Master's degree thesis

LOG950 Logistics

Sustainable development of solid waste supply chain operations: a case of Molde municipality

Nisha Shrestha
Pratigya Bhattarai

Number of pages including this page: 64

Molde, 25 May 2021

Molde University College
Specialized University in Logistics

Mandatory statement

Each student is responsible for complying with rules and regulations that relate toexaminations and to academic work in general. The purpose of the mandatory statement isto make students aware of their responsibility and the consequences of cheating. Failure tocompletethestatement does notexcusestudents from theirresponsibility.

*Please complete the mandatory statement by placing a mark **ineachbox** for statements 1-6 below.*		
1.	**I/we hereby declare that my/our paper/assignment is my/our ownwork, and that I/we have not used other sources or received other help than mentioned in the paper/assignment.**	☒
2.	**I/we hereby declare that this paper** 1. Has not been used in any other exam at another department/university/university college 2. Is not referring to the work of others without acknowledgement 3. Is not referring to my/our previous work without acknowledgement 4. Has acknowledged all sources of literature in the text and in the list of references 5. Is not a copy,duplicate or transcript of other work	Mark eachbox: 1.☒ 2.☒ 3.☒ 4.☒ 5.☒
3.	**I am/we are aware that any breach of the above will beconsidered as cheating, and may result in annulment of the examination and exclusion from all universities and university colleges in Norway for up to one year, according to the Act relating to Norwegian Universities and University Colleges, section 4-7 and 4-8 and Examination regulations** section 14and 15.	☒
4.	**I am/we are aware that all papers/assignments may be checked for plagiarism by a software assisted plagiarism check**	☒
5.	**I am/we are aware that Molde University College will handle all Cases of suspected cheating according to prevailing guidelines.**	☒
6.	**I/we are aware of the University College's rules and regulation for using sources**	☒

Personal protection

Personal Data Act

Research projects that processes personal data according to Personal Data Act, should be notified to Data Protection Services (NSD) for consideration.

Have the research project been considered byNSD? ☐**yes** ☒**no**

- If yes:

Reference number:

- If no:

I/we hereby declare that the thesis does not contain personal data according to Personal Data Act.: ☒

Acton Medical and Health Research

If there search project is effected by the regulations decided in Act on Medical and Health Research (the Health Research Act), it must be approved in advance by the Regional Committee for Medical and Health Research Ethic (REK) inyourregion.

Has the research project been considered by REK? ☐**yes** ☒**no**

-If yes:

Reference number:

Publication agreement

ECTS credits: 30

Supervisor: Antonina Tsvetkova

Agreement on electronic publication of master thesis

Author(s) have copy right to the thesis, including the exclusive right to publish the document (TheCopyrightAct§2).

All theses fulfilling the requirements will be registered and published in BrageHiM, with the approval of th eauthor(s).

Theses with a confidentiality agreement will not be published.

I/we hereby give Molde University College the right to,free of charge,make the thesis available for electronic publication:	☒**yes** ☐**no**
Is there an agreement of confidentiality?	☐**yes** ☒**no**
(A supplementary confidentiality agreement mustbe filled in)	
-If yes:	
Can the thesis be online published when the period of confidentiality is expired?	☒**yes** ☐**no**

Date:25/05/2021

Preface

This MSC thesis is our final work in completing the master's degree program in Logistics specialized in Supply chain management at Molde University College. The research has been conducted between the period of December 2020 to May 2021. We gained a lot of practical knowledge while working on this thesis as it took us into the real world of our topic of which we were unaware of beforehand. The experience and knowledge we gained during the writing of our thesis are much precious for us hereafter.

Thank you!

Abstract

Waste management is an organization of disposable objects through different methods where Supply chain management (SCM) plays a considerable role. However, waste management companies frequently grow through acquisition, making supply chains more complicated and often redundant. For the last decades, there is increased attention to making supply chains more sustainable as a solution for managing waste in the long term. There are three aspects of sustainability within solid waste management, including social, economic, and environmental aspects. While the research on the environmental aspect of sustainability has tripled during the recent decade, the social aspect is still underexplored in the literature (Tsvetkova, 2020). However, to make a supply chain sustainable, it is essential to take into consideration all three aspects of sustainability. Norway is one of many countries that try to expand different methods to deal with solid waste production. However, there are conflicts of interest between waste management companies and the Norwegian government, which cause some challenges to obtain sustainable development from all three aspects: economic, environmental, and social. Being motivated by the mentioned above gap, the overall purpose of our master's thesis is to explore how sustainable SCM within solid waste management is organized in Norway, particularly in Molde municipality.

Four research questions (RQs) have been formulated to come with findings:

RQ1: What kind of supply chain operations has been applied in Molde municipal solid waste management?

RQ2: How do solid waste supply chain operations in Molde contribute to the economic aspect of sustainability?

RQ3: How do solid waste supply chain operations in Molde contribute to the environmental aspect of sustainability?

RQ4: How do solid waste supply chain operations in Molde contribute to the social aspect of sustainability?

The master's thesis applies a single case study approach. The empirical case presents supply chain operations within solid waste management in Molde town, located in Møre and Romsdal county, Norway. Data were obtained from 11 semi-structured face-to-face interviews with the private householders and the renovation company, and archival material and analyzed through the Content analysis method. Our findings have revealed two key actors involved in waste management in Molde

municipality: the renovation company and private householders. While the renovation company implements its supply chain operations in a sustainable way, taking into account all the three aspects, to meet customer demands, the private householders are more active primarily due to the economic aspect of sustainability. Our findings have also identified that solid waste supply chain operations in Molde municipality are based on a reverse supply chain strategy to develop sustainable development. It is also emphasized that waste management has the potential to turn obstacles into solutions when implementing sustainable supply chain strategies in reusing waste materials as extra and renewable resources.

The findings were obtained only from ten private householders in Molde about their motives in waste management and their contribution to sustainable municipal development. Future research should cover a greater number of actors involved in waste management in Norway. In addition, future research on how other municipalities operate their supply chain operations can fill up the gap of social responsibility practices within SCM.

Keywords –Supply Chain Management, Sustainability, Supply Chain Operations, Solid Waste, Social Responsibility, Recycling, Case Study.

Acknowledgment

Our intense thanks go to our Associate Professor Tsvetkova Antonina for her immense guidance and suggestions. She has been much constructive in her instructions, without which we would not have accomplished our goal to complete our thesis. We would also like to thank the representative of the renovation company for his time and information. We profoundly appreciate him for the long hour he shared with us. He shared his experience in a renovation management company which has contributed much to our thesis. Moreover, we would also like to express our gratitude to all the respondents from private households in the interviews for providing us with valuable information and data which we needed to write in our thesis. We highly appreciate them taking their valuable time for us. We would not have been able to write this thesis without their participation.

"I would like to express my special thanks to my beloved husband Krishna Shrestha, who has been strong moral support during my thesis writing and would like to thank my friend Priyanka Paudyal who is a batch senior to me on guiding me regarding how and where to find the contents during thesis writing. Also, my family has been strong support who blessed me with their love, including my two little dogs name Max and Tuffy" (Nisha Shrestha)

"I would like to thank all my family and friends who have morally supported me and sent their blessings from Nepal. I would also like to thank all the respondents who provided information regarding wastes and information communication officer from the waste company who helped me to gather information regarding thesis" (Pratigya Bhattarai)

Terms and Definitions

Supply chain management: "*Supply chain management is the integration of key business processes from end user through original suppliers that provides products, services and information that add value for customers and other stakeholders." (Lambert and Enz 2017)*

Sustainability:

Sustainable Development*: Sustainable development is the overall prototype of the United Nations. The concept of sustainable development was described by the 1987 Bruntland Commission Report as "development that meets the needs of the present without compromising the ability of future generations to meet their own need." (UNESCO, 2019)*

Sustainable Supply Chain Management: *"tough network systems which have diversified setup that maintains the products from suppliers to customers and their returns which is related to the environmental, economic and social impacts."(Barbosa-Póvoa, da Silva et al. 2018)*

Solid Waste: *"any garbage or refuse, sludge, discarded material, resulting from industrial, commercial, mining, and agricultural operations, and from community activities. Nearly everything we do leaves behind waste."*(EPA, 2020)

List of Abbreviations

CSR: Corporate Social Responsibility

ISO: International Organization for Standardization

SCM: Supply Chain Management

SSB: Statistisk Sentralbyrå (Statistics Norway)

SSCM: Sustainable Supply Chain Management

Table of Contents

List of Tables

List of Figures

Chapter 1. Introduction

This chapter presents the motivation for this study with the overall description of our master's thesis. Then, the problem statement is identified where we formulate our overall research purpose and four research questions and about the structure of this master's thesis.

1.1. Motivation for the study

Solid waste management is a crucial topic regarding sustainable urban development of cities and communities. Solid waste refers to any garbage or refuse, resulted from air pollution control facility, wastewater treatment plant, and other discarded substance resulting from industrial, commercial, mining, and agricultural operations and from community activities. Almost everything we do leaves behind some kind of waste. Hence management of such substances is essential for the benefit of society (EPA, 2020).

Solid waste management can be defined as a set of interconnected elements of an organization that aims to establish policies, objectives, and processes facilitating the handling of solid waste. The scope may vary, and for this study, the strategic level in the town is the major focus in terms of monitoring performance (hage, 2016).

There are many different perceptions in solid waste and solid waste management. However, the main focus is that amount of solid waste is increasing each year considerably. It is an essential part of contemporary civilization, including a city and country`s services, activities, and performance. Every year, about 11.2 billion tons of solid waste is collected worldwide, and overall the world currently generates approximately 1.3Gigatons of solid waste per year, which is expected to increase to 2.2 Gigaton by 2025. The massive production of solid waste harms the environment because it directly affects societal well-being, people’s health, flora, and fauna. At the same time, many renovation companies worldwide are looking for solutions for managing waste in the long run (Maharjan,2016). There is increased attention to the growing importance of supply chain management in waste management. Supply chain management in waste usually involves the process of collecting wastes from different parts of waste disposal centers, sorting wastes, transporting wastes, and disposal of wastes. Waste management companies can achieve the prospect of growth by embracing new technologies and data-driven strategic procurement, rethinking their supply chain relationships, and hence focusing on continuous improvement in management and operations (Ziemerink, 2020).

Supply chain management (SCM) plays a considerable role in solid waste management. Waste management companies frequently grow through acquisition, making supply chains more complicated and often redundant. Therefore, they need to step up the pace of embracing strategic supply chains and rethink their supply chain relationships (Ziemerink, 2020). Building a proper SCM practice, it is expected that waste management companies can reduce their operating costs (business, 2021). These types of companies also make sure about customer satisfaction and ensure that their demands are met (business, 2021). At the same time, many waste management companies worldwide are looking for solutions for managing waste in the long term. Several supply chain strategies have been adopted to improve solid waste management. The adaptation of newer technologies, sorting machines, value optimization methodology helps deliver the most incredible value to the consumer at a minimal cost (Ziemerink, 2020).

For the last decades, there is an increased attention to making supply chains more sustainable. There are three aspects of sustainability within solid waste management, including social, economic, and environmental aspects. The economic aspect of sustainability involves factors, such as monetary benefits, return on investment, operating cost, and healthy cash flows. Business performance and balancing internal and external management practices also have an impact on maintaining economic stability (Kurnia, 2012). The social dimension mainly involves the issues related to the community, corporate government, the diverse relationship between employees and their safety, and human rights (Kurnia, Rahim et al. 2012). Collection of waste materials and disposal ultimately plays an essential role in the sustainability drive, as the responsibility of the government is to conserve resources and safeguard people`s health. The environmental aspect of supply chain management says that since the massive production of solid waste hurts the environment, it directly affects societal well-being, people's health, flora, and fauna (Mohammad,2016). While the research on the environmental aspect of sustainability has tripled during the recent decade, the social aspect is still under-explored in the literature (Tsvetkova, 2020). However, to make a supply chain sustainable, it is essential to take into consideration all three aspects of sustainability.

1.2 Problem statement

Norway is continuously expanding its waste management methods to deal with its enormous quantity of waste. Since 1951, 60 percent of waste has been increased in Norway. This is because the country elaborated national solid waste targets. The Norwegian Environmental Protection Agency announced

one of them and stated: "The total amount of waste shall be considerably less than the economic growth" (Miljøverndepartmentet., 2013). Waste management has the potential to turn challenges into solutions and to make a way towards sustainable development by reusing solid waste materials as renewable resources.

Being motivated by the mentioned above gap, **the overall purpose of our master's thesis is to explore how sustainable SCM within solid waste management is organized in Norway, particularly in Molde municipality.**

Our investigation applies a qualitative case study approach. The empirical case presents supply chain operations within solid waste management in Molde town, located in Møre and Romsdal county, Norway. We also focus on different types of solid wastes managed by municipal authorities and a local renovation company to create a sustainable balance between the natural environment and human activities in the long run. We formulated four research questions to make our empirical part more understandable and clearer to come to our overall purpose. Several solid waste supply chain strategies have been applied to improve solid waste management. Then, we come to our first research question (RQ):

RQ1: How does SCM affect solid waste management in Molde municipality?

From an economic aspect, solid waste management operations are essential, therefore the problem is figuring out how exactly solid waste supply chain operations in Molde contribute to the economic aspects.

RQ2: How do solid waste supply chain operations in Molde contribute to the economic aspect of sustainability?

From an environmental aspect of sustainability, solid waste management is of utmost importance as the collection of waste has a huge impact on the environment and the health of the people as well.
Negative effects of improper waste management such as air contamination, water contamination, harm towards marine life and animal

RQ3: How do solid waste supply chain operations in Molde contribute to the environmental aspect of sustainability?

The social dimension mainly involves the issues related to the community, corporate government, the diverse relationship between employees and their safety and human rights. Thus, it is essential to explore the following research question:

RQ4: How do solid waste supply chain operations in Molde contribute to the social aspect of sustainability?

1.3 Structure of the study

Chapter 1. Presents the motivation behind the study, research problem, and structure of the study.

Chapter 2. Presents literature review that provides gaps of the study, logistics operations in municipal solid waste management, methods and techniques of waste management, reverse logistics, the social and economic dimension of sustainability.

Chapter 3. Presents methodology of the study, research design, and sample size of the study.

Chapter 4. Presents the process of development of solid waste management in Norway: context description.

Chapter 5. Presents empirical findings which include waste management of Molde municipality, solid waste supply chain operations in Molde municipality, the role of a renovation company in waste management, role of private householders in municipal waste management. Their perception of supply chain operations and sustainability and the importance of solid waste management.

Chapter 6. Presents analysis and discussion mostly involving Summary of the empirical findings, implications of solid waste supply chain operations in Molde for the economic aspect of sustainability.

Chapter 7. Presents conclusion, limitations, and further scope of research.

Chapter 2. Literature review

In this chapter, we discuss key concepts of our investigations, namely waste management, types of wastes. The importance of municipal solid waste is discussed. Operations and supply chain management within solid waste management system are presented.

2.1 Waste management

According to the European council, waste is defined as any object, material that the user or holder has disregarded and it has been also viewed as to be those objects that are disregarded as per the provisions of the law (Christensen 2011). The defining of a substance as waste is crucial to inducting the authoritative controls and environmental stability measures that direct waste management methods in each jurisdiction. For many common waste materials, such as various household waste, the definition is clear and simple. For other materials, it may not be so outspoken, and in some instances and some jurisdictions, the state of material can grow because of processing or other actions (Garth Lamb, 2012). In most jurisdictions, the scope of the waste definition covers all types of 'thing' and 'substances' including stable, liquid, and volatile wastes (Garth Lamb, 2012). This is compatible with the scope of the National Waste Policy which also recognizes garbage across all three states. one exemption to this is the Queensland definition which also involves energy and any blend of matter and energy (Garth Lamb, 2012).

According to (White, Franke et al. 1995), "Waste is useless by-product of human activities which physically contains the same substance that is available in the useful product. Some regard waste to be something that can completely be discarded which means of no value meanwhile some regard it to be of value if it can be reused hence a substance can only be regarded as a waste when the owner names it as such (Dijkema, Reuter et al. 2000). But other researchers have contrast definitions such as "As long as waste has a value, it cannot be recognized as wastes" (Bontoux and Leone 1997)

Waste is the unusable by-product of human activities which physically includes the identical material that is available in the useful product (White, Franke et al. 1995). But the main principle lies in reducing the waste from the source itself. But if they have a value they should not be discarded and can be revalued and reused as well. (Cheyne I, 1995). Waste can be defined into two classifications: consumption waste or production waste. Hence the classification defines waste as like household waste in composition and quantity. This definition is relatable to the current EU definition of

municipal waste (Joe Papineschi, 2019).

Definitions of wastes have been defined from several sources below:

“Waste shall mean any material or object in the classifications which the holder discards or expected to discard” (Pongrácz and Pohjola 2004).

“Wastes are substances other than dangerous materials intended for disposal” (Pongrácz and Pohjola 2004).

“Wastes are things or objects, which are disposed of or are meant to be disposed of or are required to dispose of by the provisions of national law” (Pongrácz and Pohjola 2004).

Types of solid wastes

Wastes can be seen in several forms. Some major types of wastes include physical wastes, solid waste, liquid waste and so on. The major waste that will be dealt with is solid waste. Solid wastes can come in several (Wynne, 1987).

- Municipal solid waste
- Construction waste
- Industrial waste
- Agricultural solid waste
- Commercial waste
- Retail waste (Wynne, 1987)

2.1.1 Municipal solid waste

Municipal solid waste has been defined differently in many countries. Some countries range municipal waste arising from private houses to that controlled by on behalf of local authorities. Municipalities can include wastes from park and garden waste, household, streets, wastes from industries, construction, in addition to household wastes (Christensen 2011). Likewise, the

Norwegian Pollution Control Act has defined municipal solid waste to be like domestic waste. This Act it is divided between waste from private households and wastes from private institutions and enterprises. It is separated between waste from public houses and private institutions and enterprises (Hage 2016).

Municipal solid waste is defined as waste from household and many other wastes because of its composition and nature is like waste from the household. Municipal solid waste is one of the essential and most studied waste streams (White, Franke et al. 1995). Many people come into contact with the waste that has to be collected, treated, and disposed of which is done by the government or public official is a remarkable service (White, Franke et al. 1995). It is explained that municipal solid waste is the waste that is collected by the public authorities which may include wastes from the household, wastes from commercial uses, wastes from institutions (Kaseva and Gupta 1996). Wastes are collected for the concerned authorities from several domestic and commercial sources (Vergara and Tchobanoglous 2012). Municipal solid waste deals with domestic wastes since it carries the domestic wastes from the community to disposal centers domestic wastes are a vital part of municipal solid waste. The types of domestic wastes are mentioned below:

Table 2. Types of domestic waste (Kamran Rousta PhD, 2019)

Common domestic wastes
Organic kitchen waste vegetables,
Paper, cardboard paper
Cotton clothes
Woolen clothes
Metal cans, tin, aluminium
Plastics

Waste selection and transportation is really essential part within solid waste management and they are part of supply chain management (Kamran Rousta PhD, 2019).

2.1.2 Solid waste management

Solid waste management has been defined as a set of interconnected elements of an organization that aims to build policies, objectives, and systems facilitating the handling of solid waste the areas may vary, and for this study, the strategic level in the town is the major focus, in terms of monitoring of performance (Hage 2016). Waste has substantially increased in volumes and the materials such as glasses and metals increased in municipalities as a result. Since the nineteenth century, the disposal of wastes was started by public officials (Wynne 1987). We can say that sustainable solid waste management deals with various methodologies to manage wastes for benefitting the society and environment. Either through controlling the wastes, destroying the wastes, processing recycling or maybe even reusing them (Online, 2021)

Different stages are involved in waste management are described below (Nikita, 2021)

Steps involved in Solid Waste Management:

There are different steps involved in the management of solid waste from its generation to final disposal. This is shown in the figure bellow.

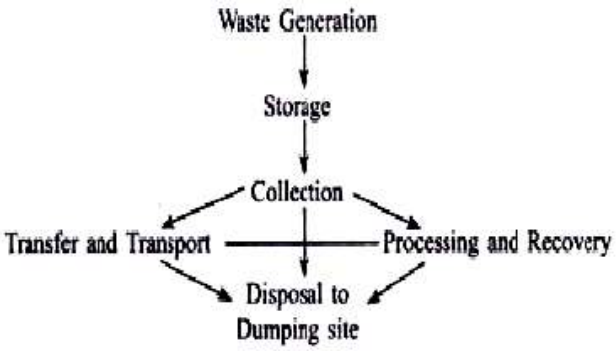

Figure 1. Solid waste management steps

As per figure 1, The first step is the waste generation which incorporates material that has been discarded because it has served its purpose or is no longer useful becomes the waste. The second step is Storage and Processing which involves the activities which are associated to handling storage and

processing of solid waste at the point of generation. The third step is a collection which includes the activities concerned with the collection of solid wastes at specific locations. The fourth step is transfer and transport which includes activities that involve the transfer of wastes from the collection points to the vehicles and then transport of wastes to the disposal sites. The fifth step is Processing and Restoration which involves methods and facilities that are used to retrieve the wastes for recycling and other treatments. The final step is disposal which involves reusing, recycling or destruction (Nikita, 2021).

2.2 Operations and supply chain management

There are different approaches and definitions for the term SCM although most of them seem to have the same meaning and common perspective. The supply chain is a group of departments through which each product and materials are forwarded There are different firms which are involved in the production and manufacturing of a particular product and giving it a right place to fit in the hand of consumers who are the end-users in a supply chain (Mentzer 2001). The supply chain members are varied in different stages from top to bottom; like raw materials producers, assemblers, wholesalers, retailer merchants, and suppliers through different transportation (Mentzer 2001). The supply chain is defined as the symmetrical alignment of the firm that collects and brings the product to the main market ,these also include the end-user as a part of supply chain systems (Mentzer 2001).

Another interesting definition of supply chain management is that it is a network of different industry and firms which are linked through upstream and downstream; although there are different procedure and activities which produce value for the final product and services which will ultimately be delivered to the end-users (Felea and Albăstroiu 2013). According to Chopra and Meindl, the supply chain involves all the departments directly or indirectly by fulfilling the demand of the customer (Felea and Albăstroiu 2013). In the organization, there are different manufacturer, supply chain which involves all the functionality from receiving the invoice for the demand until fulfilling the customer demand (Felea and Albăstroiu 2013). There is a different department in an organization such as marketing, operations, distribution, new product development, finance and customer service (Felea and Albăstroiu 2013).

Operations in supply chain management are the structure and improvement of the networks that build and deliver the company's primary products and services (Global, 2018). Supply chain operation is responsible for the coordination of the strategies along the supply chain through the decision-making on the timing of the material and resource release (de Kok and Fransoo 2003). Supply chain

operations include the transformational activity which is normally a designation of any relationship between the two items in a supply chain and is said to be a physical activity like manufacturing or assembling and the non-physical activity such as transferring from one place to another (de Kok and Fransoo 2003).

There is an increased interest in making supply chain operations more sustainable in the present time and therefore it is important to discuss it.

2.3 Sustainable supply chain Operations

Sustainability is defined as development that fulfills the needs of the present time and not making compromises to the ability of future generations to meet their own needs (Wilkinson, Hill et al. 2001). The concept of sustainability refers to renew, restore and maintain the environment (Wilkinson, Hill et al. 2001). The main aim of sustainability is achieving environmental balance (Wilkinson, Hill et al. 2001).

In the sustainability, there are three dimensions categorized.

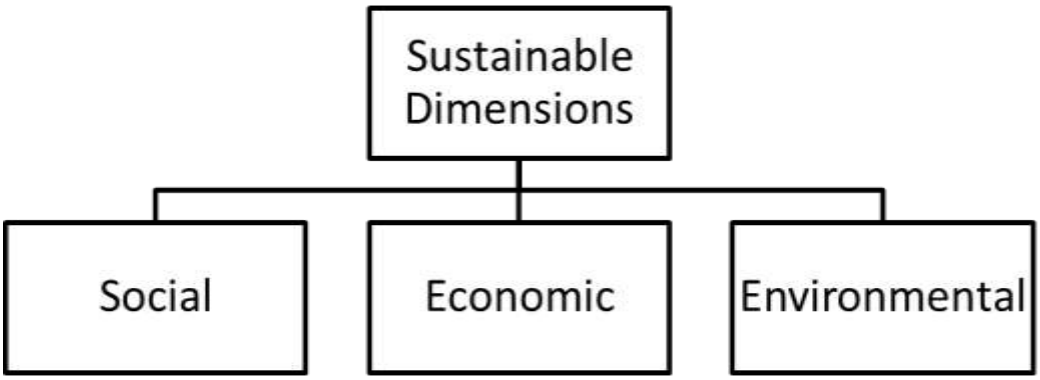

Figure 2. Dimensions of sustainability

To build a sustainable supply chain we need to take into consideration all the dimensions of sustainability. Sustainability nowadays has become a huge topic both in business communities and within society (Crum, Poist et al. 2011). They are different factors and drivers which are giving rise to sustainability including supply and demand, there is also much understanding of science which is related to climate change and globalization which is also a concern for both environmental and the social actions of organizations (Crum, Poist et al. 2011).

Table 2. Definitions of SSCM

References	Definitions
” (Barbosa-Póvoa, da Silva et al. 2018)	“tough network systems which have diversified setup that maintains the products from suppliers to customers and their returns which is related to the environmental, economic and social impacts”
Dyllick and Hockerts (Zailani, Jeyaraman et al. 2012)	“unification of the supply chain management and sustainable development where the sustainable development is a combination of dimensions which are environmental, social and economic issues which are maintain and managed for the development of the human wellbeing”
Sikdar(Zailani, Jeyaraman et al. 2012)	“Includes the three dimensions which are social, environmental, and economic aspects and defined the SSCM as the reasonable balance between three dimensions which will be connected to the green design, production planning, inventory management and control of production, reverse logistics, waste management, emissions reductions and energy use”
(Al-Odeh and Smallwood 2012).	“method of maintaining and managing the SCM activities taking into consideration for the several issues like environmental, social and economical for the improvement of long-term goals of the organization and its supply chains”
Carter & Rogers (Project, 2013)	“the strategic, achievement and translucent integration of a company's social, environmental, and economic goals in the proper system and maintain the coordination of main inter-organizational methods for enhancing the long-term economic representation of the particular company and its supply chains “

The most identified and worked on aspects are the economic and environmental aspects of the supply chain (Zailani, Jeyaraman et al. 2012). However, it is important to realize that the scholars have not done enough to critically point out the fact that the social dimension of a sustainable supply chain has not been explored yet. We can still find that there has been a minimum utilization of critical and analytical perspectives on the social part of a sustainable supply chain (Carter, 2019).

We have known that the supply chain emphasis on supply chain strategies that have been adopted by many companies to overcome financial, environmental aspects, meanwhile the actual impact or the

transformative impacts on the wider range, remains unexplored (Fritz, 2018). It is still ambiguous on what type of supply chain strategies can be adopted to create a whole new level of change on the practices regarding socially sustainable supply chain (Fritz, 2018). The three-dimension mention in the SSCM which are Social, economic, and environmental are to be emphasized more to make the SSCM more relevant.

2.3.1 Economic dimension of sustainability

The economic dimension is one of three aspects in sustainability that involves practices like fruitful profit margins, correct return on investment, ensuring healthy cash flow (Kurnia, Rahim et al. 2012). Business performance and balancing internal and external management practices also have an impact on maintaining economic stability (Kurnia, Rahim et al. 2012). The performance includes the values operated from cost, quality, speed, and flexibility which create the bottom lines for the various level of performances (Kurnia, Rahim et al. 2012). Working smarter can give the contribution to economic sustainability and also follow the strategic SCM which improves the quality in increasing the company's performances (Kurnia, Rahim et al. 2012). An increase in supply chain performance with also improving buyers and suppliers performance can also support the economic sustainability and also results in increasing the sales and revenue (Kurnia, Rahim et al. 2012).

2.3.2 Environmental dimension of sustainability

SSCM practices related to the environmental dimensions of sustainability have increased the growth substantially for decades (Kurnia, Rahim et al. 2012). Generally, it is called green supply chain logistics which defines the environmental factors which contribute to the sustainable logistics integrating the green concerns into the different organizational practices (Kurnia, Rahim et al. 2012). It includes both inbound and outbound logistics like disposal, warehouse safety, and transportation problems such as pollution emitted through the transport and it also focuses on the operational problems like disposable of the hazardous materials which must be focused on eco-friendly disposal or reverse logistics and sustainable procurement or green purchasing (Kurnia, Rahim et al. 2012). Economic and environmental aspects are measured through the business performances in the sustainable supply chain operations which means that increase in complexities in performances are measured as key points to attain sustainable supply chain operations. (Kurnia, Rahim et al. 2012). This made the increase in the need for greater and higher cooperation, collaboration, and more focus on the Sustainable supply chain (Kurnia, Rahim et al. 2012). Moreover, the complexities are seen and reflected in the supply chain process and maintaining the customer-supplier relationship,

therefore the fusion of economic and environmental sustainability are mainly focused on the trade-off terms in balancing the outcomes (Kurnia, Rahim et al. 2012).

One of the reports by Eltayeb et al shows that sustainable practices in purchasing and reverse supply chain were found to have little impact on the company's performances instead they contribute to the intangible outcomes and impacts (Kurnia, Rahim et al. 2012).

2.3.4 Social dimension of sustainability

While research on the environment aspect there is still a gap in research of social aspect within the supply chain (Bubicz, Barbosa-Póvoa et al. 2019). The social dimension mainly involves the issues related to the community, corporate government, the diverse relationship between employees and their safety and human rights, also the ethical and educational sector are considered in the social aspects (Kurnia, Rahim et al. 2012). The social dimension also helps on the technological aspects in developing relevant to the SSCM such as safe working conditions in supplier plants or purchasing from minor suppliers (Kurnia, Rahim et al. 2012). Ethical values are important and are considered as the integrity of most of the business management practices which are related to the employee and their relationships with the other community and the manners they show while behaving with them (Kurnia, Rahim et al. 2012).

Social responsibility

Social responsibility is a humane theory in which individuals are responsible for performing their civic duty, and the efforts of individuals benefit society. In this way, there must be an equilibrium between economic growth and the well-being of society and the environment. If this equilibrium is affirmed, then social responsibility is fulfilled (Alliance, 2021). The principles of social responsibility are developed on a practice of ethics, in which choices and activities must be ethically verified before the performance. If the activity of choice creates harm to society or the environment, then it would be supposed to be socially irresponsible (Alliance, 2021). Ethical values that are essential in society create a contrast between right and wrong. Every person has a responsibility to act in a manner that is helpful to society and not individually (Alliance, 2021).

In business companies social responsibility has different goals than an individual. The European Commission has stated corporate social responsibility (CSR) “as a concept whereby companies

integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on the voluntary basis" (Fortunati, Martiniello et al. 2020) . This definition was later changed in 2011 with the recognition that CSR does not go beyond the rules and regulation but works as a means to respect legal obligations. It is seen that enterprises, to fully meet their corporate social responsibility, will have to recognize the process of integration of social, environmental, ethical, human rights, and consumer concerns into their business operations and core strategy in close collaboration with their stakeholders (Fortunati, Martiniello et al. 2020). Aligning with this aim, CSR is defined as "the responsibility of organizations for their impacts on society" (Fortunati, Martiniello et al. 2020). CSR can hence represent a common strength between market, economy, politics, and civilization through discovery, development, human resources management, and given value creation, which eventually will ensure companies a good reputation and greater visibility (Murphy &Ng'ombe, 2009). There is a connection between waste management and social responsibility is that waste management is essential in every type of organization and it must be adopted by every organization as its social responsibility. To recycle, revalue and reuse the waste products is necessary for all kinds of waste. In today`s time, waste management is a growing concept, and it provides a huge amount of welfare to the society and environment. Waste management aspect should be considered by the company to maintain its goodwill in society and to sustain in the society as a corporate social responsibility holder company (Gangwar and Saraswat 2016). Waste companies should focus on environmental impacts the corporation has since it is essential to look at the responsibility, they have towards the community in which it exists, to help the economy forward and to better the lives of the community. The issues that arise due to inappropriate misconduct of operation in managing waste can lead to inappropriate social responsibility, air pollution, water pollution, and soil pollution. Wastes that are managed poorly can lead to soil pollution, attack on vegetation, wastewater, clogged pipes. This can ultimately lead to unlivable conditions and human issues. Consequences can range to issues such as sudden loss of shareholders, loss of profit, lack of trust from employees and customers as well. Therefore, it is essential to evaluate the attentiveness level and responsiveness level that the leaders of the organization should embody to manage relationships between the organization and society. Along with this, it is also essential to evaluate the impact of corporate policies and practices on both the internal and external stakeholders for an organization to function responsibly (UKDISS, 2018).

2.4 Reverse Supply chain

It is the range of activities required to retrieve a used product from respective customers and reuse it.

And for a growing number of manufacturers, reverse supply chains are becoming an essential part of the business (Wassenhove, 2002). It accumulates the products from different stages of the supply chain including companies and their customers and used the products to dispose of them with the most suitable disposition strategy (Karamchandani and Srivastava 2017). Companies who choose reverse supply chain by choice or necessity, face different challenges. It has to teach their customers and develops new communication strategy with them (Wassenhove, 2002). Generally, companies try to keep the cost low while researching innovations for recovering the value of the products reused (Wassenhove, 2002). One of the main components of the reverse supply chain to make rational decisions about the structure of the reverse supply chain is Reverse logistics. It focuses mostly on collecting and treating and add value after reprocessing (Alnuwairan, 2018). Reverse logistics includes the activities such as reuse, recycle and disposal. The future of the industries depends on those who frame the strategies for products in a manner that they succeed in maintaining both economic and environmental value both sides by side and from a win-win opportunity and the channels should be environmentally, socially, and economically viable (Millet 2011). With the increase in the world's population, the level of consumption is also increasing day by day which leads to the decrease in the natural resources and on the other hand the product demand continues to grow, the increase in demand increases the production line and hence increase the consumption which results in the production of more waste and impact negatively to the environment (Hellebust and Øye 2019). The relevant approach is needed to face this issue and hence the most common approach sued to face the issue is reverse logistics which is defined by Rogers and Tibben-Lembke in 1999

"The method of planning, executing, and controlling the efficient, cost-effective flow of raw materials, in-process inventory, finished goods, and related information from the point of consumption to the point of origin, to recapture content or proper disposition."

Reverse logistics is a new concept which aims to increase the essence of sustainable business policies (Dowlatshahi 2000). It is a process in which a manufacturer decides to accept to ship those products which were shipped previously from the point of consumption; mainly for recycle or disposal purpose; by this, it uses resources effectively (Dowlatshahi 2000). It has a great need of attention from the managers and the company personnel (Dowlatshahi 2000). It is normally practiced in many companies and industries of all the category and faculties (Dowlatshahi 2000). The effective and efficient use of reverse logistics helps a company to compete in its industry, which makes intense competition and low margin profits (Dowlatshahi 2000). There are many reasons like economic, environmental, or legislative, disposable of the product is not much be the responsibility of consumer as original

manufacturers recycle the products themselves (Dowlatshahi 2000). The reverse logistics and sustainability are related as the recovery process of the products are mainly about the reusing the products which are collected from the municipal waste and consumers, where the aim is to minimize the amount of waste which get delivered to the landfills as the huge amount of the greenhouse gas get emitted from the landfills (Hellebust and Øye 2019). Remanufacturing is about turning old products into new ones by disassembly, refurbishing, and replacement operations (Pedram et al. 2017). The recovered parts and products from the process will then be used in the repair, remanufacturing of other products and components and for sale.

The purpose of the recycling of materials is the disassembly for the separation and processing of materials of used products. Which will minimize the amount of disposal and maximize the number of materials that will be returned into the production cycle (Gungor and Gupta 1999). The purpose of reuse is to use the materials from the products and components that have lost their identity and functionality (Choi, Hwang, and Koh 2007).

Chapter 3. Methodology

This chapter presents about the methods we used in our study and how it has helped us achieve our overall purpose with proper validation. This chapter also presents how we have analyzed the data with right method.

3.1 Philosophical view

There are two main philosophical streams, positivism and social constructivism.
Positivism is positioned with the hypotheses that build on recognizing the previously experimented hypotheses variables (Park, Konge et al. 2020). It focuses on identifying the causal relationships by the means of a quantitative approach in which large numbers of samples are favored (Park, Konge et al. 2020). the positivist paradigm of exploring social reality is founded on the thought that can attain through an understanding of the respondent's behaviors and observations (Nel, 2016). According to the positivist paradigm; true details are based on the experience of senses and are obtained by observation and experiment. Positivist thinkers lean strongly on determinism, empiricism, parsimony, and generality. According to the positivist paradigm, true details are based on the experience of senses and are obtained by observation and experiment. (Jackson, 2010) Positivist scholars lean fully on determinism, philosophy, selfishness, and abstraction.

Social Constructivism is understanding the world considering the wide diversity of people's views (Jackson, 2010). The theoretical base which is used to understand knowledge is called social constructivism (Jackson, 2010). It is understanding the world recognizing the wide variety of people's views (Jackson, 2010). The philosophical base which is used to get the knowledge is called social constructivism (Jackson, 2010).

Philosophy presents the generic principles of theoretical thinking, a process of knowledge, aspect, and self-awareness, all of which are used to gain an understanding of reality and to design, conduct, analyze and interpret research and its outcomes (Blackman, 2017). There are two branches of philosophy we can discuss here that are essential in the sciences and assists to exhibit the differences between them.

The primary branch is ontology, or the ‘study of reality, which is involved with what exists in nature about which humans can obtain experience (Blackman, 2017). Ontology assists researchers to

identify how sure they can be about the world and the presence of objects they are investigating (Blackman, 2017). Pragmatist ontology correlates to the presence of one single reality which can be considered, learned, and encountered as a 'truth'; a real society exists unconventional of human experience (Blackman, 2017). While, relativist ontology is based on the belief that reality is built within the human consciousness, such that no one 'true' reality exists (Blackman, 2017). Rather, the reality is 'related' according to how individuals experience it at any given time and place (Blackman, 2017). Ontology has been defined as the science of being with the nature of reality of what an individual reflects in an interpretation about the fact (Bergin, 2017). What kind of things exist in the world and nature of social reality; it is concerned with the question about the existence of social reality independently with human interpretation (Bergin, 2017).

Epistemology concerns how we know and learn about social reality (Bergin, 2017). the second branch is epistemology, the 'art of knowledge'. Epistemology is with all perspective of the validity, scope, and way of procuring knowledge, such as

- what develops a knowledge claim,
- how can opinion be procured or delivered, and
- how the amount of its transferability can be evaluated (Blackman, 2017).

Epistemology is essential because it determines how researchers build their research in their efforts to discover knowledge (Blackman, 2017). By studying the connection between a subject and an aim we can examine the idea of epistemology and how it impacts research design. Objectivist epistemology implies that reality exists outside, or separately, of the individual mind. Objectivist research is useful in implementing security (consistency of results obtained) and external validity (Blackman, 2017).

The major philosophical paradigms in this study are based on the assumptions of social constructivism because it focuses on the essence of culture and context that makes it possible to understand the social issues and challenges about the massive production of waste (Kim 2001). Social constructivism is based on assumptions of knowledge, reality, and learning (Kim 2001).

Knowledge: knowledge is a human premise that is constructed according to society and culture (Kim 2001). People gather knowledge from the interaction of theirs with other human living in the

society and environment (Kim 2001).

Reality: reality is created through the human effort in a particular activity (Kim 2001). When people live in a certain society, they create the products and properties altogether which cannot be discovered as it does not exist before its social invention (Kim 2001).

Learning: it is a social process that cannot be possible with an individual as it takes an individual to get engaged in social activities to learn something (Kim 2001).

3.2 Research design

Research design is studying the whole procedure which initially starts with problem description, data collection, analysis, and empirical findings (Gojani 2016). The research design also aims to collect information from different objects at a given time which provides the analysis of collected data and relationships between different variables (Gojani 2016). There are qualitative and quantitative research approaches.

Quantitative research includes a variety of methods with proper rules of an investigation using different numerical data (Watson 2015). It includes measurement and assumes that every phenomenon can be measured which results in some numeric data to make decisions (Watson 2015).

Qualitative research analyzes the data directly from the observations in the practical field, detailed interviews, and written documents help to study in a qualitative manner (Patton 2005). It includes the naturalistic information which researchers' study in a real-world setting to develop the narrative descriptions and case studies (Patton 2005). Qualitative research is useful when it is important to reach the in-depth significance of the social procedure, the how, where, when, and why of objects (Gojani 2016). It is simply meant to definitions, meanings, features, traits, symbols, metaphors, concepts, and the details of the objects (Gojani 2016).

Our study was based on a qualitative research approach as it helped us to see and understand the context in which the respondent's decision and actions takes place (Myers 2019). It was useful to understand how key actors involved in solid waste management in Molde municipality behave and encourage the SCM practice to become more sustainable. Also, the qualitative research helped us to find the answers based on observations as it is the only thing that distinguishes the human from the artificial world as we directly interact with them. This approach helps us to have a better understanding of the opinions of the private households and the company both. Furthermore, this study will lead to the in-depth details of the information which is qualifiable to decide out of the participant's answers and reasons regarding their own choices of managing their waste sustainably. According to Kalpan & Maxwell; the main aim of understanding a phenomenon from the respondent's viewpoint and its specific social context is only be understood through qualitative research (Myers 2019).

3.3 Case study approach

This study applied a single case study approach. A case study is the investigation of the particularity and complexity of a problem, developing to understand its activities and appropriate incidents outlines case studies' critical features (Tomaszewski, Zarestky et al. 2020). It investigate "a concurrent phenomenon in extent and within its real-life setting, particularly when the borders between the event and circumstances are not clearly evident (Tomaszewski, Zarestky et al. 2020). The phenomenon and its context are tangled, but the case should represent a *defined system*, in which the case is clearly defined and delimited (Tomaszewski, Zarestky et al. 2020). It addresses the entire complexity of a study problem by consolidating multiple sources and sorts of confirmation (Tomaszewski, Zarestky et al. 2020).

According to Yin, case studies are used to explore the phenomena in the day-to-day context in which they process (Crowe, Cresswell et al. 2011). The case study approach helped us to understand how different actors, the renovation company, and private householders in Molde municipality are involved in the sustainable development of SCM within waste management. It helped gather in-depth, different explorations of difficult and complex issues concerning SCM within solid waste management in Molde municipality. We used the case study approach to obtain detailed information about the empirical context (Crowe, Cresswell et al. 2011). In this study, we have taken private householders and a renovation company as a case through which we will get information and content to analyze the current situation. This approach helped to explore real-life events through detailed, in-depth data collection include several sources of information (Gustafsson 2017). It also helped us to learn the phenomenon in real practices, disclose the contextual settings and internal process (Crowe, Cresswell et al. 2011). It provided us insights into what loopholes exist and why one applied strategy one should choose over another (Crowe, Cresswell et al. 2011).

Our empirical case company is a Renovation company. The head office is in Årødalen in Molde, where the company has its landfill and waste. The company currently has 30 employees. We choose this company because it is the company that is responsible for solid waste management in Molde.

3.4 Data collection

When conducting a case study, researchers use a variety of data compilation methods. multiple data sources for restoring and investigating the case (Tomaszewski, Zarestky et al. 2020). Within the limited system, one must investigate the opinions of diverse respondents, assemble multiple kinds of proof, and pay careful consideration to the context in which all perspectives of the study were embedded, in other words, triangulate data (Tomaszewski, Zarestky et al. 2020).

3.4.1 Primary data

The data collection was based on multiple sources. The interviews were one of the most essential ones. In total, 11 semi-structured interviews were conducted. We conducted semi-structured interviews because we wanted to explore the respondent's feelings and values about our topic, also we ended up collecting qualitative, open-ended data. We had a very specific interview guide for our participants which had predetermined questions. The first interview was conducted face-to-face with the representative of the local renovation company located, he is the only key person to share the information regarding the company to the public and he has been working in the company for 15 years which helped us in gathering more information. An interview guide was prepared beforehand the interview and sent to our respondent (see appendix A). The interview was conducted on the 29th of April and lasted 1.5 hours. The representative was involved to share the information with us and was friendly in the process of taking interview, he asked us about our thesis topic and share that he has been sharing information regarding waste management with many students in previous years also and whenever he got chance to share, he feels obliged to help the fellow students.

Then, we conducted 10 short face-to-face semi-structured interviews with householders. We prepared an interview guide for this type of our respondents (see Appendix B). To conduct interviews, we went door to door and also went to the supermarkets where we could find potential respondents. It was done mostly in the morning between 9 am and 10 am. There were six males we interviewed and four females. It was stressful to find respondents in this COVID-19 situation because when we belled or knocked on the private houses' doors, it was stressful to ask them for sharing information face to face. We maintained proper distance and followed COVID-19 measures while interviewing and asked our householders to maintain a distance they liked and felt comfortable talking to us.

3.4.2 Secondary data:

We gathered secondary data which are based on journals, official releases, official interviews, statistics, press releases, articles from the internet. Secondary data is important as it takes less time to organize with no cost at all (Vartanian 2010). We use the secondary data to increase the validity of our primary data. The secondary data can also be compared with more than one research in the same field (Smith 2008). Enables the researchers to find the highest quality of data and access them for their future use (Smith 2008).

3.5 Content analysis

According to TITSCHER et al. (2000), content analysis is "the longest practiced method of text analysis amongst the set of empirical approaches of social examination"(Kohlbacher 2006). However, there does not seem to exist a homogenous recognition of this method at present, but formerly the term "applied only to those practices that concentrate on immediately and quantifiable phases of text content, and as a rule on unquestionable and corresponding frequencies of words per text or surface unit (Kohlbacher 2006). Later, the concept was prolonged to include all those methods which work with levels, but which seek at least to quantify these kinds employing a frequency study of classifications (Kohlbacher 2006).

Our study focuses on a qualitative approach and for this, we have used the content analysis method for the data analysis. It has a vast history of use in the business sector and for two decades it has shown steady growth (Elo and Kyngäs 2008). Content analysis in qualitative research has been defined as follows:
"a research method for the biased explanation of the received data through the precise segmentation technique and recognizing patterns" (Zhang and Wildemuth 2009).

"an approach of empirical analysis of texts gathered within the context of communication following step-by-step models and no use of quantification"(Zhang and Wildemuth 2009).

"*An access to documents that underlines the role of the investigator in the construction of the meaning of and in texts. There is a focus on allowing sections to appear out of data and on*

understanding the significance for knowing the meaning of the context in which an item is examined (and the categories derived from it) emerged" (Kohlbacher 2006).

These definitions explain that the qualitative analysis of content is based on speech, texts, and voices. It supports researchers to know social existence in a systematic manner (Zhang and Wildemuth 2009). We conducted interviews for analysis which involve identifying patterns of municipal solid waste management sustainably and critically analyzing them to achieve research aims and objectives. In this study, we have analyzed that how the company has contributed to implementing sustainable solid waste management in Molde. How it has contributed to the three aspects of sustainability that are economic, environmental, and social aspects. We have analyzed the supply chain operations of the company in Molde and how they have contributed to creating awareness to their customers to properly select the solid waste. Moreover, the analysis also includes the future renovation plan of the company. All the qualities of the entities from the collected text, messages, and voices have been analyzed without experimentally measured or examined.

3.6 Research quality

Research quality can be evaluated based on different criteria and we hereby mentioned the criteria for analyzing the research quality.

3.6.1. Validity and reliability

Validity:

Validity in qualitative research means "suitability" of the tools, methods, and data. Whether the study question is accurate for the aspired result, the selection of methodology is suitable for clarifying the research question, the study is valid for the methodology, the sampling and data examination is relevant, and ultimately, the decisions and outcomes are adequate for the example and circumstances (Leung 2015). In evaluating the validity of qualitative research, the provocation can originate from the ontology and epistemology of the argument being studied, e.g. the theory of "individual" is seen adversely between humanistic and positive psychologists due to differing rational perspectives (Leung 2015): Where humanistic psychologists consider "individual" is an

outcome of existential knowledge and social communication, positive psychologists think the "individual" exists side-by-side with the development of any human being (Leung 2015). Set off in several pathways, qualitative research regarding the individual's wellbeing will be concluded with varying legality (Leung 2015). Validity and reliability in qualitative research are examined through trustworthiness and are the result of research quality.

Reliability:

The degree to which outcomes are uniform over time and an authentic portrayal of the total community under consideration is referred to as reliability and if the results of a study can procreate under a similar methodology, then the research apparatus is reliable(Golafshani 2003). The importance of reliability for qualitative research reclines with firmness (Leung 2015). An edge of variability for results is endured in qualitative research contributed the methodology and epistemological logistics consistently yield data that are ontologically related but may disagree in richness and ambiance within related dimensions (Leung 2015).

To maintain the validity and reliability of this study the interviews were recorded after we had permission from our respondents and at the same time the interview was handwritten to increase the validity of our findings. Theoretical sampling is formed by the open-ended method of data collection and opinion in progression. All the interviews were conducted in the English language.

3.6.2 Generalization

Most qualitative research investigations are intended to study a precise issue or phenomenon in a specific ethnic group, of a concentrated locality in an appropriate context, hence generalizability of qualitative research findings is normally not an exacted characteristic (Leung 2015). However, with the growing bias of knowledge integration from qualitative research evaluation of generalizability becomes relevant (Leung 2015). A realistic approach to evaluating generalizability for qualitative studies is to select the same standards for validity: That is, use of precise sampling, triangulation and consistent comparison, proper documentation (Leung 2015). However, some researchers adopt the method of scientific generalization where one judges the extent to which the findings in one study can be generalized to another under parallel theoretical, where generalizability of one study to another is judged by similarities between the time, place, people, and other social circumstances (Leung 2015). We explore specific issues concerning SCM within waste management in Molde, we

have focused on only one municipality and our research questions are also related to Molde municipality. It looks like that around the whole of Norway, we can find the same organization of waste management. In different municipalities will be the same type of organizations and there can be furthermore studies. The study can further compare the other municipality's SCM with Molde and can discuss the overall issues concerning SCM within waste management.

The findings of this study can be used to compare how Molde and other municipalities operate their Supply chain and what strategies are being used by the other municipalities and what suggestions the municipalities have for the improvements.

3.7 Ethical issues

Ethical concerns are present in any kind of research. The research method builds tension between the purposes of research to perform generalizations for the gain of others, and the rights of participants to preserve privacy (Orb, Eisenhauer et al. 2001). Ethics concerns doing good and evading harm. Wrong can be restricted or diminished through the utilization of relevant ethical beliefs (Orb, Eisenhauer et al. 2001). Thus, the protection of human subjects or participants in any research study is crucial (Orb, Eisenhauer et al. 2001).

Confidentiality is the main factor in ethical issues and for our study all the interviews were anonymous, and we have not mentioned any personal details of any of our participants. All the information was taken only after we had permission from each respondent.

Chapter 4. Development of solid waste management in Norway: Context description

This chapter presents how Norway has managed wastes and how it has been developed in the last three decades.

4.1 Overview of solid waste management in Norway

There are approx. 8000 employees in the waste management sector with an annual turnover of 23billion NOK (Hellebust and Øye 2019). There are two separate markets for this sector: competitive market and private market (Hellebust and Øye 2019). The competitive market normally accumulates all the garbage from the trading industries and complete the contracts and compete with another actor (Hellebust and Øye 2019). On the other hand, in the private market; it is the sole responsibility of one company to collect garbage from the private segments such as households (Hellebust and Øye 2019).

It has been 30 years that waste management has come so far as it was only meant to be a disposable pollutant but now it is meant to deliver the recycled raw materials for the manufacturing sectors (Hellebust and Øye 2019). It is called an important part of the sustainable waste management sector in which the main purpose is to minimize the waste and make the most possible from the waste and reuse it (Hellebust and Øye 2019). Moreover, the main aim of the firm is to eliminate waste and use the landfill disposals as the concluding output (Hellebust and Øye 2019). Norwegian waste management and recycling association is the cover company for the private companies and public services company (Hellebust and Øye 2019). The association and the members of this association are responsible for the 95 percent of municipal household waste in Norway and provide suitable guidance so that it is convenient to follow the guidelines to develop the sector (Hellebust and Øye 2019). The association's main task is to maintain coordination and interest in this waste management sector (Hellebust and Øye 2019). The most important activity of the association is to map the operations related to the waste sector with standards every year so that they can determine the status and predict the best practices in the sector (Hellebust and Øye 2019).

4.2 The Norwegian regulation on waste management

Norway is not a member of the EU, but Norway is a part of EFTA member and has an agreement with European Economic Area (Kjær 2013). Norway had the agreement to appliance the directives in the environment (Kjær 2013). Every second year the government of Norway produces the white paper for environment protection (Kjær 2013). It is a record which states the report on the environment which also includes the discussion on the government's future predictions and policies (Kjær 2013). This white paper figures out the national waste goals and the tools to reach them (Kjær 2013). The new regulation came into force in 2004 which changed the rules and responsibility for the municipalities as previously only municipalities had the responsibility of collecting the waste from the household and likewise the household type waste from the firms (Kjær 2013). And under the new regulation, only municipalities are responsible for the households and each municipality has its own decision and can decide its price (Kjær 2013).

4.3 Norwegian consumer Waste

Consumer waste mainly occurs from the private households which can be delivered to recycling facilities, kerbside, or drop off sites for recycling (Hellebust and Øye 2019). In 2020, the annual household waste per capita was 436.3 KG (Statistics Norway, 2021). There is a different type of material waste collect.

Table 3. Different types of material waste collection in Norway in 2020 (Statistic Norway, 2021)

Types of Waste	**Amount in tons**
Residual Waste	917695,0
Paper	223199,0
Glass	68434,0
Plastics	55333,0
Metals	101153,0
Food and another wet organic	194970,0
Garden Waste	171785,0
Hazardous Waste	92180,0

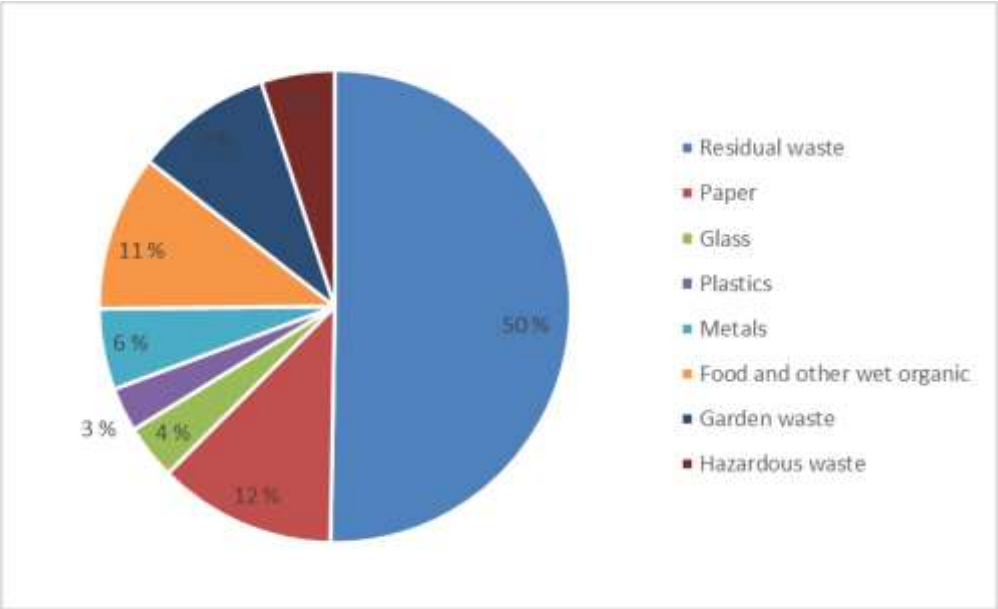

Figure 3. Different types of material collected in waste (Statistics Norway, 2021)

The residual waste contributes 50% of the whole. Moreover, when these wastes are collected, they

are reused in many ways, there are different methods of using the waste to attain sustainability. the below figure can explain the reusability of the wastes in various forms.

Table 4. Waste treatment in Norway (SBB, 2021)

Treatment types	Amount (tons)
Recycling	616637,0
Incineration	1225568,0
Landfilling	125887,0
Biogas production	157543,0
Composting	186696,0
Others	17205,0

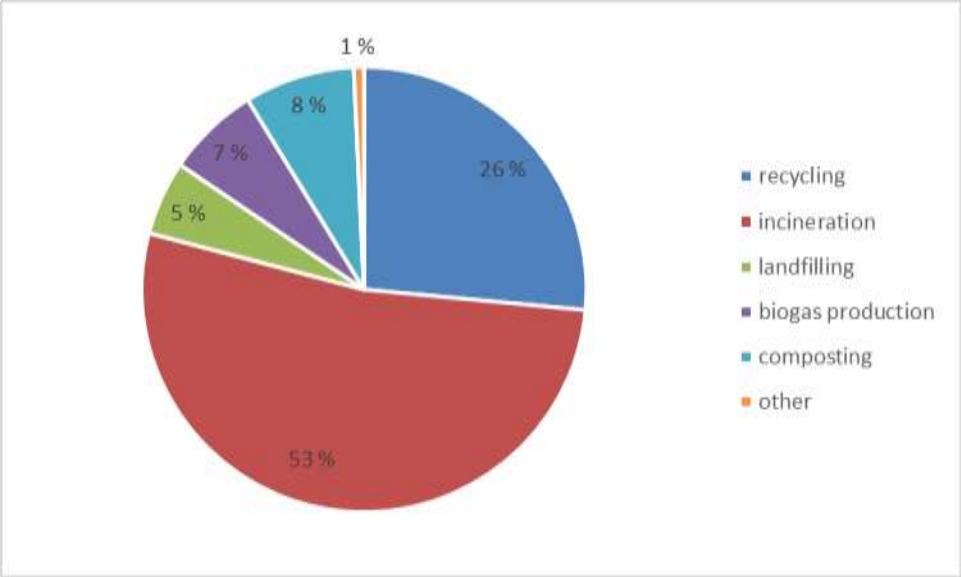

Figure 4. waste treatment in Norway in 2020 (SBB, 2021)

As per figure 4, the first most used method is incineration which involves the burning of organic materials collected as waste in high temperatures also known as thermal treatment which converts the waste into gas and heat or ash (Wikipedia, 2021). Additionally, the second most used is the recycling of waste.

Chapter 5. Empirical findings

This chapter presents our empirical findings of how SCM within waste management is organized in Molde municipality and how supply chain strategies are organized in Molde municipality.

5.1 Molde municipality waste management

5.1.1 Role of the renovation company

Molde is one of the biggest municipalities in Møre and Romsdal county. The renovation company is responsible for waste management in Molde. It is responsible for household renovation in the owner municipalities Aukra, Hustadvika, Gjemnes, Molde, and Rauma. The company thus covers an area with just over 58,000 inhabitants. The head office is in Årødalen in Molde, where the company has its landfill and waste reception, and the company has 30 employees. The company has two owned subsidiaries the one provides services to the business houses and another carries out the waste on behalf of the parent company. Renovation company is certified according to the standards ISO 14001 and ISO 9001. The main vision of the renovation company is to manage solid waste in municipalities.The company is responsible in Molde with its market which is mainly based on a monopoly in which they collect waste from households (Hellebust and Øye 2019).

The total amount of waste generated in Molde in 2020 has been provided below figures in Tons:

Table 5. Solid waste by material (Statistics Norway, 2021)

Types of Waste	Amount (tons)
Residual Waste	4877,0
Separates	8472,0
Paper	1239,0
Glass	418,0
Plastics	320,0
Metals	620,0
Electronics	293,0
Food and other wet organic	1737,0
Tree	1949,0
Garden Waste	1093,0
Hazardous Waste	697,0
Other	7,0
Plaster	99,0

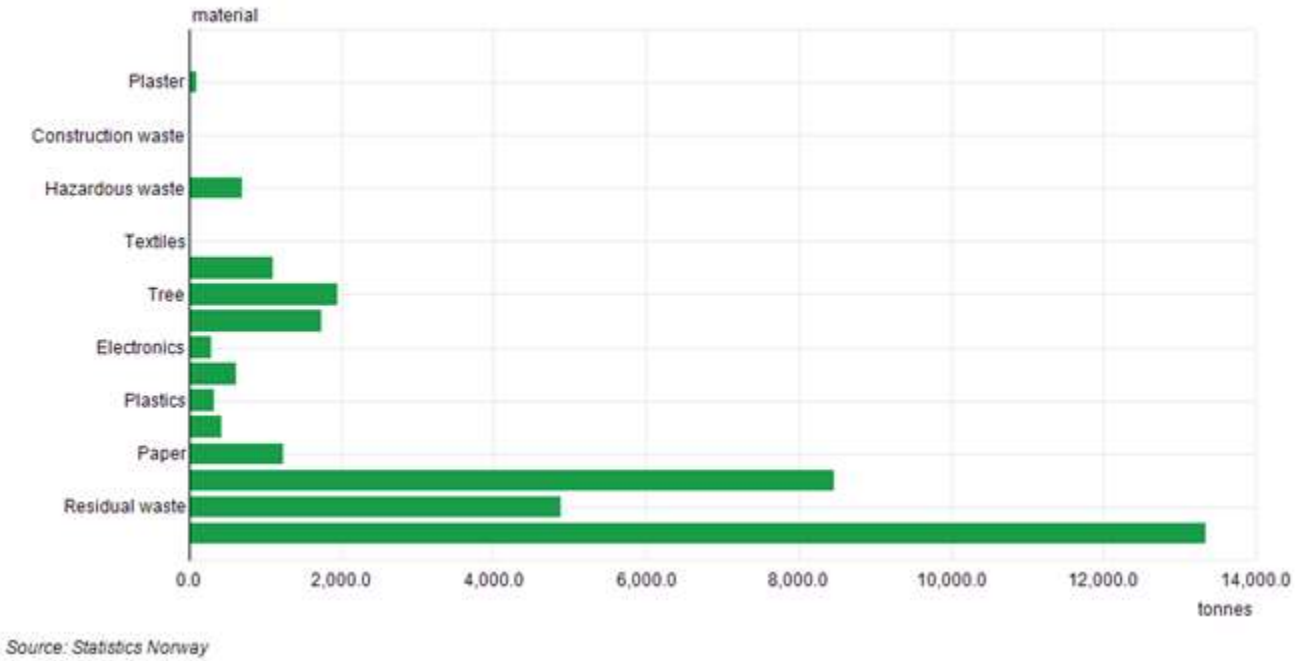

Figure 5. Solid waste by material in Molde in 2020 (Statistics Norway, 2021)

As per the table and figure above, the most residual waste has the highest generation rate when

compared to other types of wastes. Solid waste is treated by the renovation company by different methods as presented in Table 6 and Figure 6. The statistics show the number only for Molde municipality.

Table 6. Solid waste treatment (Statistics Norway, 2021)

Treatment types	Amount (tons)
Recycling	3768,0
Incineration	6384,0
Landfilling	360,0
biogas production	1744,0
Composting	1093,0

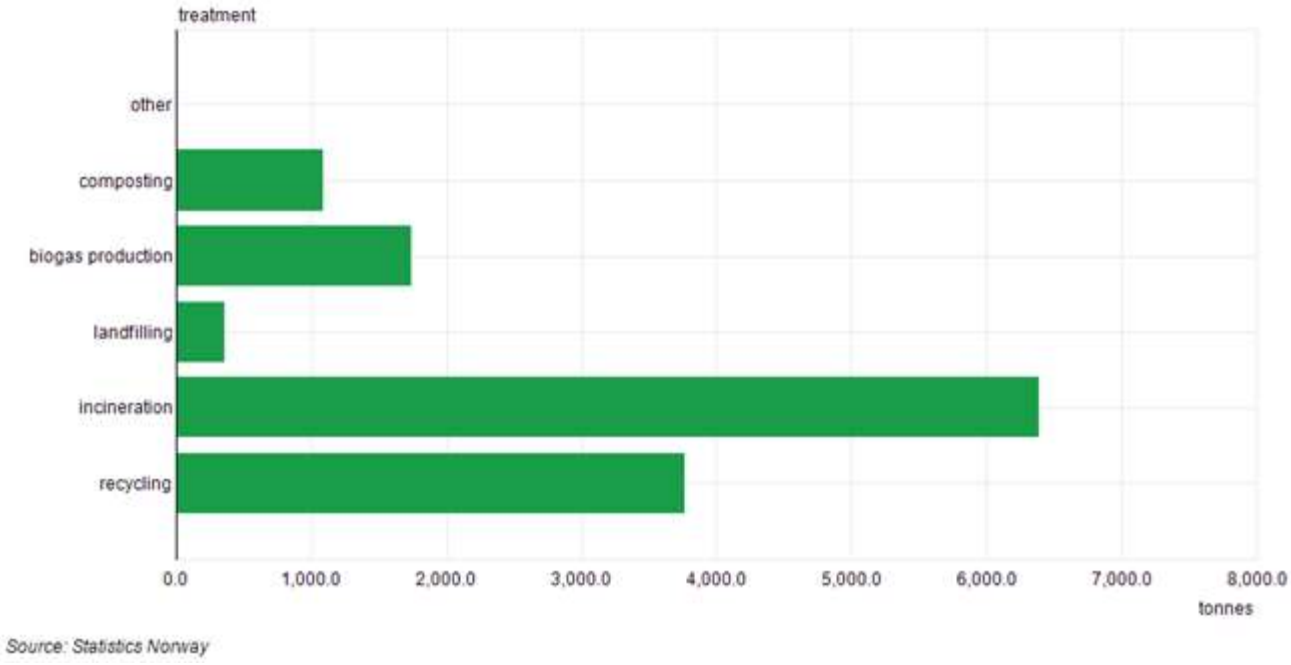

Figure 6. Solid waste treatment in Molde in 2020 (Statistics Norway, 2021)

As per the above table and figure, the most used treatment for waste management is incineration which is burning everything to decompose.

The company has three methods for waste collection which are recycling facilities, kerbside collection, and drop-off sites. The most used method is the kerbside collection method in which

customers are asked to sort out the garbage in bins and the collection is done on the date provided by the customers. The customers who share the apartments use the common garbage bins where most of the blocks have their garbage rooms. Dropoff sites are located nearby groceries and consumers can put the glass and metals in it as in 2018 renovation company decided to make this fraction of glass and metals at the kerbside also lessen the drop off sites (Hellebust and Øye 2019). The recycling facility is provided in every municipality in Norway where households can deliver the different types of waste (Hellebust and Øye 2019). In Molde it is located Årødalen in Molde. The annual fee for waste collection is NOK 3034 per month in 2020 and increased to NOK 3100 per month in 2021(2021).

5.1.2 Role of private householders in municipality waste management

We interviewed 10 private households and based on the interview found how they perceive the sustainability aspect in waste management. See table 7 and figure 6.

Table 7. Divergence of sustainable aspect in the private householder's perception (based on interview data)

Sustainability Aspect	**Number of householders**
Economical	6
Environmental	2
Social	2
Total	**10**

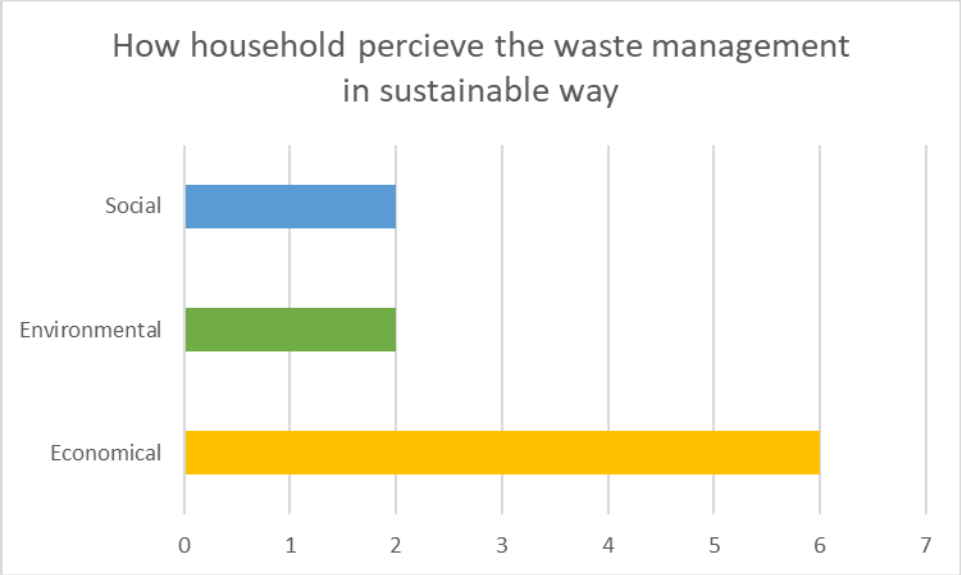

Figure 7. Sustainability aspect of private households in waste management in Molde

As per the findings, householders have unstable equations between the three aspects. We have analyzed that, 6 out of 10 householders are motivated to manage waste from an economical point of view as they have shared that paying the fee and fines are the compulsory motivator factors. And they also told that they have a positive attitude towards that, they have no complaints about the fee and fines as in the end they also found that if they pay the regular municipal fee with taxes, the overall tax they must pay becomes less. And rest 4 out of 10 householders were half socially motivated and half environmentally. 2 out of 10 householders are very conscious about their good image and they do not want to ruin it by not maintain good hygiene and clean surroundings. And 2 out of 10 householders said that they are very careful with messing up with the environment. They think that the government is trying to make the environment good and clean and their responsibility to support their government in making the environment pollution-free.

There were different sayings from private holders regarding the economic aspect and we have cited them below.

" Money is important and he does not want to pay fine for not keeping waste as per the rules."

"I have to anyhow pay the municipal fee for waste and therefore it mandatory for me to manage waste so that my money does not get wasted."

Other householders shared that they do not want to be seen as unhygienic and untidy to their neighbors. They want to maintain the reputation among the neighboring society. Some householders also have said.

" I care for my reputation among my neighbors and I do not want to show them how unorganized and how filthy I am."

And two out of ten were conscious about the environmental aspect as they shared that they need to follow rules and maintain the environment well to preserve the Norwegian environment.

"The Norwegian government does so much for our country and the environment. At the same time, we, private householders, have a special responsibility to keep the environment safe and clean. It looks like we, thereby, support our government. It is beneficial both for us and country."

5.2 Solid waste supply chain operations in Molde municipality

The renovation company has established a subsidiary company for managing solid waste supply chains in Molde municipality. Supply chain management plays a significant role in the renovation company's operational performance and includes diverse stages such as waste collection, sorting, and transportation. As told by the representative of the renovation company:

"The company is focusing on a more sustainable way of transportation by developing more reliable supply chain operation such as eco-friendly vehicles which leads to fewer trips and less emission."

"*the company wants their customers to get more facility in future and they are working upon it."*

The company uses supply chain logistics in which it collects first collects the solid waste from the households and then reuse it for recycling purpose. SCM of this subsidiary involves different stages which are described in the figure below:

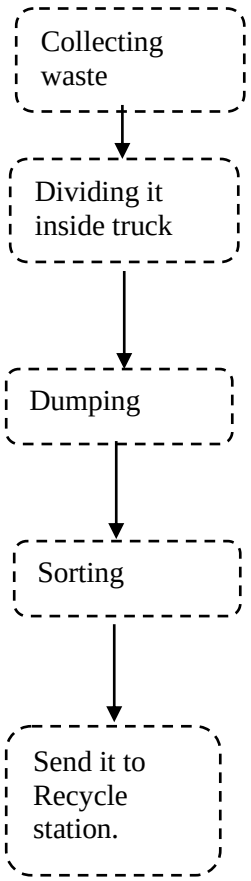

Figure 8. Stages of supply chain operation of solid waste management in Molde

The **first step** of the company is to collect the municipal waste from the private household. The company has 11 trucks in total from which they use one truck one day and 5 trucks a week except for weekends. Not all the wastes are collected on the same day, the collection day of different types of waste is different. For the food and residual waste, the collection is done every two weeks, for the plastic and paper the collection is done every four weeks, and for the glass and metal every eight weeks. Like this, the collection process is sorted for every type of waste. According to the representative of the renovation company, they also have a waste taxi, which they use for the collection of huge and bulkier waste like furniture. For this taxi assistance, customers must call for extra wet collection, and for that, they are charged 200 NOK per trip. The **second step** after collecting is to divide the waste in the truck first. The truck is divided into two compartments which makes it the garbage man easier to separate the waste according to the day of collection. If the day of collection is for food and residuals, then the garbage man will put the food waste in one compartment of the truck and residual waste in the other compartment and likewise on the other day of collection as per the type of wastes. The **third step** is to dump the collection in the building which is created to

deposit the waste for the further process. The **fourth step** is the process of sorting out the waste. When the waste is dumped in the building there are machines set up for the sorting purpose. The waste will be then put in the machine and the sorting starts, it sorts out the metals, plastic, food, textiles, and others separately. **The fifth and last step** is the process of collecting all the reusable waste together and send it to the recycle station. There is only one recycle station in Molde. The different type of waste is treated differently for recycling purpose like, bio waste is loaded at renovation company and when it gets full, the waste is transported to biogas plant where the gas is formed from the biowaste breakdown which is called biogas and it is further used as a fuel, for vehicles.

For the plastic, it is packaged in Molde and transported to sorting plants situated in Germany. From Germany, the various qualities of plastic are delivered throughout Europe. Paper waste is sorted according to the types of paper, if there are newspapers and magazines, they are sent to Norske Skog's paper factory at Skogn in Nord Trondelag. If the paper waste is cardboard, then it is transported to Trondheim and make the new cardboards. And the beverage papers are transported to Norrkoping at Fiskeby Board where new packaging cardboards are made which include pizza boxes. This is how the supply chain operation of municipal waste is managed in Molde. And as per the renovation company, they focus on continuous improvement in management and operations.

Chapter 6. Analysis and Discussion

This chapter analyzes the supply chain operations presented in Molde municipal solid waste management and how they have contributed to the economic, environmental, and social aspects of sustainability. In this chapter, we discuss the interplay between the renovation company and private householders in making solid waste supply chains more sustainable. Through this chapter, we show how our research findings reflect on our research questions. Here, we also present how our empirical findings are consistent with the existing literature.

6.1 Analysis of empirical findings

There is a special interaction between two key actors involved in solid waste renovation companies and private householders which motivates the householders towards social responsibility. Private householders are pressurized by the government regulations to be socially responsible by paying a certain fee imposed by the government for solid waste management. From the empirical findings, we have analyzed the supply chain operations applied in Molde municipal solid waste management and how they have contributed to the economic, environmental, and social aspects of sustainability. SCM is a link between these two key actors. The role of SCM in this study is making private householders more socially responsible. Everyone day in a week truck comes to the house to collect solid waste, all the householders know the schedule and they sort all the garbage containers beforehand. Social responsibility is pushed by financial pressure, if the householders do not select and sort the wastes properly, they will pay a fine. Their social responsibility grows from governmental pressure. Renovation company also encourages the private householders as the supply chain operations are managed by the renovation company initially from collecting stage the garbage until the recycle stage.

The findings have revealed that the renovation company is engaged in the reverse supply chain strategy to maintain sustainability. As we can see through the supply chain operation in Molde that they have divided the process into five steps, which start from collecting the waste and finishes at recycle point.

6.2 Implications of solid waste supply chain operations in Molde for the economic aspect of sustainability

Our findings have shown that the economic aspect is the most influential tool in sustainable solid waste supply chain operations in Molde. The householders said that they know that paying for the waste management is a mandatory expense in the month and when they pay a certain fee for waste management, they always try to provide their best effort to manage waste for the company in the most sustainable way. Their attitude towards the use of economic fines and fees was positive and, in their opinion, these fees and fines give them some kind of compulsion to act for sustainable development. The Norwegian regulation on solid waste management. make the private householders select and collect solid waste in a proper way if not proper they pay fees. Many of the respondents were also like that they pay the fee, so it becomes a duty to manage the waste properly. So, therefore, the economic aspect of sustainability from most of the potential household side is well maintained as they follow the rules and regulations which are meant to be good for the municipality, they live in. Most of the private householders we interviewed emphasized that they recognize the importance of the regulation as they persuaded us that they follow these rules, and it increases their social responsibility and their awareness (societal awareness). The renovation company asks householders to select and sort the waste properly as truck comes to collect the wastes. The sorting of the waste from the householders is managed in a way so that it will be convenient for the garbage man and a company to sort more later for recycle purpose. They face many challenges in their supply chain operation if the wastes are not sorted properly as it cost huge money to perform supply chain operations and implement the reverse supply chain strategy. That is why householders pay a certain amount as a fine if not done properly. Moreover, the waste they transport for recycling, they get paid for some waste which is sent for the recycling. Therefore, the interplay between the Norwegian regulations, renovation company, and private householders has been established in a way to support first the economic aspect of sustainability.

6.3 Implications of solid waste supply chain operations in Molde for the environmental aspect of sustainability

Our findings have revealed that the renovation company plans to use electric vehicles or gas-fueled vehicles. This will allow making their supply chains more environmentally friendly, producing energy through recycle and gas productions. The private householders have revealed that they think about the environment as the economic aspect contributes to the environmental aspect making householders more aware and more responsible. However, the company is already in a sustainable phase where it is doing all the efforts to obtain sustainable development by reducing emissions and producing energy through recycle and gas productions.

6.4 Implications of solid waste supply chain operations in Molde for the social aspect of sustainability

The findings have identified that private householders are interested in being more conscious towards social responsibility, but social responsibility emerges only after the satisfaction of the economic aspect. The private householders pay a certain fee to the renovation company which is a motivation for them. Some respondents said that it is their local duty and they also want to keep their surroundings and home clean and hygienic for the sake of their reputation. The literature says that it is possible to build a sustainable supply chain by taking into consideration all three aspects of sustainability (Gautam 2015). Our findings have shown that all these three aspects are interrelated.

Chapter 7. Conclusions, limitations and suggestions for future research

This chapter provides our main conclusions, including implications for theory and practice. It also concludes with the limitations and shows how this study can be extended by future research**.**

7.1 Implications for theory

Our findings have revealed two key actors involved in waste management in Molde municipality: the renovation company and private householders. While the renovation company implements its supply chain operations in a sustainable way, taking into account all the three aspects, to meet customer demands, the private householders are more active primarily due to the economic aspect of sustainability as compare to other two aspects. Our findings have also identified that solid waste supply chain operations in Molde municipality are based on a reverse supply chain strategy to develop sustainable development. It is also emphasized that waste management has the potential to turn obstacles into solutions when implementing sustainable supply chain strategies in reusing waste materials as extra and renewable resources.

While all three aspects of sustainability are interconnected, there is not so much previous SCM research that combines all three aspects of sustainability. In contrast, our master's thesis extends the literature on sustainable SCM and emphasizes the importance of making SCM practices more sustainable by finding a balance between three aspects of sustainability. Our findings have emphasized the importance of making supply chains socially responsible within waste management.

There have been increasing calls for developing case-study based research within the SCM field (Seuring and Muller, 2008). Our thesis's thesis explores solid waste supl chain operations in real contextual settings.

7.2 Implications for practice

The findings of this master's thesis can be valuable for managers within the waste management sector who are engaged in developing supply chain operations. Further, this study can be useful for

these managers in their efforts to develop sustainability through enhancing the quality of their services. Our findings can be very useful for supply chain managers providing new insights into developing sustainable strategies to balance all three aspects of sustainability. In addition, the empirical findings guide the managers on fostering their human resources by applying social responsibility practice in their business.

7.3. Limitations and suggestions for future research

Our investigation explores solid waste supply chains within Molde municipality. As SCM practices can be considerably affected by contextual and institutional factors (Li, Ragu-Nathan et al. 2006, Saeed, Jun et al. 2018), the same phenomenon in different contextual settings can bring new insights. Future research may extend our knowledge about the management of solid waste supply chains in contexts different from Norway's practice.

The findings were obtained only from ten private householders in Molde about their motives in waste management and their contribution to sustainable municipal development. Future research should cover a greater number of actors involved in waste management in Norway. In addition, future research on how other municipalities operate their supply chain operations can fill up the gap of social responsibility practices within SCM.

The data for this study has been taken from only one representative of the renovation company, which may cause response bias. It can generate a delusion in findings. Future research should be seeking multiple representatives from each department of an organization to enhance the research findings. It will also be valuable to use the representatives from SCM and, by comparing the views across the supply chain in an organization, it is possible to explore key challenges and vulnerability of the supply chain through which future research may be a study of SCM issues within waste management.

Bibliography

"A Consumer-OrientedBio-Waste Recycling System. The Case of Household Bio-Waste Collection at Romsdal Waste Management Company." Høgskolen i Molde-Vitenskapelig høgskole i logistikk, 2019.

Alliance, P. (2021). *Social Responsibility and Ethics*. Retrieved from Pachamama Alliance: https://www.pachamama.org/social-justice/social-responsibility-and-ethics#:~:text=Social%20responsibility%20is%20an%20ethical,of%20society%20and%20the%20environment.

Al-Odeh, Mahmoud, and Jim Smallwood. "Sustainable Supply Chain Management: Literature Review, Trends, and Framework." International Journal of Computational Engineering & Management 15, no. 1 (2012): 85-90.

Amasuomo, E. &. (2016). The Concept of Waste and Waste Management. Journal of Management and Sustainability. *Journal of management and sustainability*, 88.

Arntsen, Rebecca Emelie, and Anne Charlotte Gundersen. "Narratives of Change in NorskGjenvinning: A Journey Towards Sustainable Waste Management." Handelshøyskolen BI, 2018.

Amasuomo, E. &. (2016). The Concept of Waste and Waste Management. *Journal of Management and Sustainability Journal of management and sustainability* , 88. https://www.researchgate.net/publication/311161719_The_Concept_of_Waste_and_Waste_Management

Baltacioglu, Tuncdan, Erhan Ada, Melike D Kaplan, OznurYurt And, and Y CemKaplan. "A New Framework for Service Supply Chains." The Service Industries Journal 27, no. 2 (2007): 105-24.

Barbosa-Póvoa, Ana Paula, Cátia da Silva, and Ana Carvalho. "Opportunities and Challenges in Sustainable Supply Chain: An Operations Research Perspective." European Journal of Operational Research 268, no. 2 (2018): 399-431.

Bergin, Michael. (2017). Re: Can someone explain the ontology and epistemology in simple way?. Retrieved from: https://www.researchgate.net/post/Can-someone-explain-the-ontology-and-epistemology-in-simple-way/58a6ad7edc332d9f993cd09b/citation/download. business, E. s. (2021). *Role of Supply Chain Management in an Organization*. Retrieved from https://exeedcollege.com/blog/role-of-supply-chain-management-in-an-organization/

Bubicz, Marta Elisa, Ana Paula Ferreira Dias Barbosa-Póvoa, and Ana Carvalho. "Incorporating Social Aspects in Sustainable Supply Chains: Trends and Future Directions." Journal of cleaner production 237 (2019): 117500.

business, E. s. (2021). *Role of Supply Chain Management in an Organization*. Retrieved from https://exeedcollege.com/blog/role-of-supply-chain-management-in-an-organization/

Bontoux, L. and F. Leone (1997). The legal definition of waste and its impact on waste management in Europe, Office for Official Pubs of the European Communities.

Carter, Craig R, and Lisa M Ellram. "Reverse Logistics: A Review of the Literature and Framework for Future Investigation." Journal of business logistics 19, no. 1 (1998): 85.

Christensen, T. (2011). Solid waste technology and management, John Wiley & Sons.

Christopher, Martin, and Helen Peck. "Building the Resilient Supply Chain." (2004).

Crowe, Sarah, Kathrin Cresswell, Ann Robertson, GuroHuby, Anthony Avery, and Aziz Sheikh. "The Case Study Approach." BMC medical research methodology 11, no. 1 (2011): 1-9.

Crum, Michael, Richard Poist, Craig R Carter, and P Liane Easton. "Sustainable Supply Chain Management: Evolution and Future Directions." International journal of physical distribution & logistics management (2011).

de Kok, Ton G, and Jan C Fransoo. "Planning Supply Chain Operations: Definition and Comparison of Planning Concepts." Handbooks in operations research and management science 11 (2003): 597-675.

Dijkema, G., et al. (2000). "A new paradigm for waste management." Waste management**20**(8): 633-638.

Dowlatshahi, Shad. "Developing a Theory of Reverse Logistics." Interfaces 30, no. 3 (2000): 143-55.

Elo, Satu, and HelviKyngäs. "The Qualitative Content Analysis Process." Journal of advanced

nursing 62, no. 1 (2008): 107-15.

EPA. (2020, june 26). *EPA.* Retrieved from EPA: https://www.epa.gov/hw/criteria-definition-solid-waste-and-solid-and-hazardous-waste-exclusions

Felea, Mihai, and Irina Albăstroiu. "Defining the Concept of Supply Chain Management and Its Relevance to Romanian Academics and Practitioners." Amfiteatru Economic Journal 15, no. 33 (2013): 74-88.

Gangwar, N. and Y. Saraswat (2016). "Waste Management: A Corporate Social Responsibility or a Legal Obligation." Imperial Journal of Interdisciplinary Research (IJIR) **2**(11): 2454-1362.

Garth Lamb, S.-R. P. (2012). *WASTE DEFINITIONS AND CLASSIFICATIONS.* North Sydney NSW. Retrieved from https://www.environment.gov.au/system/files/resources/d05aa2d3-be01-44f3-904b-04dd09e9b0a1/files/waste-classification-gaps-part1.pdf

Gautam, Nabaraj. Analyzing the Sustainable Development Indicators of Nepal Using System Dynamics Approach *. 2015.

Global, K. (2018, April 24). *Operations Management and Supply Chain Management*. Retrieved from https://online.kettering.edu/news/2018/04/24/operations-management-and-supply-chain-management-understanding-nuances

Gojani, Ardena. "Citizens Attitudes and Participation in Solid Waste Management: A Case of Gjakova, Kosovo." Norwegian University of Life Sciences, Ås, 2016.

Golafshani, N. (2003). "Understanding reliability and validity in qualitative research." The qualitative report **8**(4): 597-607.

Greene, David L, and Michael Wegener. "Sustainable Transport." Journal of Transport Geography 5, no. 3 (1997): 177-90.

Gustafsson, Johanna. "Single Case Studies Vs. Multiple Case Studies: A Comparative Study." 2017.

Hage, I. (2016). Waste Management in Norway-A study of possible application of" ISO 37120 Sustainable Development in Communities-Indicators for city services and quality of life", NTNU.

Hellebust, Henning, and Vegard Øye. "A Consumer-Oriented Bio-Waste Recycling System. The Case of Household Bio-Waste Collection at Romsdal Waste Management Company." Høgskolen i Molde-Vitenskapelig høgskole i logistikk, 2019.

Jackson, P. (2010). *Social Constructivism*. Retrieved from Science Direct: https://www.sciencedirect.com/topics/computer-science/social-constructivism

Janvier-James, AsseyMbang. "A New Introduction to Supply Chains and Supply Chain Management: Definitions and Theories Perspective." International Business Research 5, no. 1 (2012): 194-207.

Joe Papineschi, D. H. (2019). ANALYSIS OF nordic regulatory framework and its effect on waste

Kaseva, M. and S. Gupta (1996). "Recycling—an environmentally friendly and income generating activity towards sustainable solid waste management. Case study—Dar es Salaam City, Tanzania." Resources, conservation and recycling**17**(4): 299-309.

Kim, Beaumie. "Social Constructivism." Emerging perspectives on learning, teaching, and technology 1, no. 1 (2001): 16.

Kamran Rousta PhD, K. B. (2019). searching household waste at the source. *Elsevier B.V.,* 105-114.

Kamran Rousta PhD, K. B. (2019). searching household waste at the source . *Elsevier B.V.* , 109-114. https://www.sciencedirect.com/science/article/pii/B9780444642004000086

Kjær, Birgitte. "Municipal Waste Management in Norway." European Environment Agency.[verkkodokumentti]. Saatavissa: http://www. eea. europa. eu/publications/managing-municipal-solidwaste/norway-municipal-waste-management (2013).

Kohlbacher, F. (2006). The use of qualitative content analysis in case study research. Forum Qualitative Sozialforschung/Forum: Qualitative Social Research, Institut für Qualitative Forschung.

Kurnia, Sherah, Md Mahbubur Rahim, and Marianne Gloet. "Understanding the Roles of Is/It in Sustainable Supply Chain Management." Paper presented at the PACIS, 2012.

Lambert, D. M. and M. G. Enz (2017). "Issues in supply chain management: Progress and potential." Industrial Marketing Management**62**: 1-16.

Leung, L. (2015). "Validity, reliability, and generalizability in qualitative research." Journal of Family Medicine and Primary Care**4**(3): 324-327

Li, Suhong, Bhanu Ragu-Nathan, TS Ragu-Nathan, and S Subba Rao. "The Impact of Supply Chain Management Practices on Competitive Advantage and Organizational Performance." Omega 34, no. 2 (2006): 107-24.

Lummus Rhonda, R., and J. Vokurka Robert. "Defining Supply Chain Management: A Historical Perspective and Practical Guidelines." Industrial Management & Data Systems 99, no. 1 (1999): 11-

17. https://doi.org/10.1108/02635579910243851. https://doi.org/10.1108/02635579910243851 .

Magee, John F, William F Capacino, William C Copacino, and Donald B Rosenfield. Modern Logistics Management: Integrating Marketing, Manufacturing and Physical Distribution. Vol. 22: John Wiley & Sons, 1985.

Márquez, Fausto Pedro García, Isidro Peña García Pardo, and Marta Ramos M Nieto. "Competitiveness Based on Logistic Management: A Real Case Study." Annals of Operations Research 233, no. 1 (2015): 157-69.

Millet, Dominique. "Designing a Sustainable Reverse Logistics Channel: The 18 Generic Structures Framework." Journal of Cleaner Production 19, no. 6-7 (2011): 588-97.

Murphy, D., & Ng'ombe, A. C. (2009). Corporate Social Responsibility. In Corporate Social Responsibility and Urban Development. *Palgrave Macmillan* , 7-33.

Myers, Michael D. Qualitative Research in Business and Management. Sage, 2019.

Nel, D. J. (2016, July 19). *Intgrty*. Retrieved from https://www.intgrty.co.za/2016/07/19/the-research-paradigms-positivism/

Nikita. (2020). *Biology discussion*. Retrieved 18 5, 2021, from Biology discussion: https://www.biologydiscussion.com/waste-management/essential-steps-involved-in-waste-management/7080

Online, B. (2021, March 3). *Waste management*. Retrieved from Biology Online: https://www.biologyonline.com/dictionary/waste-management?fbclid=IwAR2F4r3i4jCsTXRmLsBRwQ8K6LDBHvVKDj_IMxD650EZM1Zqt425KnfzwPs

Orb, A., et al. (2001). "Ethics in qualitative research." Journal of nursing scholarship**33**(1): 93-96

Park, Yoon Soo, Lars Konge, and Anthony R Artino. "The Positivism Paradigm of Research." Academic Medicine 95, no. 5 (2020): 690-94.

Patton, Michael Quinn. "Qualitative Research." Encyclopedia of statistics in behavioral science (2005).

Pongrácz, E. and V. J. Pohjola (2004). "Re-defining waste, the concept of ownership and the role of waste management." Resources, conservation and recycling **40**(2): 141-153.

Potrac, Paul, Robyn Jones, and Lee Nelson. "Interpretivism." Research methods in sports coaching (2014): 31-41.

Project, T. S. (2013). *Sustainable supply chain management*. Retrieved from Sustainable supply chain project: http://sustainable-supplychain.com/sscm.php

Renovasjonsselskap, R. I. (2020). *Romsdalshalvøya Interkommunale Renovasjonsselskap*. Retrieved from https://www.rir.no/om-rir

Saeed, Amer, Yun Jun, SaviourNubuor, HewawasamPriyankara, and Mahabaduge Jayasuriya. "Institutional Pressures, Green Supply Chain Management Practices on Environmental and Economic Performance: A Two Theory View." Sustainability 10 (05/10 2018): 1517. https://doi.org/10.3390/su10051517.

SBB. (2021, March 15). Retrieved from https://www.ssb.no/en/statbank/table/13136/tableViewLayout1/

Slight, Sarah, Kathrin Cresswell, Ann Robertson, GuroHuby, Tony Avery, and Aziz Sheikh. "The Case Study Approach." BMC medical research methodology 11 (06/27 2011): 100. https://doi.org/10.1186/1471-2288-11-100.

Smith, Emma. "Pitfalls and Promises: The Use of Secondary Data Analysis in Educational Research." British Journal of Educational Studies 56, no. 3 (2008): 323-39.

statbank. (2021, April). Retrieved from Statistics Norway: https://www.ssb.no/en/statbank/table/13136/tableViewLayout1/

Statista. (2020, November 4). Retrieved from statista.com: https://www.statista.com/statistics/586923/population-by-county-in-norway/

Statistic Norway. (2021, march 15). Retrieved from https://www.ssb.no/en/statbank/table/13136/tableViewLayout1/

Statistics Norway. (2021, February). Retrieved from https://www.ssb.no/en/omssb/om-oss

Statistics Norway. (2021, March 3). Retrieved from Statbank, Municipal Charges: https://www.ssb.no/en/statbank/table/12842/tableViewLayout1/

Statistics Norway. (2021, March). Retrieved from https://www.ssb.no/en/statbank/table/13136/tableViewLayout2/

"Sustainable Supply Chain Management: Literature Review, Trends, and Framework." International Journal of Computational Engineering & Management 15, no. 1 (2012): 85-90.

Taylor, Steven J, Robert Bogdan, and Marjorie DeVault. Introduction to Qualitative Research Methods: A Guidebook and Resource. John Wiley & Sons, 2015.

Tomaszewski, L. E., et al. (2020). "Planning Qualitative Research: Design and Decision Making for New Researchers." International Journal of Qualitative Methods**19**: 1609406920967174.

Vergara, S. E. and G. Tchobanoglous (2012). "Municipal solid waste and the environment: a global perspective." Annual Review of Environment and Resources **37**: 277-309.

UKDISS. (2018, November 18). *All Answers Ltd*. (UKDISS) Retrieved december 9, 2019, from All answer: https://ukdiss.com/examples/corporate-social-responsibility-waste-management.php#citethis

UNESCO. (2019). *Sustainable Development*. Retrieved from UNESCO: https://en.unesco.org/themes/education-sustainable-development/what-is-esd/sd

Vartanian, Thomas P. Secondary Data Analysis. Oxford University Press, 2010.

Wassenhove, V. D. (2002, February). *The Reverse Supply chain*. Retrieved from Harvard Business Review: https://hbr.org/2002/02/the-reverse-supply-chain#

Watson, Roger. "Quantitative Research." Nursing Standard (2014+) 29, no. 31 (2015): 44.

Wei, Zhang, and Wu Xiang. "The Importance of Supply Chain Management." International Journal of Business and Social Science 4, no. 16 (2013): 279-82.

Werner, Hartmut. Supply Chain Management. Springer, 2000.

White, P. R., et al. (1995). Integrated Solid Waste Management: A Lifecycle Inventory: A Lifecycle Inventory, Springer Science & Business Media.

wikipedia. (2021). Retrieved from https://en.wikipedia.org/wiki/Incineration

Wilkinson, Adrian, Malcolm Hill, and Paul Gollan. "The Sustainability Debate." International Journal of Operations & Production Management (2001).

Williams, Malcolm. "Interpretivism and Generalisation." Sociology 34, no. 2 (2000): 209-24.

Yadav, Vinay, and SubhankarKarmakar. "Sustainable Collection and Transportation of Municipal Solid Waste in Urban Centers." Sustainable Cities and Society 53 (2020): 101937.

Zailani, Suhaiza, K Jeyaraman, G Vengadasan, and R Premkumar. "Sustainable Supply Chain Management (Sscm) in Malaysia: A Survey." International journal of production economics 140, no. 1 (2012): 330-40.

Zhang, Yan, and Barbara M Wildemuth. "Qualitative Analysis of Content." Applications of social research methods to questions in information and library science 308 (2009): 319.

Ziemerink, C. (2020, februry 18). *Waste Management Supply Chain Strategies to Strengthen the Bottom Line*. Retrieved from Maine pointe: https://www.mainepointe.com/practical-insights/waste_management_supply_chain_strategies_to_strengthen_bottom_line

(2020). *13136: Household waste, by material, contents, downstream system, year and region.* Molde: Statistic Norway. Retrieved from https://www.ssb.no/en/statbank/table/13136/chartViewLine/

Appendix A
Interview Guide for the case company

Name of the company's representative:

Position:

Address:

Email Id:

Phone number:

Interview questions:

1. What is solid waste in Norway?
2. What kind of solid waste is selected now in Molde commune?
3. How is solid waste management organized in Norway and particularly in Molde commune? What is the role of RIR in solid waste management in Norway?
4. What kind of supply chain operations are involved in solid waste management in Molde commune?
5. What kinds of logistics solutions have been implemented in practice for the last decades?
6. What are the main actors involved in solid waste management in Molde commune?
7. What are the main actors involved in supply chain management of solid waste?
8. Is the RIR company engaged in the renovation of the waste system?
9. What does the RIR company do to increase householders' understanding of the importance of properly selecting solid waste?
10. How does the RIR company contribute to the development of social responsibility? What social programs does RIR provide?
11. How do social programs help increase householders' responsibility for collecting and selecting solid waste in a proper way?
12. How does RIR interact with householders?
13. Supply chain operations in Molde municipal solid waste management
14. Implications of solid waste supply chain operations in Molde for the economic aspect of sustainability
15. Implications of solid waste supply chain operations in Molde for the environmental aspect of sustainability
16. Implications of solid waste supply chain operations in Molde for the social aspect of sustainability

Appendix B
Interview guide for private householders

Name:

Address:

Gender:

Interview questions:

1. What is solid waste in Norway?
2. What kind of solid waste is selected now in Molde commune?
3. How is solid waste management organized in Norway and particularly in Molde commune?
4. Do you sort waste? If so, why are you doing this?
5. What types of waste do you sort?
6. What types of trash containers are around your home?
7. How often does the garbage company collect waste from the house?
8. Are there any improvements / initiatives in the sorting and recycling waste by the garbage company or municipality? Any examples ?