010: 38-39). There are four forms of main partnerships:

1. Strategic alliances between non-competitors
2. Cooperation between competitors
3. Joint venture, which target is to develop new businesses

4. Buyer-supplier relationship

There are a variety of reasons for forming partnerships. The company is attempting to cut costs, minimize risk, increase value, or gain more capital. The primary motivation for forming a relationship is typically to save money or add value. Purchase roles often prefer strong partnerships that have a direct impact on manufacturing and cost structure. The term "partnership" refers to a group of people who work together to make the best (Wirtz 2011: 136-141; Osterwalder and Pigneur 2010: 38-39).

Controlling and reducing risk has always played an important role in the day-to-day operations of a company. Reduce and monitor risks may also be a major motivator for developing a relationship. The current market environment is extremely competitive in every area, which has an impact on a company's ability to develop long-term partnerships because partners typically have a direct connection to value development (Osterwalder and Pigneur 2010: 38-39).

- **Key Activities Block**

The various key items that businesses must do to be effective can be described by key activities. Problem solving, development, and platform or network are three separate sections of the key activities block. The company's key activities are determined by the business field in which it operates. Production operations are the most important part of a manufacturing company's business model. Typical development tasks include content design, production, assembly, commissioning, and delivery. Consultants also engage in problem-solving activities. They need continuous practice and systems integration.

Activities can also be seen as the foundations for the company's vital capabilities. In the value creation process, key tasks are critical (Achtenhagen et al 2013: 427-442). The activities of a company are determined by the type of business it can conduct. Many different tasks, such as arranging, preparing, tracking, and management, are needed in both service and production businesses. These are critical monitoring practices from an efficiency and financial perspective.

According to Kaplan (2009:21-29), the aim of the main activities section is to explain all of the actions that an organization must take during the value delivery process. The ability of the business to deliver is also a factor. Some acts are critical, whereas others are merely supportive. The company's operations model can be separated into two parts: main enablers and core capabilities (Kaplan. 2009: 21-29). Processes are one way to explain the key activities of a business model (DaSilva & Trkman 2013).

- **Key Resources Block**

The company's main assets are identified in the key resource block, which has an impact on the viability of the business model. Physical, economical, intellectual, and human capital are the four primary assets. Because the company can own or lease resources, key resources are linked directly to key partners. When a company leases resources from another, those two companies form a partnership. Buildings, machines, production plants, processes, and distribution networks are all examples of physical properties. Patents, collaborations, trademarks, proprietary information, and consumer databases are all examples of intellectual properties. Cash, lines of credit, and stock options are examples of financial assets. Stock options are a good way to entice key workers to join the company. Last but not least, there are human properties, which include the main people who add value to the goods or services. They also needed understanding of what corporations need during the value creation process (Osterwalder and Pigneur 2010: 34-35).

Since the company's assets are limited, an important problem has arisen in the value creation process: matching available capital. This is another way to keep a company's cash flow in check. Companies must determine the best resource mix that maximizes value for both the business and the consumer. The role of investing is critical in the value creation process because companies need free cash flow to invest financial capital in the future, ensuring that the value creation process continues. This also means that a business cannot guarantee long-term value creation without the right personnel and product development investment (Achtenhagen, Melin & Naldi 2013: 436- 437).

Enterprises must identify their main resources since it influences the value propositions of their businesses. If a company can develop a business model that is unique and difficult

to replicate, it can gain a significant competitive advantage. The core resources of a company can be a mix of external and internal resources, both tangible and intangible. They will build certain resources and strengthen competence once the company's main resources have been established (Wirtz 2011: 118-120).

- **Cost Structure**

All-important costs have been accumulated in a cost structure block that generates revenue for the business model. Naturally, any business model should strive to reduce costs, and some business models prioritize low-cost structures over others. Value-driven and expense-driven cost structures are the two major types of cost structures. Typically, the goal of business models is to strike a balance between value and cost. The aim of a cost-driven business model is to cut costs as much as possible. Low-cost value proposition, comprehensive outsourcing, and full automation in the value development process are the structure of the cost material. The aim of a value-driven business model is to provide the best value to the customer. Content premium value proposition and customized service cost structure (Osterwalder and Pigneur 2010: 40-41).

Variable costs, fixed costs, economies of reach, and economies of scale are all common characteristics of cost structures. Fixed costs remain constant over time and are unaffected by output volume. The amount of output determines variable costs. When a company produces a large number of goods, it benefits from economies of scale. When an organization uses a large number of operations, it benefits from scope economies (Osterwalder and Pigneur 2010: 41).

The process of creating value incurs costs for the business. Costs are important for more than just financial planning. Manufacturing costs are good indicators that provide a wealth of knowledge about emerging areas and the types of cost-cutting opportunities available in the industry (Wirtz 2011: 141-143). Costs are often inextricably linked to a company's profitability. Since the cost structure is influenced by the company's value proposition, quality criteria, strategic choices, and synergies, the cost structure can differ (Wirtz 2011: 264).

2.2.4 The Environmental layer of The Triple Layered Business Model Canvas

The TLBMC[1]'s environmental layer is based on a life cycle approach to environmental effects. This is based on analysis and experience with Life Cycle Assessment, which is a formal method for calculating a product's or service's environmental effect at all levels of its life cycle (Svoboda, 1995). A systematic LCA[2] evaluates environmental impacts through various types of measures (e.g., CO2e, eco-systems quality, human health, resource degradation, water usage cf., Hendrickson et al., 2006; Pennington et al., 2004) across the entire life-cycle of a product or service (e.g., raw material extraction, processing, delivery, use, and end-of-life cf., Svoboda, 1995; Guiée, 2002).

In comparison to conventional business innovations, combining LCA with business model innovation will help competitive product, service, and business model innovations with improved environmental characteristics (FORA, 2010), as well as ongoing impact assessment and enhancement of sustainability-oriented innovations over time (Chun and Lee, 2013). While the TLBMC does not include a structured LCA, it does ensure that a business model's environmental impacts are considered from a life cycle perspective.

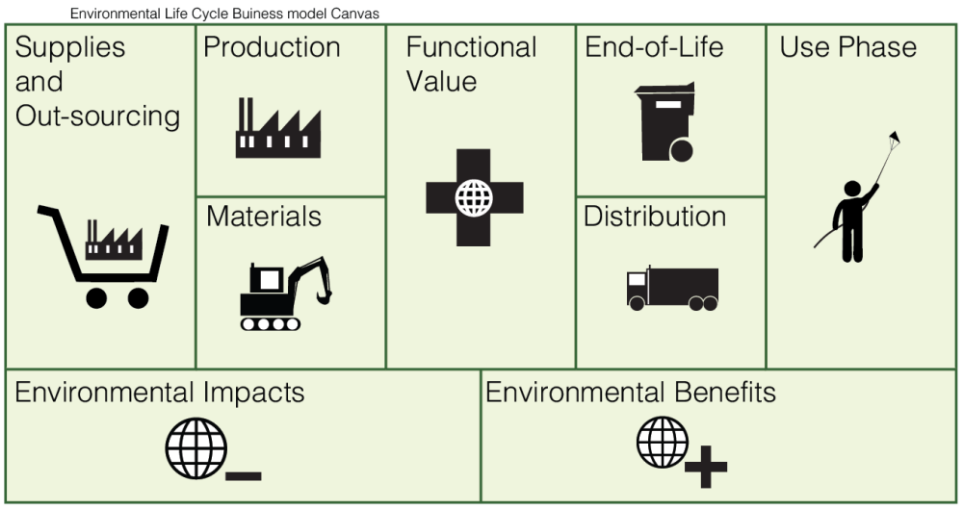


Figure 16. Environmental layer of the business model (Joyce & Paquin 2016)

The key goal of the TLBMC's environmental layer is to assess how the company produces more environmental benefits than environmental impacts, similar to how the original

business model canvas is used to understand how profits outweigh costs. This helps users to gain a deeper understanding of where the company's greatest environmental impacts are located within the business model, as well as insights into where the organization can concentrate its efforts when developing environmentally friendly technologies. As previously stated, environmental impacts can be monitored using a variety of indicators, including Supplies and Sourcing, Production, Materials, Functional value, End-of-life, Distribution, Use phase, Environmental impacts, Environmental benefits.

Supplies and Outsourcing Supplies and out-sourcing refer to all of the other material and development activities that are required for the organization's functional value but are not considered "core." The distinction seems to be between what is considered core and non-core to help the organization's value development, similar to the original business model canvas. This can be thought of as activities that are critical to the company and help its competitive advantage versus actions that are important but not exceptional (Porter, 1985). It can also be thought of as actions that are held in-house versus those that are outsourced, but this is not always the scenario.

Production The development component captures the behavior that the company takes to generate value and expands the main activities component from the initial business model canvas to the environmental layer. A manufacturer's production can entail the transformation of raw or unfinished materials into higher-value outputs. Running an IT infrastructure, transporting people or other logistics, utilizing office facilities, and hosting service points are all examples of production for a service provider. The emphasis here, as with materials, is not on all operations, but rather on those that are central to the company and have a significant environmental effect.

Materials The materials component of the original business model canvas is an environmental extension of the main resources component. The bio-physical stocks used to render the usable value are referred to as materials. Manufacturers, for example, purchase and convert large quantities of physical materials, while service companies need materials such as building facilities and information technology. These support organizations often consume a large amount of material assets, such as computers, cars, and office buildings.

Although it is not possible to include all materials in the canvas, it is necessary to recognize an organization's main materials as well as their environmental effects.

Functional Value The functional value defines the main outputs of a service (or product) provided by the company in dispute. It resembles the functional unit in a life cycle evaluation, which is a quantitative description of either service efficiency or needs addressed in the investigated product framework (Rebitzer et al., 2004). The distinction between the functional unit and the functional value of an LCA can be viewed as one of consumption.

End-of-life End-of-life refers to when a customer decides to stop using a product's usable value, and it frequently involves material reuse problems such as remanufacturing, repurposing, recycling, disassembly, incineration, or disposal. From an environmental perspective, this element assists the company in finding ways to manage its effect by expanding its responsibility beyond the value of its products as originally conceived. Governments are increasingly pressuring businesses to resolve this by various content restrictions (European Commission, 2012) and recycling legislation (Environment Agency, 2012).

Distribution Distribution entails the shipment of goods, much as the original business model. When it occurs to a service provider or a goods producer, distribution related to the tangible means by which the company ensures that the usable value is available. Therefore, the mixture of shipping types, distances driven, and the weights of what is transported must be considered within the environmental layer. Packaging and shipping logistics can also be critical considerations.

Use Phase The client's involvement in the organization's functional importance, or core service and/or product, is the objective of the use phase. When applicable, this will include product maintenance and repair, as well as some consideration of the client's material resource and energy needs as a result of use. When charging a computer and using networks to help the community of servers, many electronic devices experience use phase impacts. This may be more important than the negative effects on productivity (Nokia, 2005). Furthermore, the distinction between the development and usage phases may be blurred, particularly as businesses increasingly offer co-creation of services (e.g., user-

generated content) and asset sharing (e.g., car sharing) in place of more conventional product and service business models (Prahalad and Ramaswamy, 2004).

Environmental Impacts The environmental costs of the organization's activities are addressed in the environmental impacts component. While a conventional business model frequently summarizes organizational impacts mainly in terms of financial costs, the environmental impacts components expand this to include the organization's ecological costs. These performance indicators may be linked to bio-physical measures such as CO2e emissions, human health, ecosystem effects, natural resource degradation, and water consumption, according to LCA research (Jolliet et al., 2003). Some environmental measures, such as energy use, water usage, and pollution, can be represented by conventional business metrics that are still important to LCA (De Benedetto and Kleme, 2009). Furthermore, close to looking at an organization's financial expenses, this gives the opportunity to check for where the organization's biggest environmental impacts are.

Environmental Benefits Environmental benefits, including the relationship between environmental effects and costs, broadens the idea of value creation beyond purely economic value. It includes the environmental value created by the organization by environmental impact reductions as well as regenerative positive ecological value. This element, in terms of sustainability, allows an organization to specifically pursue product, service, and business model technologies that can reduce negative and/or increase positive environmental impacts through its behavior. The definition of impacts will move beyond generalizations and intuitions to create a firmer, even quantitative foundation upon which to design more sustainable business models by assessing environmental impacts with a life cycle approach in the business model canvas.

2.3 Circular Business Model

According to Mentink (2014, p. 24), “A circular business model is the rationale of how an organization creates, delivers and captures value with and within closed material loops”. Linder and Williander (2015) argue that: “The conceptual logic for value creation is based on utilizing economic value retained in products after use in the production of new offerings”. However, the most detailed concept is as follows: “The rationale of how

an organization creates, delivers, and captures value with slowing, closing, or narrowing flows of the resource loops".

In the past, a business strategy aimed to provide better value to consumers and gain a larger share of that value than competitors. In CBM[3]s, business should be conducted in a sustainable manner that offers measurable environmental and/or social benefits in addition to financial advantages (De Winter et al, 2014). CBM outcomes could perhaps be classified as economic, social, or environmental factors. Customers and the company will save money by reusing, recycling, and using less materials/components/products. Sharing and reusing resources among members of society, especially among businesses, are examples of social factors that improve interactions. Environmental impacts are reduced by reducing waste production and resource use (Boken et al, 2016).

CBMs can have distinctive features because of collaborative relations, as companies do not add value on their own (Beattie, 2013). This necessitates close cooperation with stakeholders. Increasing complementary services/products, on the other hand, results in more interactions with consumers.

Basic characteristics of CBMs are depicted in Figure 17**,** which was adapted from a study by Bocken et al (2017). The goal of CBMs is to enhance human life quality by including the environment and community as stakeholders and treating their interests equally to those of other stakeholders (Stubbs, 2008). This alters the offer's architecture, which influences the cost structure. If residuals from goods or waste could be used as a major resource, a new design could potentially reduce costs. Reducing the number of materials/components used will also save money. Special designs for reparability, reliability, and upgradability, on the other hand, can raise the product/service development costs at the outset (Kok et al, 2013).

The near cooperation with suppliers, partners, and consumers, which necessitates consistent agreements and mutual confidence (Kok et al, 2013), is another key difference with CBMs. Since consumers do not own the product and may need to use various services, there is more consumer engagement in CBMs (Bocken et al, 2016). Customers can be educated and informed about the authenticity of the goods (Tukker, 2004). Finally,

since the offering would be more service based, the business model will be completely unique (Linder & Williander, 2015).

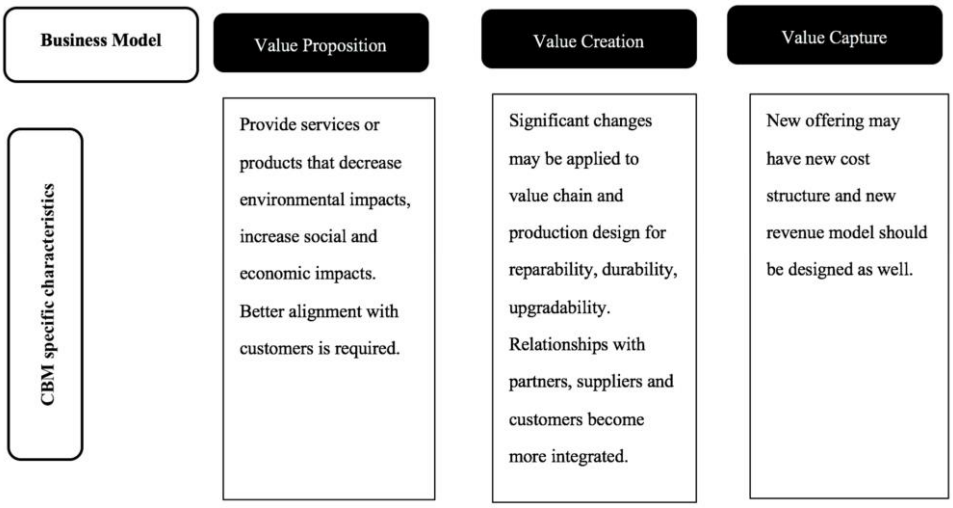


Figure 17. Special characteristics of Circular Business Model Framework (Bocken et al,2016)

- **CBM Transition**

Transformation to a CBM necessitates a combination of techniques, tactics, processes, and resources. Brand design, supplier collaboration, supporting technology, and infrastructure are all critical elements in this transformation (Bocken et al, 2016). Internal activities and improvements in logistics, the offerings produced, facilities, and the manufacturing process are all part of this transformation (Grant, 2010), which is hampered by a variety of constraints, including technical, economic, political, and cultural constraints (Genovese et al, 2017). Every phase in this dynamic organizational transformation entails risk management.

One of the most important aspects is product design, as products should be adapted for multiple lifecycles and upgradeability (Produktion2030, 2014). Product architecture for CBM strategies is specifically discussed in the analysis by Bocken et al. (2016). Slowing resource loops by extending product life by reuse, repair, and remanufacture; closing the loop through recycling; and narrowing resource flows through minimizing the amount of

materials and components in the manufacturing system are the three proposed fundamental strategies for product design.

- **CBM Archetypes**

Based on product design, Bocken et al. (2016) proposed circular business model archetypes. They suggested three models for slowing loops: (1) access and performance, in which customers use products or services without owning them; (2) extension of product value, in which customers exploit the residual value of products and then return it to the manufacturer; (3) classic long-life model, in which the firm offers high quality, a long product life, and a design that will withstand the test of time. Bocken et al. (2016) proposed two additional business model archetypes for closing loops: (5) expanding resource value, in which the firm uses the residual value of resources by recycling to transform waste materials into new forms of value; and (6) industrial symbiosis, in which the firm offers a process-oriented solution by feeding one process with the residual outputs of another process.

- **CBM Challenges**

Barriers to CBMs were discovered after a thorough analysis of the literature. Cultural and institutional barriers are more relevant than skills and resource constraints in CBMs, according to Liu and Bai (2013). Table 1 shows all the defined obstacles in the empirical and conceptual studies examined in the literature.

Table 1. Challenges of circular business model (Pejvak, Rana)

Challenges of CBM	Description
Lack of Supporting Regulation	Lack of supporting regulations, complexity and inconsistency of regulations.
Organizational barriers	Change is difficult for organizations and individuals. Restructuring is costly and risky, resistance among managers benefiting the current structure might rule out the expected benefits for the firm and the environment.

Cultural barriers	Fear of the unknown is a barrier for organizations.
Financial and economic barriers	Major up-front investment costs, recycled materials are often still more expensive in CBM rather than in linear business models. Different skills and resources can be more expensive.
Technological barriers	Lack of methods for handling life cycle of products data [36]. Limited availability and quality of recycling materials [36]. Technological limitations for recycling, product design, and other processes have been identified as major barriers for CBM adoption.
Customer Type Restrictions	Customers want to have ownership, particularly in B2C area. Customer is careless when leasing. Lack of customers' knowledge on origins of products.
Product Category Restrictions	Product category restrictions would be a barrier. Lack of resources for designing products adopted for reuse, repair and remanufacture.
Fashion Vulnerability	Since CBM strives to slow down or close the life cycle of materials and products, fashion could be a barrier for high quality products.
Risk of Cannibalization	Risk of cannibalization similar to fashion vulnerability hinders production of long-lasting high quality products.
Return Flow Challenges	Exchange of materials is limited by capacity of reverse logistics. Return flow challenges are barriers to CBM adoption.
Lack of channel control	Lack of channel control and conflict of interest within firms are barriers to CBM adoption.
Confidentiality for individual firms	Information exchange between all actors in CE can conflict with confidentiality and related competitive position of an individual firm.
Trust among partners	CBM is based on collaboration, and that requires trust between parties.

Mutual benefits for all partners	Mutual benefits among all stakeholders are necessary for collaboration. Misaligned profit sharing along supply chain would hinder CBM adoption.
Increase of dependency to partners	Partners work closely and increase dependency on each other which is considered a risk that must be controlled.
Higher risks for CBM	Validation is not achievable without later sales and that risk of resource exposal grows during the validation.

Rules and regulations can unintentionally inhibit CBM transition. For example, tax structures that favor new products over restored and reused materials reduce consumer demand for CBMs that are focused on reuse, repair, and remanufacture. According to Kalmykova et al. (2016), despite Sweden's goal of reusing or recycling 60% of household waste by 2020, no policies have been implemented to encourage reuse and repair or reduce the need for new goods (Berglund & Samdström, 2013).

Organizational and cultural barriers have been mentioned in several reports, but they rank low when compared to other challenges in the transition to CBM. Personal resistance within the organization as a result of the possibility of changing the existing beneficial structure.

Both analytical and philosophical papers have addressed financial and economic barriers. The assessment measures are very difficult with CBM due to its distinctive structure, and up-front investment costs are higher than with linear BM. Furthermore, the return on investment is difficult to quantify since maintenance and repair costs are highly dependent on the type of use and customer service. Lack of assets was ranked second on the list of challenges by Rizos et al. (2016) in their empirical report.

Technology know-how is another difficulty for practitioners (Kok et al. 2013), in addition to organizational, cultural, and economic barriers. A critical obstacle is a lack of experience in product design for recycled materials, data handling regarding product life cycles, and other processes. The function of design is investigated by De Los Rios and Charnley

(2016). Lack of technological know-how is ranked fifth on Rizos et al. (2016)'s list of challenges. Because of the structure and goals of CBM, creating revenue models is difficult. Linder and Williander's (2015) empirical research clearly shows the difficulties of the CBM revenue model.

CBM faces many marketing challenges, including consumer form restrictions, product segment restrictions, fashion insecurity, and the possibility of cannibalization (Linder & Williander, 2015). Another factor to remember is that circularity cannot be achieved without the participation of all parties (Rizos et al, 2015). Circularity can be interrupted or terminated in the global world, where partners are distributed around several countries (Planning, 2015). Lack of channel control, confidentiality for individual firms, confidence among partners, shared benefits for all partners, and increased reliance on partners are among the challenges found in the literature related to networks.

- **CBM Performance**

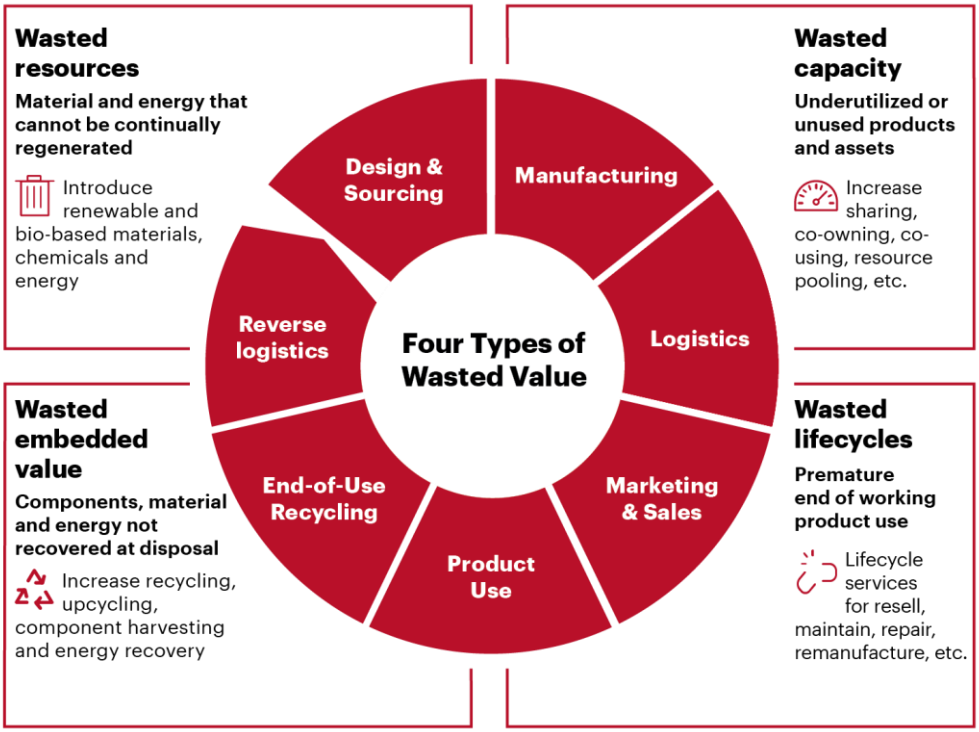
Since the beginning of business and trade, practitioners have been concerned with efficiency. Researchers have attempted to define and quantify it, but there are several assumptions and perceptions of performance (Haggége et al, 2017). According to a study by Writz et al. (2016), only 14 (9.4%) of the 149 research studies on BMI concentrated on success and BM regulation. The output of a business model can be divided into two categories: static and dynamic (Richardson, 2008). With metrics as net income and return on revenue, static success focuses on value development and capture. Dynamic success considers long-term firm survival and reflects on the economic viability of businesses (Haggége et al, 2017).

Both viewpoints are needed in practice. In order for CBMs to thrive, other dimensions of sustainability (e.g., environmental and social) must be considered in addition to conventional results. Bakker et al. (2014), for example, used the CBM to calculate the increase in the operational life of refrigerators in terms of years (Bakker et al, 2017). For several cases, Lee et al. (2012) show the environmental, economic, and social dimensions of CBM success at the macro and micro levels (Lee et al, 2012).

- **Categories of Waste**

In circular economy, the concept of "waste" was redefined (Waste to Wealth, 2015). In order to capture the value from waste resource, waste was basically divided into four categories which are wasted resources, wasted capacity, wasted lifecycle, and wasted embedded value (Figure 18).

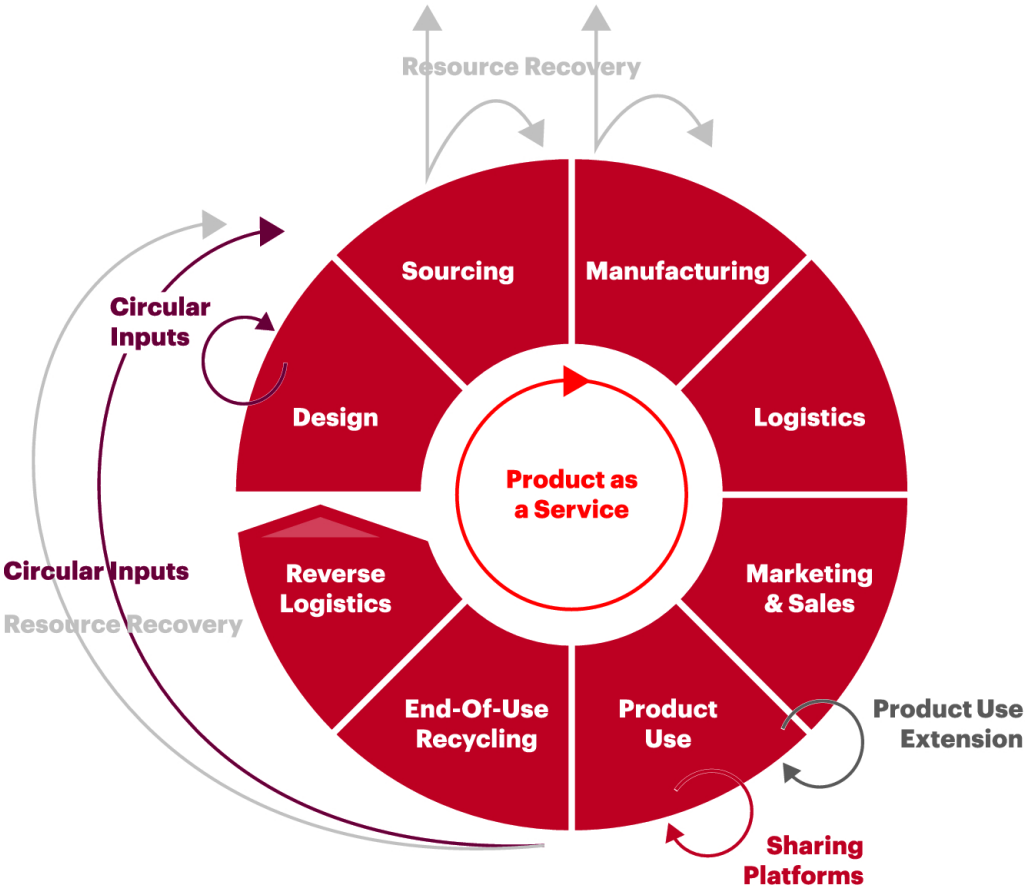
Figure 18. Four categories of waste (Palgrave Macmillan, 2020).



- The typical wasted resources are fossil energy and material that is non-recyclable. Basically, it is challenging for these resources to be regenerated in an effective way.
- Wasted capacity includes products and assets that, during their lifecycle, are not fully utilized.
- Wasted lifecycle covers products that are not reused owing to their poor design.
- Finally, the energy or materials that are not recovered from the waste streams will be listed as wasted embedded value.

- **The Five Circular Business Models**

In order to produce value from and minimize these wastes, the circular approaches are developed into five circular business models (Figure 19). Although the recognition of the five models is early growing, the pace of adoption is not as expected and not implemented by all industries. Therefore, the insights and benefits of the models needs more analysis and experiences so as to effectively enhance the awareness in the importance of them.



Typical value chain

CIRCULAR INPUTS
Use of renewable energy, bio-based or potentially completely recyclable materials

SHARING PLATFORMS
Increased usage rates through collaborative models for usage, access, or ownership

PRODUCT USE EXTENSION
Prolongation of product use through repair, reprocessing, upgrading and resale

PRODUCT AS A SERVICE
Offer of product use with retention of the product at the producer to increase resource productivity

RESOURCE RECOVERY
Recovery of usable resources or energy from waste or by-products

Figure 19. Five business models (Palgrave Macmillan, 2020)

In these circular value loop, there are three models that concentrates on the production process; they are Circular Inputs, Product Use Extension, and Resource Recovery. Sharing Platforms and Product as a Service, on the other hand, are specialized in consumption as well as the relationship between the customer or consumer and the product.

- Circular Inputs, or “Circular Supplies”, is widely implemented by companies across industries. Fundamentally, the resource in the supply chain must be replaced with a circular form from a linear type. Those resources are divided into three categories so that the solutions can be developed; they are renewable resources, renewable bio-based materials, and renewable man-made materials. The stages that Circular Inputs are adopted cover product design, sourcing, and manufacturing. This business model targets at mitigating or eliminating the wasted resources.
- In Sharing Platform, the use of assets is maximized by creating a community where the customers are provided with affordable access to the owner’s products and services. The wasted capacity and wasted lifecycles are addressed in this business model.
- In Product as a Service, a leasing or pay-for-use contract is applied to the customers. The durability of the product is boosted because the companies model concentrates on the performance instead of the volumes. Primarily, the ownership of the product remains to the owner.
- Product Use Extension enables the extension of product life. In other words, the product is optimized through upgrading, maintenance, or repaired in its end of use instead of disposing or landfilling. Wasted lifecycles are focused in this model.
- In the Resource Recovery, the materials and resources at the end of use in the value chain are recovered so that they can be used for the manufacturing of other products. The wasted embedded value is utilized in this process so that the value loop is closed, and the materials and energy are returned back into the sourcing and production cycle.

3 EMPIRICAL STUDY

3.1 Research Methodology

Qualitative research is focused on the meanings conveyed by words, both spoken and written, as well as images. Since researchers need to consider the subjective and socially formed context conveyed about the phenomena being examined, qualitative analysis is generally correlated with an interpretive philosophy. Many data collection methods and analytical procedures can be used to develop theory in qualitative research. (2016, 568, Mark Saunders, Philip Lewis, Adrian Thronhill.)

This thesis has been developed using a qualitative analysis method. A qualitative research method is advantageous for the thesis because it allows the author team to better understand how circular economy business models are applied in the operations of Wärtsilä. Quantitative analysis would have been ineffective in solving the thesis' research issue. Individual interviews with Wärtsilä's representative were conducted, with the aim of understanding the how Wärtsila implements circular economy and which circular business model Wärtsilä utilizes.

3.2 Data Collection

The chapter on data collection contains extensive details on the data collection process. The data collection steps taken during the thesis writing process are depicted in Figure 18.

Figure 20. *Data Collection Process*

The writing of the thesis began in the spring of 2021. The first step in the data collection process was to gather as much knowledge as possible about the circular economy, its business models, and the state of the circular economy in Finland and the European Union. Following that, it was critical to contact and construct the interview the representative from Wärtsilä willing to respond to the questions and actively engage in the interview. Among all chosen and contacted representatives, Vesa Marttinen agreed to take part in the personal interview. Individual interviews took place approximately half an hour to one hour. The personal point of view on Wärtsilä issue is used as the information source and base in the research.

3.3 **Research Design**

The research issue and investigative questions in this study are focused on the theoretical framework, and the research has been structured around it. Secondary data was gathered from a variety of literary sources, including related books, websites, and other publications. The theoretical structure was created using these literary sources relevant to the research issue, which assisted the author team in comprehending the implementation of the circular economy business model of Wärtsilä.

To gain a better understanding of the Wärtsilä's activities and creations, an individual interview was conducted with Wärtsilä’s Marine Director – Vesa Marttinen, who had been working closely with the marine business throughout. The interview was conducted at the end of the thesis writing process to build a strong analysis to ensure that the thesis would support both the organization and the author team. The interviewer team preferred the question interview format because they wanted to keep the dialogue flowing while also focusing on the key points.

Relevant questions about the topics were asked during the interview in order to obtain concrete information and to maintain a general discussion about the topics. The interview questions are mentioned in the appendix. In addition, general trial knowledge was gathered to aid the study. The interviewer's phone was used to record the conversation, and the responses were written down on the interviewer's computer. The majority of the data and theories used in the study came from secondary sources.

3.4 Interview Outcomes

The main subjects of the interview are the circular business model of Wärtsilä and how circularity is currently perceived on marine industry, as well as what the effect on environment.

Circularity

At the beginning of the interview, the question is about the circular economy principles of Wärtsilä and from the respondent's point of view, is the circularity gains benefits for Wärtsilä.

Vesa Marttinen emphasized that circularity is the ideal way of looking at how different sectors and economies should approach their economic impact through the concept of sustainability. Historically, Wärtsilä have taken a throwaway approach to stuff, producing it, using it, and then discarding it. It is currently commonplace to mention about the recycling economy, which involves repurposing products. This is far superior to the linear model, but even though new materials will always be required, a circular economy in which products are manufactured, used, recycled, and then produced again is preferred. Wärtsilä may enhance to prevent dumping products into the atmosphere. It might take time, but shifting to the direction of sustainable companies is that companies are supposed to do in the future.

The concept of circularity impacting the maritime economy

The maritime industry can be divided into four categories: Leisure, Harvesting, Logistics and Infrastructure.

Governments abominate polluters in their space or pollution in their air and water, so they all face a "license to operate" problem. As a result, regulators impose conditions on all maritime businesses. There are global actors such as the Hong Kong Convention and the International Maritime Organization (IMO), as well as local actors such as the European Union and other local actors for example cities. Not only publicity but also politicians are

involved in the environmental issues. In particular, both regulators and end users are pressuring all sectors of the maritime economy to become more environmentally friendly.

Modification of marine industry business model promoting circular economy

Wärtsilä make alterations to the circular marine industry originally with a lifecycle perspective. In corporate jargon, a lifecycle refers to the middle of a product's life, but the structure of a lifecycle includes the beginning, middle, and end of a product's life.

Vesa Marttinen typically said "built to last" when designing these assets and operations in the beginning, but he preferred "designed to last." This means that the assets will not easily degrade – they can be used for a long time before being repurposed into something else in the manufacturing process. Therefore, Wärtsilä must consider how to put everything that has been conditioned and refurbished into the operations. The elements of assembly and incorporation are the final stages of the lifecycle stage.

The operation is included in the middle of the lifecycle stage. Instead of using a product-based model, Wärtsilä could use a service-based model. This means they are more concerned with success than with asset ownership. Repair and maintenance work, as well as long-term maintenance support, are included in this level. At this stage, Wärtsilä should inquire if there are any opportunities for enhancements or ways to boost the assets' results. The substance efficacy is increased by extending the lifespan. Wärtsilä usually focus on energy efficiency, but increasing material efficiency means using less raw materials since the life of existing materials is extended. Finally, there's the end of life phase, which includes decommissioning, scrapping, and determining what can be recycled or upcycled back into raw materials.

The maritime industry making progress in circularity

As being asked if the maritime industry was making progress in circularity, Vesa supposed that they were doing a pretty good job of returning assets to the material flow so they can be reused. Most ship products, he believed, are reused every day. Steel accounts for the majority of it, but internal materials and device elements can also be reused. The

most significant victory, though, is the lifetime extension. They are expanding asset life, which means they will need less new content in the future.

Ethical relationships and moral appeals

According to the respondent, across these stages, there are interlocking industrial chains. This results in the creation of an interconnected whole of the economic operation, as well as new ethical ties and moral appeals that are distinct from conventional linear economy. The three organizational stages not only rebuild labor relations, but also new ethical partnerships within and between businesses, as well as between corporations and society. The intrinsic ethical spirits of the circular economy, as opposed to the conventional linear economy, are holistic and sustainable value concepts, which entail new understandings and due ethical attitudes toward capital, climate, development, consumption, interests, and justice, and embody human active spirits in terms of ecological constraints and sense of obligation for future mankind.

4 RESULTS

- **Which CBM has Wärtsilä as an Equipment Manufacturer Applied to its Cruise Ship Customers?**

According to conducted interview directly with Vesa Marttinen who is currently the managing director, Eniram at Wärtsilä Voyage, the company is transitioning from transactional business model into performance target business model. In other words, the company is no longer a ship builder but a ship system manufacturer. And two main focus systems are technical and nautical systems. Instead of applying linear model, Wärtsilä has adopted circular business model in which the product life extension and performance based are concentrated. The company remains its ownership of the ship system and the contract for its operation is made directly between the two parties who are the company and the ship owner.

- **What are the Benefits and Challenges in the Process of Adopting its CBM?**

One of the most substantial benefits acquired from the circular model is the reduction in greenhouse gas emissions as the product life is optimized and resources are therefore saved. Another benefit which is added to the shipowner is the amount of operational expenditure is reduced and shared by the company. This also brings Wärtsilä a competitive advantage compared to other actors in the same industry. However, the challenge for the Wärtsilä is to maintain a noticeable amount of capital cost as the ownership of the systems still belong to the company.

- **Is there any Suggestion on a new CBM that Wärtsilä should Apply or on the Improvements for the Company's Current Business Model to Minimize GHG Emission?**

According to the Circular economy playbook of Sitra, the only circular business model that Wärtsilä, in its maritime division, has not applied yet is sharing platform model as the operation of the company is inhouse. The other four models which are circular input, product as a service, resource recovery, and product use extension are being adopted effectively by the company.

5 DISCUSSION AND CONCLUSION

This chapter summarizes all of the knowledge obtained during the study and provides answers the research questions. The answers to the research questions are addressed, validity and reliability are presented, and research recommendations are provided.

5.1 Summary of The Thesis

The study explores the value of circular economy for Wärtsilä's circular business model, which has the potential to be an environmental solution. The main aim was to strengthen Wärtsilä's circular economy business model and determine if it would be beneficial to the company. The key research question is: How is the circular economy beneficial to Wärtsilä's circular business model and the method of implementing it?

What is the Circular Economy Concept?

What is the circular economy concept? In order to minimize waste, deforestation, greenhouse gas emissions, unregulated resource use, and energy leakage, the circular economy strives to hold materials at their highest potential benefits by offering alternatives for waste-free production and consumption. It takes a long period of innovating, redesigning, restoring, remanufacturing, and recycling to achieve. The “take, produce, dispose” model, which is a linear economy, contrasts with this form of economy. In technological, social, financial, and environmental terms, the circular economy is concerned with the future.

What are the Circular Economy Business Models?

The circular business models vary from conventional ones in that they concentrate on and understand the needs of all stakeholders while also generating greater value by concentrating on various aspects rather than sales. There are five different circular economy business models that can be used separately or in combination. The first is titled "Circular supplies." The aim of this business model is to substitute single-lifecycle inputs with fully renewable energy and recyclable input materials. The Resource Recovery model, which focuses on recycling useful resources from discarded goods, is the second circular economy business model. Product life extension is the third business model. The model focuses on extending the lifecycle of products by repairing, remanufacturing, and updating,

which gives materials new life and can help companies make a new profit. Another model is the "Sharing platform," which functions as a platform that allows users to share access to a product, thus increasing product utilization. "Product as a service" is the final business model. This model disrupts the conventional way of using goods by offering leasing and pay-for-use options.

What are the advantages of circular economy for Wärtsilä?

It is clear from the sub-questions and research that Wärtsilä needs a circular economy business model. From an environmental standpoint, the circular economy has the potential to address the emissions and waste issues that businesses face. Furthermore, the circular economy will provide businesses with new market opportunities, new clients, various types of goods, and additional benefit. Through renovating and implementing the most appropriate circular economy business model, Wärtsilä will gain a competitive advantage over companies that do not follow circular economy concepts, attracting new customers and spreading the circular economy concept to consumers.

What challenges would Wärtsilä face in implementing a circular business model?

Avoiding quality problems with the new products generated by any business model based on recycled materials is a significant challenge. To overcome this obstacle, technological innovation is needed to establish adequate sorting and pre-processing, as well as social innovation to form new alliances with waste collection and sorting companies. Such collaborations are needed to ensure consistent and appropriate quantities of correctly sorted waste materials that are free of pollutants to meet the raw material producers' processing ability. Besides that, ethical spirit is not only an essential challenge but also a value principle of circular business model because it intends to reduce the contradictions between economy and environment, as well as between economy and society.

5.2 Validity and Reliability

Validity and reliability are critical factors to consider when writing a thesis. The thesis' main goal was to respond to the research questions posed by the researcher team. The key research goals have been met, and the answers to the research questions have been stated

and clarified. Data for the study was gathered from both primary and secondary sources. Interviews with Wärtsilä's representative provided primary data, as the answered questions prepared by the author team. Secondary data was gathered from a variety of sources, including official publications, books, posts, and internet resources. The conducted research can be considered true and accurate based on these factors.

5.3 **Suggestions on Further Research**

The thesis sparked ideas for future study. Due to the lack of research on the topic of circular economy, especially circular business models, it appears that companies that are implementing the circular economy have not commented on the disadvantages of current circular business models or suggestions for new circular business models. The case study of Wärtsilä, on the other hand, was helpful in gaining a better understanding of circular business models and how they can be applied to the maritime industry. The aim of the case study was to inculcate new ideas in each of the business models. However, further analysis and research is required to what the current circular business of Wärtsilä is and how Wärtsilä improves it to achieve environmental benefits.

In conclusion, the analysis revealed a number of study options that will require further consideration at a later stage. The following are some ideas for further research: what circular business model is the best model for Wärtsilä, the overall impact of circular business models on maritime industry and environmental variables in circular economy.

REFERENCES

Published Books & Journals:

Local Government for Sustainability Africa. (s. d.). Circular development | ICLEI Africa. Circular Development Pathway. Consulté le 15 mars 2021, à l'adresse

L'économie circulaire. (2020, 4 novembre). Ministère de la Transition écologique. https://www.ecologie.gouv.fr/leconomie-circulaire

L'économie circulaire, un nouveau modèle de développement. (2020, 11 juin). ESCadrille Toulouse Junior Conseil. https://www.escadrille.org/fr/blog/economie-circulaire-nouveau-modele-developpement

Économie circulaire - Ellen Macarthur Foundation. (s. d.). Ellen Macarthur Foundation. Consulté le 9 mars 2021, à l'adresse https://www.ellenmacarthurfoundation.org/fr/economie-circulaire/concept

Local Government for Sustainability Africa. (s. d.). Circular development | ICLEI Africa. Circular Development Pathway. Consulté le 15 mars 2021, à l'adresse https://africa.iclei.org/pathways_cat/circular-development-pathway/

L'économie circulaire. (2020, 4 novembre). Ministère de la Transition écologique. https://www.ecologie.gouv.fr/leconomie-circulaire

McCarthy, A., R. Dellink and R. Bibas (2018), "The Macroeconomics of the Circular Economy Transition: A Critical Review of Modelling Approaches", OECD Environment Working Papers, No. 130, OECD Publishing, Paris, https://dx.doi.org/10.1787/af983f9a-en.

Stahel, W. (2010), The Performance Economy: 2nd Edition.

EEA (2019), Paving the Way for a Circular Economy: Insights on Status and Potentials, European Environment Agency, https://www.eea.europa.eu/publications/circular-economy-in-europe-insights (accessed on 27 July 2020).

OECD (2019), OECD Roundtable on the Circular Economy in Cities and Regions, OECD, Paris, http://www.oecd.org/cfe/regional-policy/roundtable-circular-economy.htm (accessed on 5 August 2019).

OECD (2020), OECD Survey on Circular Economy in Cities and Regions, OECD, Paris.

Communication from the commission to the European parliament, the council, the European economic and social committee and the committee of the regions A New Circular Economy Action Plan for a cleaner and more competitive Europe

Towards the Circular Economy 1: Economic and Business Rationale for an Accelerated Transition; January 2012, Cowes, Isle of Wight: Ellen MacArthur Foundation.

"how PALANTA works". palanta.co. Retrieved 12 April 2021.

"Construction | Growth". European Commission. 2016-07-05. Retrieved 12 April 2021.

Nuñez-Cacho, Pedro; Górecki, Jarosław; Molina-Moreno, Valentin; Corpas-Iglesias, Francisco Antonio (2018). "New Measures of Circular Economy Thinking in Construction Companies". Journal of EU Research in Business. 2018: 1–16.

European Circular Economy Stakeholder Platform

Automakers Enter the Circular Economy

The Circular Economy In The Automotive Sector: How Far Can We Introduce It?

Van Buren, Nicole; Demmers, Marjolein; van der Heijden, Rob; Witlox, Frank (8 July 2016). "Towards a Circular Economy: The Role of Dutch Logistics Industries and Governments". Sustainability. 8 (7): 647

Circulair Nederland 2050. Retrieved 2021-04-12.

Kringlooplandbouw. Retrieved 2021-04-12.

Omslag naar duurzame en sterke landbouw definitief ingezet. Retrieved 2021-04-12.

Realisatieplan Visie LNV: Op weg met nieuw perspectief. Retrieved 2021-04-12.

Kaddoura, Mohamad; Kambanou, Marianna Lena; Tillman, Anne-Marie; Sakao, Tomohiko (2019). "Is Prolonging the Lifetime of Passive Durable Products a Low-Hanging Fruit of a Circular Economy? A Multiple Case Study". Sustainability. 11 (18): 4819.

Towards the Circular Economy: Economic and Business Rationale for an Accelerated Transition (PDF) (Report). Ellen MacArthur Foundation. 2013. Retrieved 2021-04-12.

Towards the Circular Economy: an economic and business rationale for an accelerated transition. Ellen MacArthur Foundation. 2012. p. 60. Retrieved 2021-04-12.

Estimating Employment Effects of the Circular Economy. Retrieved 2021-04-12.

Circular Economy Action Plan. For a cleaner and more competitive Europe. European Commission. Retrieved 2021-04-12.

"Directive's legal text". Eur-lex.europa.eu. Retrieved 2021-04-12.

Directive 2008/98/EC of 19 November 2008 on waste and repealing certain Directives. Retrieved 2021-04-12.

Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency.

Su, B., Heshmati, A., Geng, Y. and Yu, X. (2013), “A review of the circular economy in China: moving from rhetoric to implementation”, Journal of Cleaner Production, Vol. 42, pp. 215-227.

Naustdalslid, J. (2014), “Circular economy in China – the environmental dimension of the harmonious society”, International Journal of Sustainable Development & World Ecology, Vol. 21 No. 4, pp. 303-313.

Benton, D., Hazell, J. and Hill, J. (2015), “The guide to the circular economy: capturing value and managing material risk”, Do Sustainability, Routledge, London, pp. 15-86.

Winans, K., Kendall, A. and Deng, H. (2017), "The history and current applications of the circular economy concept", Renewable and Sustainable Energy Reviews, Vol. 68, Part 1, pp. 825-833.

Geng, Y., Fu, J., Sarkis, J. and Xue, B. (2012), "Towards a national circular economy indicator system in China: an evaluation and critical analysis", Journal of Cleaner Production, Vol. 23 No. 1, pp. 216-224

Li, J. and Yu, K. (2011), "A study on legislative and policy tools for promoting the circular economic model for waste management in China", Journal of Material Cycles and Waste Management, Vol. 13 No. 2, pp. 1-103.

Pomponi, F. and Moncaster, A. (2017), "Circular economy for the built environment: a research framework", Journal of Cleaner Production, Vol. 143, pp. 710-718.

Park, J., Sarkis, J. and Wu, Z. (2010), "Creating integrated business and environmental value within the context of China's circular economy and ecological modernization", Journal of Cleaner Production, Vol. 18 No. 15, pp. 1494-1501.

Pan, S.Y., Du, M.A., Huang, I.T., Liu, I.H., Chang, E.E. and Chiang, P.C. (2015), "Strategies on implementation of waste-to-energy (WTE) supply chain for circular economy system: a review", Journal of Cleaner Production, Vol. 108, Part A, pp. 409-421.

Liu, Y. and Bai, Y. (2014), "An exploration of firms' awareness and behavior of developing circular economy: An empirical research in China", Resources, Conservation and Recycling, Vol. 87, pp. 145-152.

Govindan, K. and Hasanagic, M. (2018), "A systematic review on drivers, barriers, and practices towards circular economy: a supply chain perspective", International Journal of Production Research, Vol. 56 Nos 1–2, pp. 278-311.

Hedman, J & Kalling, T (2003). The business model concept: theoretical underpinnings and empirical illustrations, European Journal of Information Systems, 12, 49-59

Gambardella, A & McGahan A.M (2010), Business-Model Innovation: General Purpose Technologies and their Implications for Industry Structure, Long Range Planning, 43, 262-271

Teecee, D.J (2010). Business Models, Business Strategy and Innovation, Long Range Planning, 43, 172-194

Chesbrough, H (2010). Business model innovation: Opportunities and barriers, Long Range Planning, 43:2-3, 354-363.

Osterwalder, A & Pigneur, Y (2010). Business Model Generation, New Jersey, Wiley, ISBN 978-0470-87641-1

Osterwalder, A., Pigneur, Y., Bernarda, G., Smith, A., (2014). Value Proposition

Design: How to create products and services customer want. Hoboken, NJ : Wiley, cop.

Wirtz, B.W (2011). Business model management: design - instruments - success factors. Germany, Gabler. 342 p. ISBN 978-3834927927.

Parvinen, P. 2008. Marketing spirit. Otavan Kirjapaino Oy, Keuruu.

Girotra K & Netessine S (2014). Four paths to business model innovation. Harvard Business Review, July-August, 96-102

Achtenhagen; L, Melin; L & Naldi L (2013), Dynamics of Business Models -Strategizing, Critical Capabilities and Activities for Sustained Value Creation. Long Range Planning, 46, 427-442.

Kaplan, S (2012). The business model innovation factory, John Wiley & Sons, New Jersey. 240p. ISBN 978-1-118-14956-0.

DaSilva, M. & Trkman, P. (2013). Business Model: What It Is and What It Is Not. Long Range Planning, vol xx, pp. 1-11.

Fleming, L. (2004), “Perfecting cross-pollination”, Harvard Business Review, Vol. 82 No. 9, pp. 22–24. FORA. (2010), Green Business Models in the Nordic Region – A key to promote sustainable growth, commissioned by the Nordic Council of Ministers.

Chun, Y.-Y. and Lee, K.-M. (2013), “Life Cycle-Based Generic Business Strategies for Sustainable Business Models”, Journal of Sustainable Development, Vol. 6 No. 8, p. p1.

Jolliet, O., Margni, M., Charles, R., Humbert, S., Payet, J., Rebitzer, G. and Rosenbaum, R. (2003), “IMPACT 2002”: A new life cycle impact assessment methodology”, The International Journal of Life Cycle Assessment, Vol. 8 No. 6, pp. 324–330.

Pennington, D.W., Potting, J., Finnveden, G., Lindeijer, E., Jolliet, O., Rydberg, T. and Rebitzer, G. (2004), “Life cycle assessment Part 2: Current impact assessment practice”, Environment International, Vol. 30 No. 5, pp. 721–739.

Rebitzer, G., Ekvall, T., Frischknecht, R., Hunkeler, D., Norris, G., Rydberg, T., Schmidt, W.-P., et al. (2004), “Life cycle assessment: Part 1: Framework, goal and scope definition, inventory analysis, and applications”, Environment International, Vol. 30 No. 5, pp. 701–720.

Porter, M. (1985), Competitive Advantage: Creating and Sustaining, Superior Performance. New York: The Free Press.

Nokia. 2005. Integrated Product Policy Pilot Project: 87. Finland. Nordic Innovation. (2012), Green Business Model Innovation: Conceptualisation next practice and policy, Nordic Innovation.

Prahalad, C.K. and Ramaswamy, V. (2004), “Co-creating unique value with customers”, Strategy & Leadership, Vol. 32 No. 3, pp. 4–9.

European Commission. 2012. http://ec.europa.eu/environment/chemicals/reach/reach_intro.htm. Accessed Apr 21 2021.

OECD, European Commission and Nordic Innovation. (2012), THE FUTURE OF ECO-INNOVATION: The Role of Business Models in Green Transformation, Danish Business Authority.

Environment Agency. 2012. Waste electrical and electronic equipment (WEEE): http://www.environment-agency.gov.uk/business/topics/waste/32084.aspx. Accessed Apr 21 2021.

Mont, O. and Tukker, A. (2006), "Product-Service Systems: reviewing achievements and refining the research agenda", Journal of Cleaner Production, Vol. 14 No. 17, pp. 1451–1454.

Joustra, D.J.; de Jong, E.; Engelaer, F. 2013. Guided Choices towards a Circular Business Model; North-West Europe Interreg IVB: Lille, France

Ghisellini, P., Cialani, C., Ulgiati, S., 2016. A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems. Journal of Cleaner Production 114, 11-32. Hillebrand, B., Kok, R., Biemans, W.G., 2001. Theory-testing using case studies - A comment on Johnston, Leach, and Liu. Industrial Marketing Management 30, 651-657.

Jolliet, O., Margni, M., Charles, R., Humbert, S., Payet, J., Rebitzer, G. and Rosenbaum, R. (2003), "IMPACT 2002+: A new life cycle impact assessment methodology", The International Journal of Life Cycle Assessment, Vol. 8 No. 6, pp. 324–330.

De Benedetto, L. and Klemeš, J. (2009), "The Environmental Performance Strategy Map: an integrated LCA approach to support the strategic decision-making process", Journal of Cleaner Production, Early-Stage Energy Technologies for Sustainable Future, Vol. 17 No. 10, pp. 900–906.

The triple layered business model canvas: a tool to design more sustainable business models. https://www.researchgate.net/publication/280044131_The_triple_layered_business_model_canvas_a_tool_to_design_more_sustainable_business_models. Accessed Apr 21 2021.

Mentink, B. Circular Business Model Innovation: A Process Framework and A Tool for Business Model Innovation in A Circular Economy. Master's Thesis, Delft University of Technology & Leiden University, Leiden, The Netherlands, 2014.

Linder, M.; Williander, M. Circular Business Model Innovation: Inherent Uncertainties. Bus. Strategy Environ. 2015, 26, 182–196

Bocken, N.M.P.; de Pauw, I.; Bakker, C.; van der Grinten, B. Product design and business model strategies for a circular economy. J. Ind. Prod. Eng. 2016, 33, 308–320.

De Winter, J. Circular Business models: An Opportunity to Generate New Value, Recover Value and Mitigate Risk Associated with Pressure on Raw Material Availability and Price Volatility. Master's Thesis, Faculty of Geosciences, Utrecht University, Utrecht, The Netherlands, 2014.

Koen, P.A.; Bertels, H.M.; Elsum, I.R. The three faces of business model innovation: Challenges for established firms. Res. Technol. Manag. 2011, 54, 52–59

Beattie, V.; Smith, S. Value creation and business models: Refocusing the intellectual capital debate. Br. Account. Rev. 2013, 45, 243–254

Stubbs, W.; Cocklin, C. Conceptualizing a "sustainability business model". Org. Environ. 2008, 21, 103–127.

Kok, L.; Wurpel, G.; Ten Wolde, A. The Circle Economy/IMSA Amsterdam. In Unleashing the Power of the Circular Economy; A Report for Circle Economy; The Circle Economy/IMSA Amsterdam: Amsterdam, The Netherlands, 2013.

Oghazi P, Mostaghel R. Circular Business Model Challenges and Lessons Learned—An Industrial Perspective. Sustainability. 2018; 10(3):739. https://doi.org/10.3390/su10030739.

Grant, R.M. Contemporary Strategy Analysis; John Wiley & Sons Ltd.: Chichester, UK, 2010; ISBN 9781119120841.

Genovese, A.; Acquaye, A.; Figueroa, A.; Lenny Koh, S.C. Sustainable supply chain management and the transition towards a circular economy: Evidence and some applications. Omega 2017, 66, 344–357.

Vargo, Stephen L. and Lusch, Robert F. (2004a) 'Evolving to a New Dominant Logic for Marketing', Journal of Marketing 68 (January): 1–17.

Woodruff, Robert (1997), "Customer Value: The Next Source for Competitive Advantage," Journal of the Academy of Marketing Science, 25 (2), 139-153.

Moors, E.; Mulder, K.; Vergragt, P. Towards cleaner production: Barriers and strategies in the base metals producing industry. J. Clean. Prod. 2005, 13, 657–668.

Produktion2030. Expertområde 5: Produkt-och Produktionsbaserade Tjänster Vision, Nulägesanalys, Utmaningar och Effektmål; Produktion 2030: Stockholm, Sweden, 2014.

Liu, Y.; Bai, Y. An exploration of firms' awareness and behaviour of developing circular economy: An empirical research in China. Resour. Conserv. Recycl. 2013, 87, 145–152.

Bechtel, N.; Bojko, R.; Völkel, R. Be in the Loop: Circular Economy & Strategic Sustainable Development. Master's Thesis, School of Engineering, Blekinge Institute of Technology, Karlskrona, Sweden, 2013.

Planing, P. Business model innovation in a circular economy reasons for non-acceptance of circular business models. Open J. Bus. Model Innov. 2015, in press.

Westblom, C. Towards a Circular Economy in Sweden-Barriers for New Business Models and the Need for Policy Intervention. Master's Thesis, The International Institute for Industrial Environmental Economics (IIIEE), Lund University, Lund, Sweden, 2015.

Kalmykova, Y.; Rosado, L.; Patrício, J. Resource consumption drivers and pathways to reduction: Economy, policy and lifestyle impact on material flows at the national and urban scale. J. Clean. Prod. 2016, 132, 70–80.

Rizos, V.; Behrens, A.; van der Gaast, W.; Hofman, E.; Ioannou, A.; Kafyeke, T.; Flamos, A.; Rinaldi, R.; Papadelis, S.; Hirschnitz-Garbers, M.; et al. Implementation of circular

economy business models by small and medium-sized enterprises (SMEs): Barriers and enablers. Sustainability 2016, 8, 1212.

De los Rios, I.C.; Charnley, F.J. Skills and capabilities for a sustainable and circular economy: The changing role of design. J. Clean. Prod. 2016, 160, 109–122.

Haggége, M.; Gauthier, C.; Rüling, C.-C. Business model performance: Five key drivers. J. Bus. Strategy 2017, 38, 6–15.

Savin-Baden, M., & Major, C. H. (2013). Qualitative Research: The Essential Guide to Theory and Practice. Qualitative Research: The Essential Guide to Theory and Practice. Routledge

Richardson, J. The business model: An integrative framework for strategy execution. Strateg. Chang. 2008, 17, 133–144.

Bakker, C.; Wang, F.; Huisman, J.; den Hollander, M. Products that go round: Exploring product life extension through design. J. Clean. Prod. 2014, 69, 10–16.

Lee, S.; Geum, Y.; Lee, H.; Park, Y. Dynamic and multidimensional measurement of product-service system (PSS) sustainability: A triple bottom line (TBL)-based system dynamics approach. J. Clean. Prod. 2012, 32, 173–182.

Saunders, M. Lewis, P. Thornhill, A. 2016, Research Methods for Business Students. 7th edition. Pearson Education Limited. Edinburgh Gate. Essex England.

Farong Qiao, 2013, Circular economy: An ethical and sustainable economic development model.

Erwan, Mouazan, 2019, Managing Circular Business Models.

Benyus, J. 1997. Biomimicry: Innovation Inspired by Nature. New York: HarperCollins Publishers Inc.

Stahel, W.R. The Business Angel of a Circular Economy–Higher Competitiveness, Higher Resource Security and Material Efficiency. In A New Dynamic: Effective Business in a Circular Economy, 1st ed.; Ellen MacArthur Foundation: Cowes, UK, 2013.

Sheth, J.N., Newman, B.I. and Gross, B.L. (1991), 'Consumption Values and Market Choice'. South WesternPublishing Company.

Sempels, C. (2014). Implementing a circular and perfomance economy through business model innovation. In A. Lovins, M. Braungart, & Ellen MacArthur Foundation (Ed.),A New Dynamic: Effective Business in a Circular Economy(2nd ed., pp. 143-156). Cowes: Ellen MacArthur Foundation Publishing.

Breuer, H. & Lüdeke-Freund, F. (2017): Values-Based Network and Business Model Innovation, International Journal of Innovation Management, Vol. 21, No. 3, Art. 1750028 (35 pages).

Online Materials & Articles:

Backhausen, 2017. Backhausen. [Online] Available at: http://www.backhausen.com/unternehmen/tradition/ [Accessed 28 10 2017].

ASME, 2012. printing-houses. [Online] Available at: https://www.asme.org/engineering-topics/articles/construction-andbuilding/printing-houses

Lacy P., Long J., Spindler W. (2020) The Circular Business Models. In: The Circular Economy Handbook. Palgrave Macmillan, London. https://doi.org/10.1057/978-1-349-95968-6_2

Towards the Circular Economy 1: Economic and Business Rationale for an Accelerated Transition; January 2012, Ellen MacArthur Foundation, available at http://www.ellenmacarthurfoundation.org/business/reports/ce2012

CEPS (2015), "The Circular Economy: Barriers and Opportunities for SMEs", No. 412 / September 2015, available at http://www.ceps.eu/system/files/WD412%20GreenEconet%20SMEs%20Circular%20Economy.pdf

Moving towards a Circular Economy – Successful Nordic Business Models, available at http://www.greengrowthknowledge.org/resource/moving-towards-circular-economy-%E2%80%93- successful-nordic-business-models

Lacy, P., Cooper, T., Hayward, R., & Neuberger, L. 2010. A New Era of Sustainability: UN Global Compact-Accenture CEO Study 2010. New York: United Nations. http://www.unglobalcompact.org/docs/news_events/8.1/UNGC_Accenture_CEO_S...

Circular economy business models for the manufacturing industry. Circular Economy Playbook for Finnish SMEs. https://teknologiateollisuus.fi/fi/circular-economy-playbook

Van Renswoude, K.; Wolde, A.T.; Joustra, D.J. Circular Business Models. Part 1: An introduction to IMSA's Circular Business Model Scan. Available online: https://groenomstilling.erhvervsstyrelsen.dk/sites/default/files/media/imsa_circular _business_models_-_april_2015_-_part_1.pdf

WRAP. Innovative Business Model Map. Available online: http://www.wrap.org.uk/resource-efficient-business-models/innovative-businessmodels (accessed on April 2018).

Smith-Gillespie, A. 2017. Defining the Concept of Circular Economy Business Model http://www.r2piproject.eu/wp-content/uploads/2017/04/R2Pi-CEBM.pdf (Accessed 17 August 2018)

Woodall, Tony (2003), "Conceptualization 'Value for the Customer': An Attributional, Structural and Dispositional Analysis," Academy of Marketing Science Review, 12 (available at www.amsreview.org/articles/woodall12-2003.pdf)

APPENDIX 1

Interview Questions

1. Does Wärtsilä use circular economy principles for its business? If yes, do you think it has improved/unimproved your business?
2. How circular economy has improved/unimproved your business/production/revenue?
3. Which Business Model/CBM has Wärtsilä as an equipment manufacturer applied to its cruise ship customers? Why it uses that BM/CBM?
4. Which sustainable business model aspect Wärtsilä expect to pursue?

Maintenance and repair: Are the cruise ship able to be disassemble?

- End-of-life treatment: How the cruise ship end-of-life is treated?
- Easily exchanged or upgraded components: Is the components of cruise ship easily exchanged? Do Wartsila use modular design?
- Constituting product features: How is the cruise ship performance? How is its durability?

5. How is the process of applying the CBM by Wärtsilä?
6. What challenges when adopting such CBM?
7. Which values/success have the company and its customer achieved when applying the model?
9. What are the drawbacks of the current business model? Is there any suggestion on a new CBM that Wärtsilä should apply or on the improvements for the company's current business model? And any Environmental Benefits of the improvements/new suggested model?
10. Do you think circular economy is common in Finland and its future? And CBM?