AALBORG UNIVERSITY

STUDENT REPORT

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Title: Waste Prevention from a municipal perspective - a case study of Hjørring Municipality

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Abstract:

In Denmark, municipalities are struggling to effectively implement waste prevention initiatives due to funding constraints and regulatory barriers. To make progress, changes are needed at both the European and Danish regulatory levels. This includes updating the definition of waste prevention and waste, enacting more comprehensive policies, and setting clear targets for waste reduction. The lack of consistency in plans presented by The Danish Government is also hindering progress.

A case study with Hjørring Municipality where two radically different waste fractions; textiles and electrical and electronic equipment, was identified for analysing. Using a stakeholder analysis in collaboration with representees from Hjørring Municipality, relevant stakeholders were identified, interviewed and the result where use to identify possible waste prevention initiatives.

The study concluded that initiatives could be done for textiles but not for electrical and electronic equipment due to regulatory barriers in place. However, this issue may over time spill over to textiles. Overall, the regulatory definitions and legislations are hindering waste prevention.

## Summary

Igennem de sidste par år er der på EU-niveau blevet sat mål for at opnå en højere genanvendelses rate. Der har også været fokus på affaldsforebyggelse dog er der ikke blevet sat nogen specifikke mål for det område. Hvorimod der har været op til den individuelle medlemsstat at lave en plan og sætte mål for affaldsforebyggelse. Det har ledt til uorganiseret initiativer på tværs af EU-landene. På EU-plan er der en lille inkludering af lokale myndigheder i forbindelse med implementering af affaldsforebyggelse.

I Danmark har den danske stat implementeret lov nr. 898, der gør det til et lovkrav at genbrugsstationer har bytte hjørne til genbrug. Yderligere gennemføre loven at kommuner ikke må administrere affaldsselskaberne længer og der er blevet sat fokus på at sektoren skal privatiseres. Det er uklart hvor meget de danske kommuner kan gøre ift. at implementere affaldsforebyggelse. Derfor er der i denne rapport lavet et casestudie på Hjørring Kommune, for at identificere de rammer og initiativer de danske kommuner kan implementere i praksis.

Der er anvendte en induktiv teoretisk tilgang. For projektet er der opstillet en teoretisk ramme forståelse for cirkulær økonomi og 9R framework, for at kunne diskutere hvad er affaldsforebyggelse og hvad for en definition der skulle anvendes i projektet, siden der er forskel på den juridiske og den praktiske definition.

Projektet er opbygget af fem analyser. Den første undersøger de lovgivningsmæssige rammer på et EU og Dansk niveau, for at undersøge hvordan lovgivninger og action planer hænger sammen og påvirker hinanden.

Derefter udvælges der to radikale affaldsfraktioner som analyseres. Baseret på casen bliver det valgt at arbejde med tekstil og elektronik.

Efter udvælgelsen, blev der i samarbejde med Hjørring kommune udført en brainstorm for at udpege aktør kommune potentielt kunne samarbejde med. Aktørerne blev også analyseret ud fra om de var på et lokalt til internationalt niveau, og hvor aktørerne kunne påvirke produktet i dens livscyklus.

Derefter blev der udpeget relevante aktører for begge fraktionerer.

For at få mere viden omkring de relevante aktører blev der efterspurgt interview. Det var muligt at etablere interview med fem er de relevante aktører identificeret.

Gennem analyserne blev der identificeret barrierer der overlappende for både tekstil og elektronik der stoppede/hindrer implementering af affaldsforebyggelse på et danske plan. Disse barrierer kan kategoriseres i kulturelle-, regulativ-, finansielle- og sektor barrierer.

Gennem den generelle mangel på mål og at lovgivningen ikke er blevet opdateret, skabes der fundamentale regulativ barrierer der hindrer implementering af affaldsforebyggelse.

Hjørring Kommune kan implementere nogen initiativer for tekstil f.eks. opstille en Repair Café, eller lave samarbejde med nationale velgørenhedsorganisationer, hvor de kan øremærke penge og kombinere social bæredygtighed med affaldsforebyggelse, samt øge deres fokus på information både udadtil men også indadtil i organisationen.

Dog for elektronik er der nogle regulativ barrierer som der ikke er blevet løst og som fortsat er i sted og hindre at Hjørring Kommune kan implementere flere initiativer end det de allerede har gjort gennem Nordværk.

Grundet de regulativ barrierer der er i EU lovgivning og Dansk lovgivning hindrer det implementering af affaldsforebyggelse og indsnævre kommunernes råderum.

Det anbefales at der sker en ændring på et EU-niveau i forbindelse med definitionen af affald men også definitionen af affaldsforebyggelse der ikke er blevet ændret siden den først blev indskrevet i lovgivningen.

Yderligere anbefales det at den danske stat får et overordnet indblik i de strategier der bliver sat for at sikre en helhedsorienteret implementering som ikke er misvisende. Generelt burde der på at EU-niveau sættes målsætninger siden der i dansk lovgivning er tilskrevet at der kun skal gøres minimumskravene sat af EU.

Grundet denne overbevisning på dansk plan og mangel på krav på EU-niveau hindres mængden af initiativer de danske kommuner kan implementere, hvor de er nødt til at finde smuthuller gennem i lovgivning og samarbejde med andre organisationer for at kunne implementere initiativer der kan være med til at fremme affaldsforebyggelse.

## Preface

This master thesis was conducted in the 10th semester of the master dictation environmental management and sustainability science at Aalborg University. I would like to thank my supervisor Henrik Rissgaard for sharing his field knowledge and guidance throughout the report. Likewise, I would like to thank team: Teknik & Miljø, Team Energi & Mobilitet at Hjørring municipality for insights, brainstorming and letting me attend meetings with them.

Lastly I want to thank my parents for their support though out my university years.

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# 1. Introduction

The European Union has set a focus on framing waste policies, e.g., setting goals for recycling, extending producer responsibility and setting targets for a reduction in waste sent to landfills (The European Parliament and The Council, 2018; The European Parliament and The Council, 2008).

*'The Waste Hierarchy*' was incorporated into EU legislation in the Directive 2008/98/EC on waste and repealing certain Directives (The European Parliament and The Council, 2008). It was incorporated to create a framework for prioritisation of the initiatives that contribute to the best overall environmental option in terms of waste legislation and policies (The European Parliament and The Council, 2008)


Figure 1.1. illustrates the waste hierarchy. The waste hierarchy shows the initiatives that have the best overall environmental option, from the highest prevention to the lowest disposal (European Commission a. , n.d.).

In recent years, the European Union's focus has shifted from disposal to prevention and recycling methods (European Environment Agency j., 2022).
According to EU legislation, in relation to amending Directive 2008/98/EC on waste (2018), one of the goals is to transform the European Union into a '*recycling society*'. Due to this focus in The Waste Framework Directive, the following targets have been set:

- By 2020, a minimum of 50% of waste materials from households by weight, e.g. paper, metal, plastic and glass, will be sent to preparation for reuse and recycling (European Commission b., n.d.).
- By 2020, a minimum of 70% of non-hazardous construction and demolition waste by weight will be prepared for reuse, recycled and other material recovery, including backfilling waste substitutes for other materials (European Commission b., n.d.)
- By 2025, at least 55% of municipal waste by weight should be prepared for reuse and recycling, increasing to 60% by 2030 and 65% by 2035 (European Commission b., n.d.).

Two of the targets focus on municipal waste. Those targets are minimum recycling of 50% of household waste, by weight, by 2020; and in 2025, a minimum of 55% of municipal waste, by weight, to be sent to be prepared for reuse and recycling, rising to 60% by 2030 and 65% by 2035.

Municipal waste is defined as "*(…) waste from households and waste from other sources, such as retail, administration, education, health services, accommodation and food services, and other services and activities, which is similar in nature and composition to waste from households*" (The European Parliament and The Council, 2018).

The recycling rate for municipal waste in European countries in 2020 can be seen in the Figure below; it is evident that there are mixed results in implementing recycling.

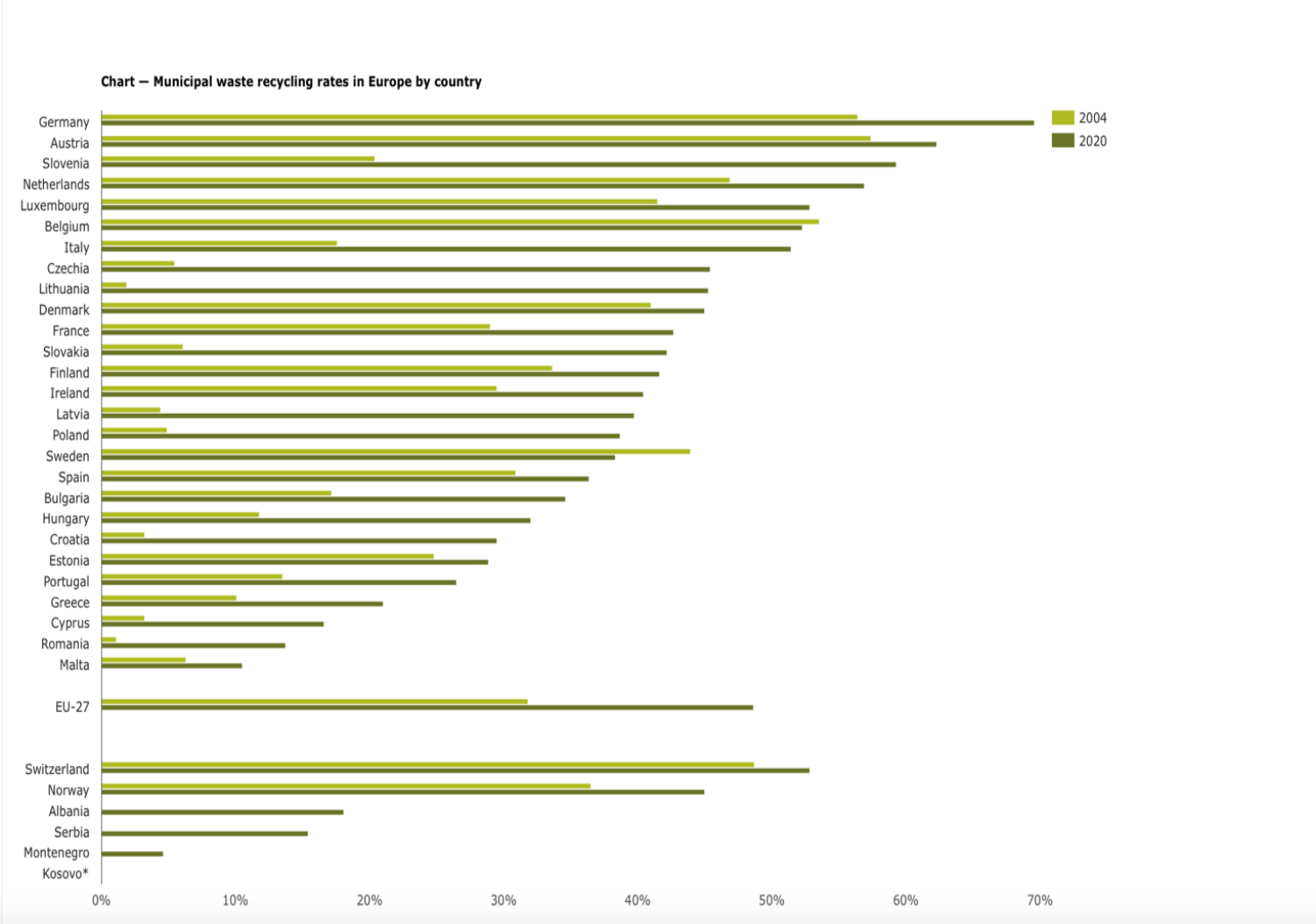


*Figure 1.2. Shows the recycling rates for municipal waste in Europe by country. The x-axis shows the recycling rate, and the y-axis shows the European country (European Environment Agency h., 2022).*

Figure 1.2 shows the municipal waste recycling rate for each European country. The countries are ranked from the highest recycling rate to the lowest, in 2020.

It should be noted that European countries could utilise different methods for accounting or a different definition of recycling, e.g., reel recycling. Additionally, methods of calculation and definitions of recycling have changed over time which may minimise the comparability.

The Digure, however, is used to estimate how the European countries are doing in terms of implementing recycling for municipal waste. It is noted that there are uncertainties with the data used in the graph.

The average recycling rate for the European Union – 27 countries - was 48.6% in 2020.

Reaching the target for 2025 of a 55% recycling rate for municipal waste had only been reached by four countries, Germany, Austria, Slovenia and the Netherlands, with 69.6 %, 62.3%, 59.3% and 56.9% respectively.

Increased recycling rates have been seen in the last 16 years. Some European countries have significantly increased the amount of recycled municipal waste, e.g. Lithuania, Czechia, Latvia and Poland. In some countries, the recycling rates have decreased in the last 16 years, e.g. Belgium and Sweden.

An explanation for the decreasing recycling rate in some countries could be due to the waste generation not being decoupled from economic growth (European Commission, 2020).

The efforts from the EU and its member states, at a national level, have yet to reduce the amount of waste generated. Instead, waste generation is still increasing (European Commission, 2020). The annual waste generation in the EU amounts to 2.5 billion tonnes, or 5 tonnes per capita a year (European Commission, 2020). Citizens produce an average of nearly half a tonne of municipal waste per year per citizen (European Commission, 2020).

The municipal waste generation for individual European countries from 2006 to 2021 has increased over the last 15 years in terms of kg per capita. See Figure 1.3 below.

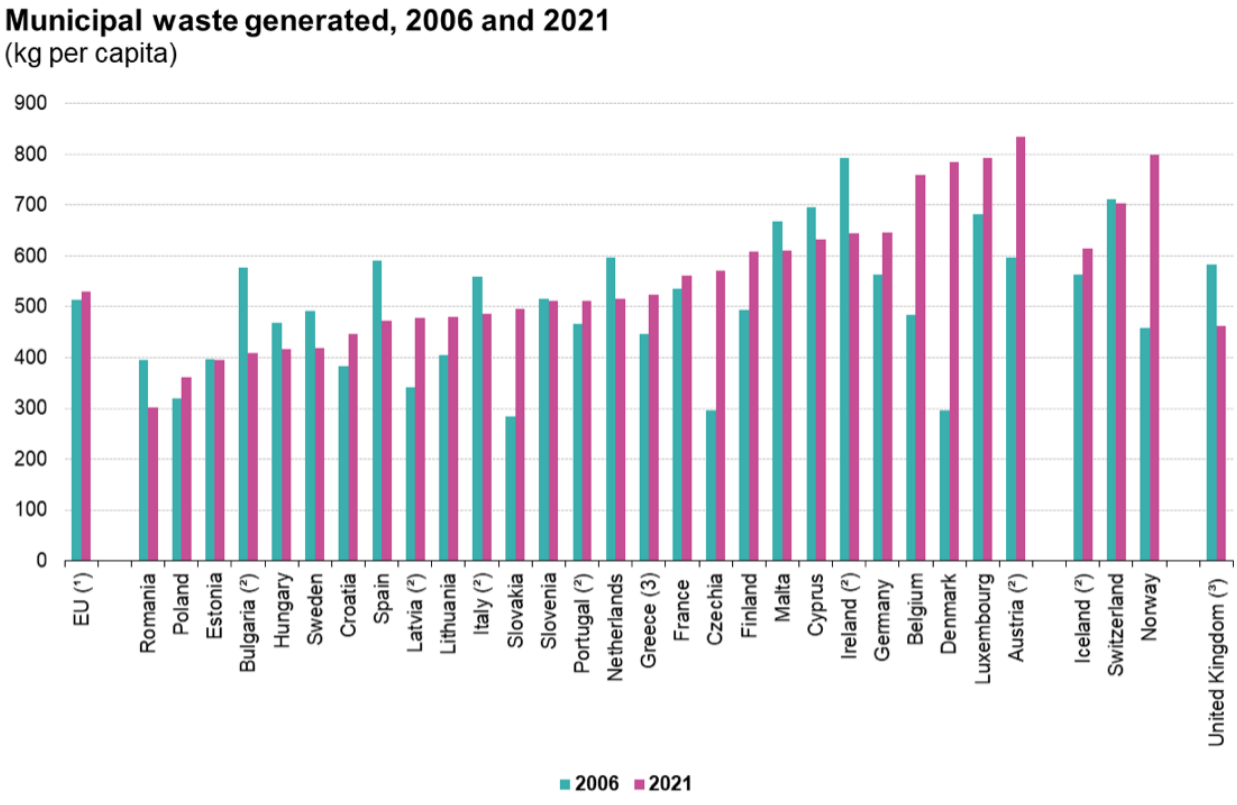


Figure 1.3. European municipal waste generation by country for 2006 and 2021. The x-axis shows the European country's municipal waste generated for 2006 and 2021; the y-axis shows the 2006 and 2021 kg waste per capita (Eurostat stratistics Explained , 2023).

Figure 1.3 shows each European country’s municipal waste generation for 2006 and 2021.

It should be noted that the method for compilation and reporting of municipal waste used by the European countries may have changed between 2006 and 2021.

The calculation of municipal waste in European countries has undergone changes in its definition over time. While four options were previously available, only one is now permitted. It is important to note that the methods used in 2006 and 2021 may not be compatible due to these changes. It cannot be assumed that all countries have used the exact definition for both periods.

Additionally, some of the data used in calculating the estimates are provisional (Eurostat, n.d.). There have also been breaks in the data collection where some countries' data is unavailable.

The figure, however, is used to estimate the generation of municipal waste over the last decade. But it is noted that there are uncertainties with the data used in the graph.

The estimated average for 27 countries of the European Union is 513 kg per capita to 530 kg per capita from 2006 to 2021. On average, there has been an increase in municipal waste generation.

In some countries, waste generation fell between 2006 to 2021, e.g. Ireland, Spain, Bulgaria, Netherlands, Italy, etc. The Figure shows that municipal waste decreased from 2006 to 2021 in terms of kg per capita for ten European Union countries.

Municipal waste generation either stagnated or did not increase significantly in two countries from 2006 to 2021, Estonia and Slovenia.

In the remaining 15 countries, there was an increase in municipal waste generated. Denmark had the highest increase from 2006 to 2021, going from 297 kg to 786 kg per capita, with an increase of 489 kg per capita in the last 15 years.

Waste generation is dependent on the development of the economy (European Environment Agency i., 2022).

Waste generation and economic growth have been relatively decoupled in the EU, where waste generation only increased by 5.2%, whereas GDP increased by 14.8% between 2014 and 2018. However, further incentives need to be implemented to fully ensure decoupling.

To achieve decoupling, it is recommended that concrete targets for waste prevention policies should be set on both an EU and national level (European Environment Agency i., 2022).

No targets for waste prevention have been set on a European level for any sector, but some member states have set waste prevention goals on a national level (European Environment Agency f. , 2022; European Environment Agency g. , 2022).

The member states must report which initiatives they are implementing to prevent waste to the European Union (The European Parliament and The Council, 2008; The European Parliament and The Council, 2018). Each member state has the autonomy to determine how they approach waste prevention, including the specific initiatives and legislation they choose to enact.

Legislation has been implemented in, e.g., Sweden and Germany, focusing on rewarding the consumers with tax reductions if the products are repaired, cleaned or maintained and thereby extending the life span of the product or if the product is donated for reuse (European Environment Agency d. , 2022; European Environment Agency g. , 2022).

Others have set targets for waste minimisation, e.g., the Netherlands has set a target of 20% less plastic by 2024 compared to that in 2017 (European Environment Agency e. , 2022).

There is a tendency to utilise legislation and policies in most EU countries, including Denmark, Spain, Germany, Sweden, The Netherlands, Greece, etc. (European Environment Agency d. , 2022;

European Environment Agency g. , 2022; European Environment Agency c. , 2022; European Environment Agency e. , 2022; European Environment Agency f. , 2022; European Environment Agency b. , 2022).

Few countries collaborate with local governments in implementing waste prevention for municipal waste (Dagilienė, et al., 2021). However, some countries, e.g. Ireland and the Netherlands, have also implemented initiatives that involve local government in waste prevention. Here, the focus is on local circular economy models, offering training in the upcycling of textiles, implementing circular economy centres where citizens can take products for reuse, repair, recycling and where tools and materials are available (European Environment Agency k., 2022; European Environment Agency a., 2022).

In some EU countries it is the local government/municipality that is responsible for the collection of municipal waste (The European Parliament and The Council, 2018). In these cases the municipalities are responsible for ensuring that the municipal waste is treated according to the waste hierarchy - preparing for reuse, recycling, material recovery and landfilling.

European waste prevention plans often overlook the involvement of municipalities, although policies and legislation directly impact them. Denmark serves as an example of this.

In Denmark, a new law, Law No. 898, was added to the Environmental Protection Act [1] in June 2022.

Law no 898 introduces several changes, such as prohibiting municipalities from managing waste management companies and implementing the arm's length principle. The environment minister has the authority to establish regulations regarding the municipal council's responsibility to create reuse areas at municipal recycling stations, including their size, layout, operation, and usefulness.

Previously, Danish municipalities had the option to create reuse areas at recycling stations, but now it is required by law. This means that the fees collected can be used to support these areas. The new legislation has also shifted the waste management approach from a self-contained system to one that promotes competition and privatisation.

It is currently uncertain whether further waste prevention initiatives will be established at a European level. It's worth noting that the consultation process for revising the Waste Directive took place from May to August 2022 (European Commission a., 2022).

Waste prevention was stated as something some stakeholders wanted to increase focus on in revising the directive (European Commission b., 2022).

Municipalities may be given more responsibility for waste prevention by revising the directive in the future. However, this change is not expected to happen soon and may not occur until 2026 at the earliest.

Additionally, it is unclear what legislation will be implemented in Denmark to give Danish municipalities more responsibility for implementing waste prevention initiatives for municipal waste.

It can be argued that the Danish municipalities could also indirectly impact other actors that The Danish Government have categorised, e.g., charity organisations (The Danish Environmental Protection Agency, 2021).

[1] Own translation from - Bekendtgørelse af lov om miljøbeskyttelse

For Denmark, waste prevention in relation to municipal waste must be viewed from a municipal perspective, as well as how waste prevention initiatives can be implemented needs to be investigated from this perspective.

In Denmark, some municipalities have already implemented waste prevention initiatives, even though they are not legally obligated to do so. One of these examples is Hjørring Municipality.

Hjørring Municipality has been identified as one of the most proactive municipalities in the northern region of Jutland (Holm, 2020) when it comes to implementing initiatives related to waste prevention and extending the life span of products.

Hjørring Municipality has been repairing large household appliances through their waste management company AVV, now Nordværk, thereby extending the lifespan of large household appliances.

For this report, collaborate with Hjørring Municipality was established. This study will focus on waste prevention and how it can be implemented in Hjørring Municipality with a case-based approach.

# 2. Research Question

As per EU legislation, municipalities may be held accountable for managing municipal waste. However, it is not their responsibility to execute waste prevention initiatives which fall under the jurisdiction of the respective European country's state. Nevertheless, national laws can have a direct impact on municipalities.

In Denmark, Law No. 898 requires municipalities to establish reuse areas at recycling stations and enforces the arm's length principle as part of the Danish prevention plan. This law highlights how municipalities are affected by legislation without having the ability to influence it.

Municipalities are a form of local government that is in closer proximity to citizens than The Danish Government. They possess the ability to influence other entities and work collaboratively to execute waste preventive measures.

With the lack of available information regarding waste prevention from a municipal perspective, a case study will be done on Hjørring Municipality, which is noted to be one of the more proactive municipalities in northern Jutland.

***How can Hjørring Municipality potentially impact the implementation of waste prevention initiatives?***

The sub-research questions below have been created to guide how the research question should be answered.

Sub-research questions:

- What is the municipality legally allowed to do for waste prevention?
- What municipal waste fraction is most critical for Hjørring Municipality?
- Which stakeholders could Hjørring Municipality potentially impact in terms of waste prevention?

## 2.1 Delimitation

The report specifically covers municipal waste and does not address industrial waste, which falls outside the municipality's responsibility. It will discuss legislation pertaining to waste prevention and municipal waste and may refer to additional relevant legislation beyond its scope.

This report specifically discusses feasible waste prevention initiatives within Denmark's legal framework. It does not analyse initiatives carried out in other countries as the legal framework may differ from Denmark's.

The focus of the report is specifically on Hjørring Municipality, which means that the initiatives and stakeholders that have been identified are directly applicable to the municipality in question.

# 3. Research Methodology

## 3.1 Research design

This section presents the report's research design, the approach used in the report's assessment theories and methods to answer the sub-research questions.

The research design for this report is illustrated in Figure 3.1 which shows how the sub-research questions are utilised to answer the research question.

Every box is related to a scientific approach for this research, which can be seen on the right side of Figure 3.1.

The theoretical approach chosen for this report is based on the selected empirical evidence, methods, and theoretical frameworks, considering the point of origin and scientific considerations. This approach helps to answer the research question posed in the report and provides a thorough understanding of the gathered empirical evidence.

An inductive approach was used to create this report, as it is based on real-world observations about the exclusion of municipalities from waste prevention efforts (Antoft & Salomonsen, 2007). The reports' theoretical framework for waste prevention takes an inductive approach, relying on academic literature and legislation to define what waste prevention means.

The following sections will provide more details regarding how the methods and theoretical framework were utilised to answer the individual research questions.

### Sub-question 1: What is the municipality legally allowed to do for waste prevention?

The initial sub-research question aims to establish the legal framework governing municipal waste in Europe generally and, more specifically, in Denmark. This will provide a comprehensive understanding of the relevant legislation. To address the sub-research question, an analysis of relevant documents was conducted to identify the legal framework and understand the impact of various legislations on each other. Moreover, an analysis was conducted on action plans at both the European and Danish levels. The purpose was to grasp the reasoning behind decision-making, which eventually resulted in a revision of legislation.

### Sub-question 2: What municipal waste fraction is most critical for Hjørring Municipality?

The second sub-research question explores the significant waste fractions for Hjørring Municipality based on their current practices. A case study was executed to classify the crucial waste fractions, focusing on the municipality's existing procedures. It was desired to select two waste fractions that were radically different.

### Sub-question 3: Which stakeholders could Hjørring Municipality potentially impact in terms of waste prevention?

The third sub-research question aimed to identify stakeholders who could help implement preventive measures for two waste fractions based on the previous sub-research question. A stakeholder analysis using the method outlined by Olsson et al. (2019) was conducted to map out these relevant stakeholders. Additional steps were taken in accordance with the scope of this report. Furthermore, collaboration with Hjørring Municipality was done to accurately identify and involve all relevant stakeholders.

The next section will delve into the methods used in this report and reflect on how they were implemented in practice.

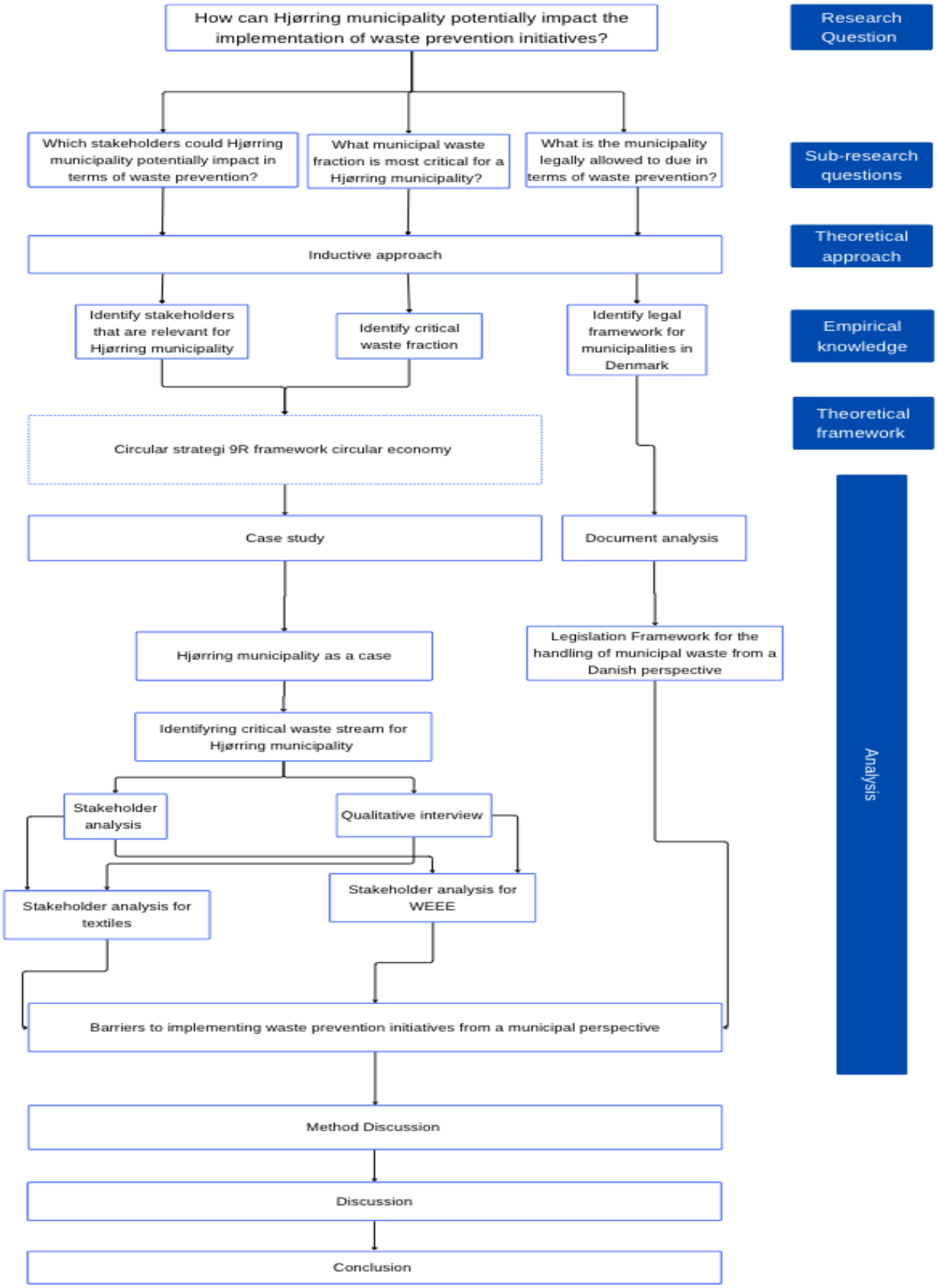


*Figure 3.1 Illustrates the research design for this report. Illustration of how methods and theoretical frameworks are utilised to answer the research question and correspond to the sub-questions.*

## 3.2 Literature Review

This report used a literature review to systematically gather information to identify the research problem. The research focused on waste prevention from a municipal perspective and analysed current literature on the topic.
Different questions were asked to get insight into the topic: what is the status of municipal waste in the EU? – What are the EU countries' strategies for waste prevention?

Table 3.1 bellows show the words that have been searched in English. English words were used since more data was found for waste prevention from a municipal perspective.

| | Word 1 | Word 2 | Word 3 | Word 4 | Word 5 | Word 6 |
|---|---|---|---|---|---|---|
| English | Municipal waste | Waste prevention | Initiatives | Local governments | Waste prevention initiatives | Municipalities |

*Table 3.1 Shows the search words utilised in the literature review in English. Own table.*

Based on the search words, a search string was created. Table 3.2., below, illustrates the search words utilised, the search string created and how many results arose. Search results were limited to 50 max.

The database Primo AUB was utilised to gather literature. When searching, a delimitation was set for the year published was set between 2018 to 2023. This was because the waste directive was revised in 2018.

Additionally, in the search, words such as 'food waste' and 'food' were eliminated from the search. From a random sample of the relevant literature where food waste and food were included, it was found that a lot of literature was related to case studies in municipalities and how to reduce food waste. These words were removed because the purpose of the literature review was to obtain a broad understanding of waste prevention initiatives at the municipal level.

| Databases | Search word | Results |
|---|---|---|
| **Primo AUB** | Municipal waste | 94.537 |
| | Waste prevention | 7.155 |
| | Waste prevention AND municipal waste | 579 |
| | Waste prevention AND municipal waste AND local governments | 126 |
| | Waste prevention AND Municipal waste AND Initiatives | 168 |
| | Waste prevention AND local governments AND initiatives AND Municipal waste | 26 |

*Table 3.2 The use database, searched words and the results given.*

Upon reviewing the abstracts of the 26 articles, it was clear that there was limited research on the topic. Out of all the abstracts, only one article proved to be useful. The rest of the articles discussed topics such as energy, consumption taxes, and producer responsibility.

With little data available on the topic, it was decided that another approach needed to be taken.

It was decided to look at current legislation for waste, targets and available data on municipal waste in the EU, to analyse the current practice.

The European Environmental Agency was heavily utilised to pinpoint and address this topic. The agency's website and its search engine were utilised.

Through the literature research, it became clear that initiatives had been taken that had incentivised recycling rather than waste prevention on an EU level.

To understand initiatives that have been done on a local government level, the short descriptions of the European countries' waste prevention plans were analysed. The plans were made assessable by the European Environmental Agency.

The plans give an overview of the waste generation in all the European countries and what initiatives are being done. The overview made it clear that only some countries were utilising local governments in implementing waste prevention initiatives.

## 3.3 Document analysis

This report utilised the method of document analysis described in the book *Qualitative Methods* [2] by Lynggaard (2020). The method is used in connection with understanding the regulation the municipalities need to uphold concerning municipal waste. This is due to the report's focus being on how municipalities can implement waste prevention initiatives.

Knowledge concerning the legal framework needs to be gathered to ensure that the initiatives are within the municipality's scope and that the potential solutions of the report are feasible.

According to Lynggaard (2020), document analysis is a systematic reading of documents that can be narrowed to a specific reached area based on, e.g., discursive, a policy process or a given historical period.

The scope of the document analysis was to focus on legislation impacting the municipalities concerning municipal waste. This has led to a narrow document research area since the focus is quite specific and still somewhat new in the Danish context concerning the changes that have been implemented. Due to this, only ten documents have been analysed.

The documents analysed are organised by type, name and year in Table 3.3 below:

| Type of document | Name | Year of publication or last changed |
|---|---|---|
| European Union – legislation | Directive 2008/98/EC on waste and repealing certain Directives | 19th November 2008 |
| European Union – Commission decision | Establishing rules and calculation methods for verifying compliance with the targets set in Article 11(2) of Directive 2008/98/EC of the European Parliament and of the Council | 18th November 2011 |

[2] Own translation from – Kvalitative Metoder

| | | |
|---|---|---|
| European Union – action plan | Closing the loop – an EU action plan or Circular Economy | Finalized 2nd December 2015 |
| European Union – legislation | Amendment to the directive 2008/98/EC on waste released | 30th May 2018 |
| Danish – action plan | Climate plan for a green waste sector and circular economy [3] | 16th June 2020 |
| Danish – action plan | Action plan for circular economy – national plan for prevention and handling of waste 2020-2032 [4] | July 2021 |
| Danish legislation | Environmental Protection Act [5] | Last changed 3rd January 2023 |
| Danish - legislation | Act regarding waste [6] | Last changed 10th December 2021 |
| Danish - legislation | Act regarding waste regulation, charge and actors etc. [7] | Last changed 10th December 2021 |
| Danish legislation | Law No. 898 - law regarding changes in Environmental Protection Act and law in supply supervision (new framework for municipal treatment of waste to material recovery, collection of industrial waste, reuse at recycling depot and increase economic authority) [8] | 21st June 2022 |

*Table 3.3. Listing of the documents that have been read for the document analysis. Organised by type of document, name and year published or changed. Own table.*

Table 3.3 shows the ten documents that have been read for the analysis. All the documents that have been analysed can be categorised as secondary documents. Secondary documents are e.g. legislation, government reports, news articles, etc. Furthermore, secondary documents are available in the public domain - though this does not mean that the document is intended for the public.

[3] Own translation from – Klimaplan for en grøn affaldssektor og cirkulær økonomi

[4] Own translation from – Handlingsplan for cirkulær økonomi – national plan for forebyggelse of håndtering af affald 2020-2032

[5] Own translation from - Bekendtgørelse af lov om miljøbeskyttelse

[6] Own translation from - Bekendtgørelse om affald

[7] Own translation from - Bekendtgørelse om affaldsregulativer, gebyrer og aktører m.v.

[8] Own translation from - Lov om ændring af lov om miljøbeskyttelse og lov om Forsyningstilsynet (Nye rammer for kommunal behandling af affald egnet til materialenyttiggørelse, indsamling af erhvervsaffald, genbrug på genbrugspladser og skærpet økonomisk tilsyn)

There are arguments for this in some cases, e.g. the Danish Action Plan for Circular Economy – National Plan for Prevention and Handling of Waste 2020-2032. Although the plan is public, the intended audience is, arguably, the European Union, since member states are required to submit a waste prevention plan to the European Union (The European Parliament and The Council, 2008) (The European Parliament and The Council, 2018).

The same can be argued for the EU legislation Directive 2008/98/EC on waste and repealing certain Directives and the amending of the directive 2008/98/EC on waste released in 2018 regarding municipal waste. The audience here can be seen as the EU Member States obligated to implement the legislation.

A semi-structured snowball method was used to find the documents that have been used. This is because there is no apparent connection between some documents. Still, it was found based on knowledge obtained from the literature review, meetings with the supervisor and previous knowledge from other reports with similar topics.

Figure 3.2 below illustrates how the documents used in the analysis were found:

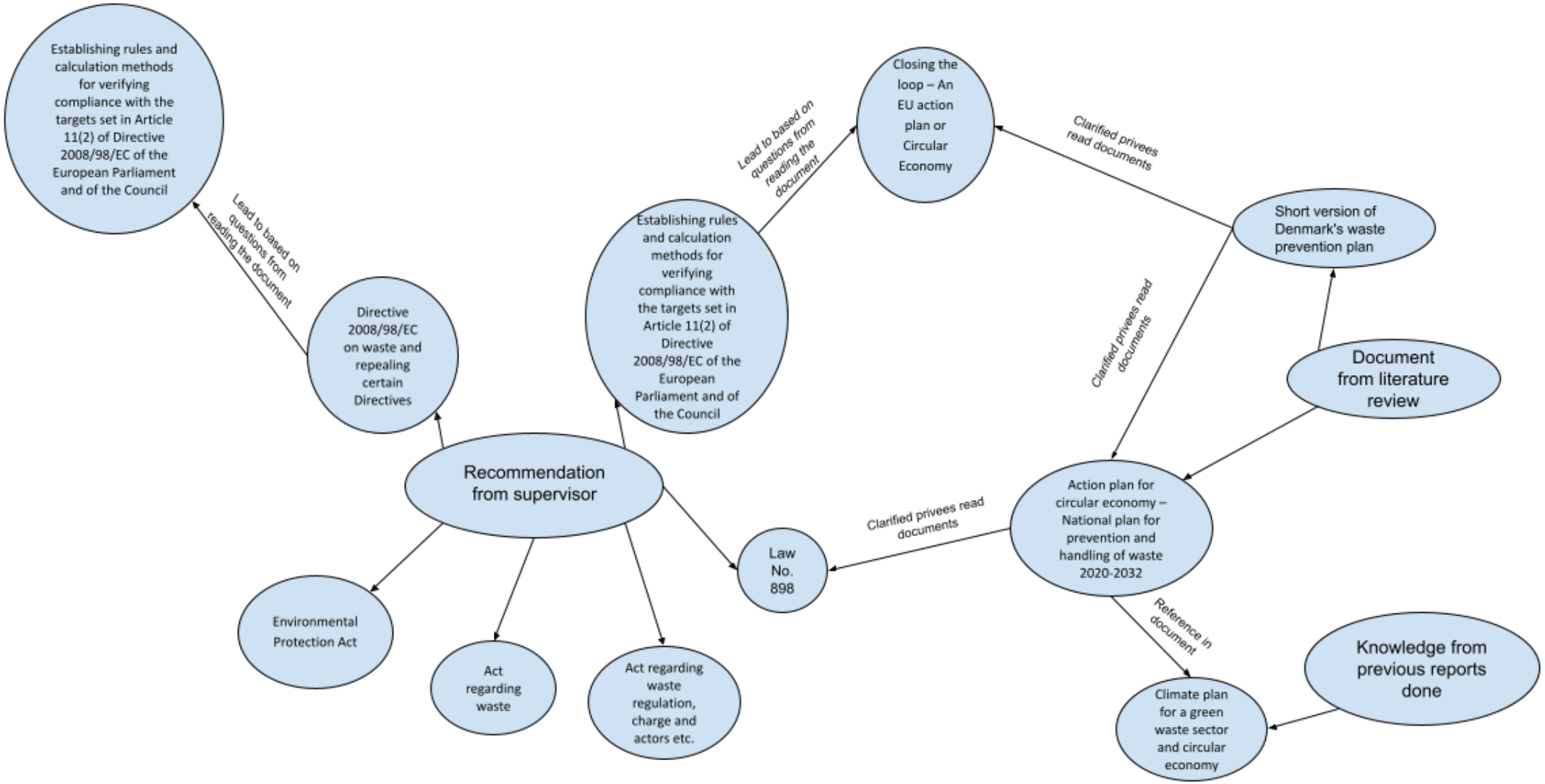


*Figure 3.2 - The figure shows how the document was found, how it helped find other documents and if it clarifies previously read documents— own figure.*

Figure 3.2 illustrates how the documents were gathered. As seen in the Figure, some documents have a clear link, e.g., Danish action plans and Law no 898; see Figure 5.1 in section 5.1.

It should also be noted that the semi-structured snowball method was used due to the lack of connection to the document in some cases. This is the case for the Danish Action Plan for Circular Economy – National Plan for Prevention and Handling of Waste 2020-2032 [9]. The action plan is the waste prevention plan that Denmark needs to send to the EU.

However, this was not stated in the plan itself but was presented as a Danish incentive done independently without reference to the EU legislation. When conducting the literature review for the research problem, a short version of the Danish waste prevention plan was read (European Environment Agency c. , 2022). Based on the initiatives described, it became clear that the action plan was the waste prevention plan.

The documents were analysed based on different keywords/focuses, municipal waste and municipalities. A table was constructed to structure the findings in the documents, which can be found in Appendices A. The table was organised using the following headings:

- Legislation type /action plan
- Name, year published
- The objective of the legislation/action plan
- Influence by legislation/action plan
- Key elements to take from the legislation/action plan regarding municipal waste and municipalities

This was done to give an overview of the results from the documents and structure the findings. Legislation that impacted the municipalities, municipal waste or waste prevention was noted down, together with citing the article or paragraph it was under in the document. This would make it easier to find the relevant data for re-evaluation if uncertainties arose later.

## 3.5 Stakeholder analysis

To analyse the stakeholders the method of stakeholder analysis was utilised described in the book *Power in Projects and Portfolio*[10] by Olsson et al., (2019). The method is used to understand what actors a municipality can utilise when attempting to implement waste prevention.

The stakeholder analysis was conducted together with representatives from Hjørring Municipality. This is due to the report's focus being on waste prevention from a municipal perspective and understanding which actors the municipality sees in terms of collaboration. This knowledge and perspective could not have been gained otherwise.

Two different stakeholder analyses were conducted based on the selected waste fractions. Both stakeholder analyses were conducted on 28th March and were recorded. Transcriptions of the recording can be found in Appendices B.

According to Olsson et al., (2019), stakeholder analysis is based on four different steps. The four steps can be seen in Figure 3.3 below.

[9] Own translation from – Handlingsplan for cirkulær økonomi – national plan for forebyggelse of håndtering af affald 2020-2032

[10] Own translation from – Power i Projekter og Portefølje

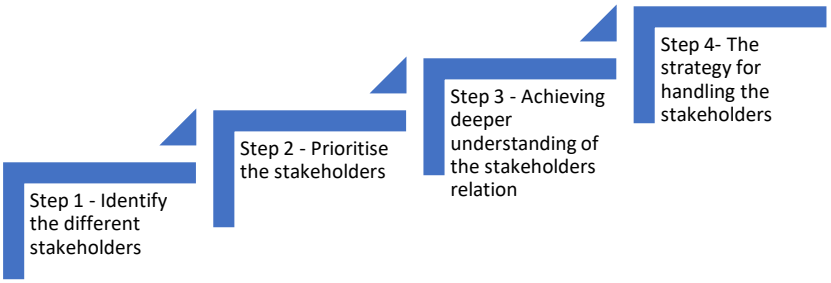


Figure 3.3 The four different steps that make up a stakeholder analysis. Own Figure based on Olsson et al., (2019).

This report's stakeholder analysis did not follow the structure exactly as laid out by Olsson et al. Steps 1 and 2 were followed to a certain extent, as described by Olsson et al.

Step 1 was done through brainstorming regarding stakeholders. The brainstorming was done in collaboration with Hjørring municipality.

Step 2 involves identifying the relevant stakeholders, which will be included in Step 3. According to Olsson et al., (2019), a matrix can be utilised to categorise the stakeholders. A matrix was utilised in Step 2. However, the matrix was designed specifically for this report and is related to waste prevention and collaboration.

The placing of the stakeholders on the matrix was done by representatives from Hjørring Municipality. This was done to ensure that the correct placement was given to the stakeholders. Figure 3.4 below illustrates the matrix techniques utilised to prioritise the stakeholders.

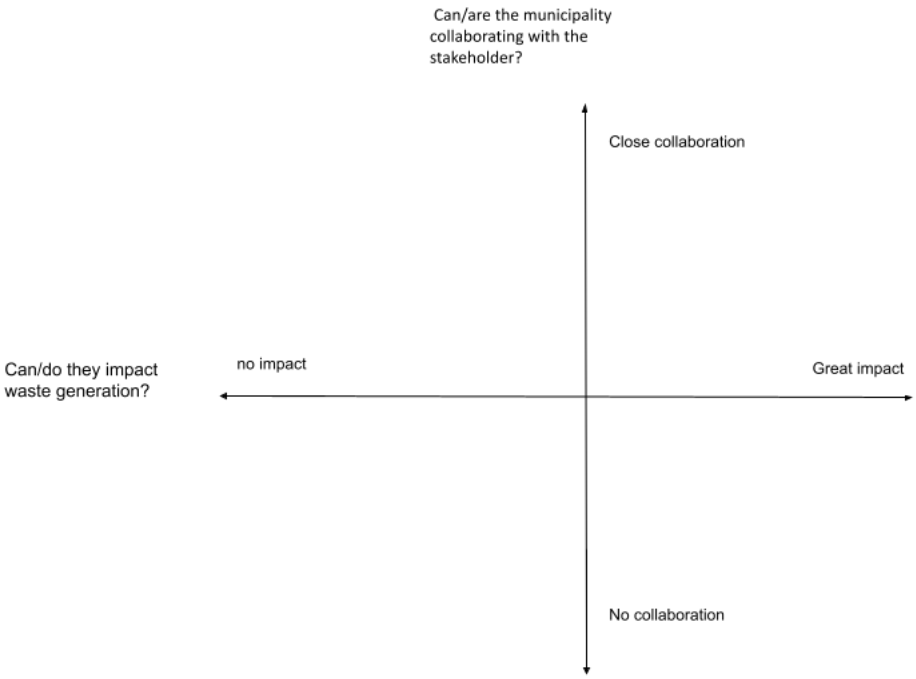


*Figure 3.4 Matrix used to prioritise the stakeholders. Own Figure based on the illustration by Olsson et, al., (2019)*

Additional Figures were utilised after the meeting when prioritising the stakeholders in Step 2.

These Figures are not a part of the method but something that was added. Figures 3.5 and 3.6 are the Figures that were added to Step 2 for both of the stakeholder analyses.

Figure 3.5 was made to help with identifying whether collaboration with the stakeholder and Hjørring Municipality could be done.


*Figure 3.5 illustrates where the stakeholders are on a local, regional, national, EU or national level—own figure.*

Figure 3.6 was made to help identify what stakeholders could conduct waste prevention initiatives.

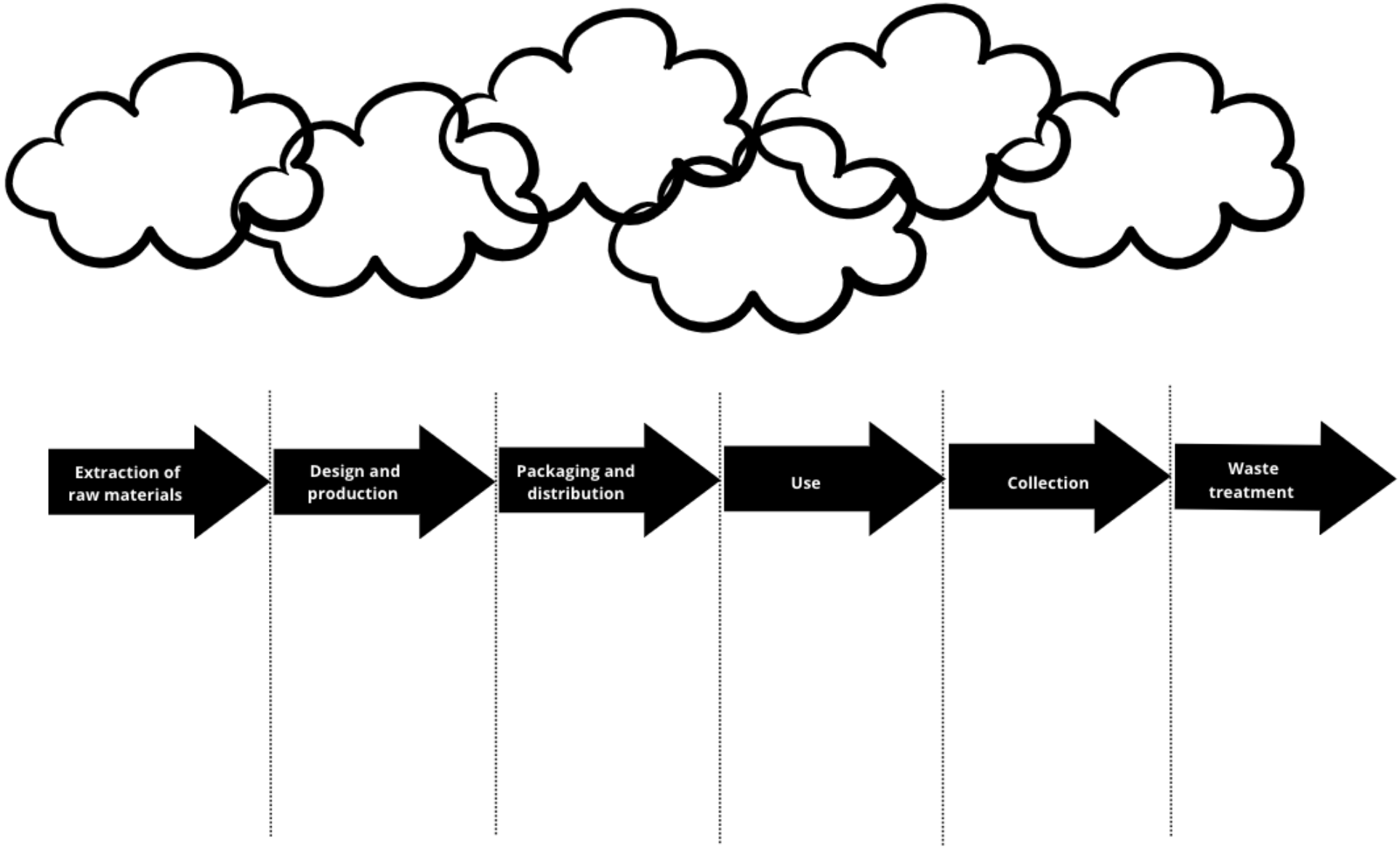


*Figure 3.6 illustrates where in the lifespan the stakeholders would impact the product - own figure*

Figure 3.6 shows clouds in the image. During stakeholder research, it was discovered that certain stakeholders did not have a direct impact on specific phases, but could affect all phases to varying degrees. As a representation of this, clouds were used to indicate the level of influence these stakeholders had.

Steps 3 and 4 were altered significantly and only generally follow the structure described by Olsson et al., (2019).

Step 3 is utilised to understand the stakeholders and their points of view, which is done without communication with the stakeholder (Olsson, et al., 2019).

For this report, Interviews were conducted with the relevant stakeholders, wherein step 3, the results from the interviews, were presented, addressing matters such as interest, and potential the stakeholder saw.

Step 4 is utilised to plan communication with the stakeholders and when or if contact should be made with them, resulting in an overview of what measures need to be taken (Olsson, et al., 2019).

For this report, step 4 was utilised to identify what types of initiatives could be done in collaboration with the stakeholders.

## 3.6 Qualitative interview method with Relevant Stakeholders

The method of qualitative interview is utilised in this report as described in the book *Qualitative Methods*[11] by Brinkmann & Tanggaard, (2020). The method is used in connection with gaining an understanding of the stakeholders and the organisations they represent, the view of waste prevention and what barriers they see. The knowledge gained could not have been gathered through a literature review.
According to Brinkmann & Tanggaard (2020), interviews have become the most common way to gain insight into people's life situation, their opinion, standpoint and their position on reality.
The stakeholders were identified in step 2 of the stakeholder analysis. The stakeholders were separated into two groups before interviewing, based on the two selected waste fractions, see section 5.2.4 Critical waste fraction in Hjørring Municipality.

Emails were sent out to 15 stakeholders between 5-13 April. Of the emails sent, six responded. Interviews were conducted from 14th April to 1st May. Out of the respondents, it was only possible to interview five. Table 3.4 below shows the stakeholders that were interviewed.

| Interviewee | Job title | Length | Date | Interview method |
|---|---|---|---|---|
| Christen Monberg | President of Repair Café Denmark | 75 min | April 14th | Online interview using Microsoft Teams |
| Thomas Thomsen | Chief of Reuse at Nordværk | 67 min | April 18th | Physical interview |

[11] Own translation from – Kvalitative Metoder

| | | | | |
|---|---|---|---|---|
| Anne Mette Drustrup | Head of Department Activities- and Social-offer NBV, Mirabell and Vester Thiup in Hjørring Municipality | 31 min | April 26th | Physical interview |
| Steffen Damgaard | Head of Education for Energy & Construction at EUC Nord | 7 min | April 26th | Phone call interview |
| Dorthe Egede Hansen | Head of Reuse from Kirkens Korshær | 127 min | April 27th | Online interview using Microsoft Teams |

*Table 3.4. Overview of interviewed stakeholders, their job titles, the length of the interview, the date when the interview was conducted and how it was conducted.*

All of the interviews conducted used a semi-structured format. This provided the opportunity to have a conversation and discussion around the prepared questions but also allowed the discussion to deviate from the prepared interview guide if it was deemed necessary.

Semi-structured interviews are not as strict as structured interviews, where the structure cannot deviate from the interview guide (Brinkmann & Tanggaard, 2020). Compared to an unstructured interview, semi-structured provides a more methodical approach (Brinkmann & Tanggaard, 2020). Due to these factors, semi-structured was deemed the best form to utilise when conducting interviews.

According to Brinkmann & Tanggaard, interview guides describe the theoretical and methodological framework for the interview. Interview guides were made individually for each interviewer. However, the question themes were similar, such as circular economy, reuse, repair and waste prevention. The specific questions, however, were different as they were based on stakeholder research undertaken before the interview.

### 3.6.1 Coding of Interviews

After they had been conducted, the interviews were 'translated' and coded based on categories. The term translation is used because spoken and written language are different. Speech can be seen as extreme, where a sentence might stop abruptly and refer to things said earlier in the interview (Brinkmann & Tanggaard, 2020).

Coding was done to categorise the statements that were given during the interview. According to Brinkmann & Tanggaard, this process creates an overview of the main points from the interviews, which can be helpful when comparing and managing them later on.

- Barriers
- Legislation
- Waste prevention
- Behavioural changes
- Solutions
- Valueless

The above list shows the six categories that have been utilised when coding the interviews. The categories were identified based on the purpose of the interviews and the problem being investigated in this report. The colours assigned to the codes were done to give an overview when looking at the transcriptions.

### 3.6.2 Methodological considerations for the use of interviews

This report focuses on municipal waste and represents a case study of Hjørring Municipality. All the interviews have been conducted in Denmark and are therefore in Danish. Danish was chosen as the preferred language to ensure the conversation would go smoothly and lower the chances of miscommunication. Interviewing in Danish had some disadvantages.

When translating technical terms from Danish to English, it can be challenging to ensure accurate use of the terms and avoid any misinterpretations when quoting them. This is because the terms are originally in Danish and may not have direct equivalents in English. However, this has not yet posed a problem in understanding the interviews and the problems.

Some interviews were conducted in person, others online via Microsoft Teams, and one as a phone call.

The physical interviews were conducted in Hjørring since the stakeholders represented a local organisation that had a residence in Hjørring. During some of the physical interviews, a tour was given of the facilities, where notes were taken. Having a tour of the facilities or organisation with an explanation helped further understand the interviewee's lifeworld (Brinkmann & Tanggaard, 2020).

The in person interviews helped with translations since one could see body language and reactions better. Yet, for the online interviews, there were no difficulties with reading the atmosphere of the interview, and it was deemed to be the same as if conducted in person. Compared to online interviews, in person interviews have some disadvantages.

The interview can be transcribed and recorded on video when conducting online interviews through Microsoft Teams. This makes it easier to review the interview and reduces the time needed for transcribing. In contrast, in person interviews only record the conversation, which may result in the loss of important non-verbal cues such as hand gestures and body language.

During the phone interview, it was not possible to interpret the interviewer's body language as only their voice could be heard (Brinkmann & Tanggaard, 2020). This could pose a disadvantage if sarcasm was used, potentially leading to misunderstandings (Brinkmann & Tanggaard, 2020). However, sarcasm seemed not present during the interview, as the questions and answers were straightforward.

The questions were formulated by referring to various sources such as media, research papers, academic articles, reviews, interviews, the organisation's website and satire programs. The objective of researching the stakeholders was to gain insight into their knowledge and understanding of the world (Brinkmann & Tanggaard, 2020).

According to Brinkmann & Tanggaard (2020), many assume that a 'good' interview can be conducted easily without having insight into the interviewee. They assume that one just needs an interviewee, asks them some questions, records it and then uses the results. Interviewing people allows access to those people's lifeworld and the phenomena they experience within it. The lifeworld refers to the world people experience in their daily lives based on their perception and understanding of reality. It is difficult to fully comprehend someone else's lifeworld. However, preparing and trying to understand reality can give a greater insight, which leads to more relevant questions being asked during the interview.

### 3.6.3 Reliability and validity of the conducted interviews

When conducting qualitative research, it is relevant to assess aspects such as reliability and validity (Brinkmann & Tanggaard, 2020). Assessing the reliability and validity of interviews allows for an evaluation of the information and the results that have been obtained. This is relevant for this report since the outcome of its results are based on the stakeholder's answers and knowledge.

In qualitative research, validity refers to whether the study investigates what it aims to (Brinkmann & Tanggaard, 2020). The interviews were chosen based on their impact on the waste fraction, collaboration with Hjørring Municipality, local or international actors, and where the stakeholder could impact the product in the life phase. Only relevant stakeholders where the criteria were met were interviewed.

One of the criteria is related to whether the stakeholder could conduct waste prevention initiatives in line with the definition of waste prevention utilised in this report, see section 4.1.4 What is waste prevention? The goal of the interviews was to gain insight into the stakeholders' values and interests and to gain a better understanding of barriers to possible collaboration. This was obtained through the interviews, and it can therefore be assumed that the validity of the interview process is high.

Reliability is associated with the qualitative research and refers to the assessment of the consistency of the results (Brinkmann & Tanggaard, 2020). The reliability of the interviews is arguable; the interviews were conducted after the new Law No. 898 was added to Danish legislation. This meant that some stakeholders had a greater focus on this than others.

Since the focus of the interviews was to understand stakeholders' values and interests, it can be argued that if no changes occur to the stakeholder's interests, or if nothing dramatic happens regarding waste prevention, the stakeholders values and interests will remain unchanged. Law No. 898 implemented some changes for waste prevention but not significant ones. It is feasible to assume that the reliability of these interviews is high.

## 3.7 Case study of Hjørring Municipality

This report aims to identify waste prevention initiatives that Hjørring Municipality can conduct in collaboration with the stakeholders and to understand the regulatory framework the municipality is working in. Therefore, it is vital to understand and learn from the experience of a municipality and identify what barriers are in place for implementing waste prevention initiatives. Therefore, a case study was the method chosen based on literature from Yin, 2014 and Flyvebjerg, 2010.

Case studies allow us to give an explanation based on empirical observations and explain how and why certain incidences are happening in reality when dealing with social phenomena that are contextual (Yin, 2014; Flyvebjerg, 2010).

This report has been done as a case study of Hjørring Municipality, which was chosen to provide a concrete case. Hjørring Municipality, as noted in the introduction, has already been identified as one of the municipalities in the northern part of Jutland that has implemented waste prevention initiatives (Holm, 2020). Additionally, Hjørring was chosen because collaboration could be done with them concerning the master’s thesis.
Hjørring was identified as a concrete case based on their previous experiences with large household appliances.

Additionally, when conducting this report, Hjørring Municipality was looking into how they could do waste prevention initiatives for textiles. Hjørring Municipality has been repairing large household appliances for several years. However, it is unclear whether other municipalities are doing the same.

When choosing a case, it is also vital to look at whether the conclusions of the study can be generalised. Some argue that results from case studies cannot be generalised. However, based on Flyvbjerg (2010), it can be argued that the results from this case study can be generalised to a certain degree. It may not be possible to generalise results regarding initiatives, however, since funds and stakeholders may differ from municipality.

The legal framework addressed in section 5.1 is the one all Danish municipalities are legally obligated to follow. Additionally, some of the stakeholders that were interviewed were not only local to Hjørring but were national organisations. This means that some of the stakeholders could also be utilised to collaborate with other municipalities. However, it should be noted that every municipality is different and has its own prioritisations and barriers that impact them.

# 4. The theoretical framework for circular strategic 9R framework circular economy

This chapter describes the theoretical framework that is utilised in this report. This section will go over circular economy, the 9R framework and waste prevention. This section addresses the understanding of these concepts concerning this report.

## 4.1 Circular economy – the butterfly model

The circular economy (CE) theory rethinks resource consumption compared to linear economy based on a 'take, make, dispose' system. Avoiding some of the risks related to a linear economy, e.g. increased price, supply chain risks and growing pressure on resources (Ellen MacArthur Foundation, 2015).

Compared to the linear economy, CE is restorative and regenerative, where the product/resources are at their highest utility for as long as possible (Ellen MacArthur Foundation, 2015).

The model for CE, presented by Ellen MacArthur, identifies two resource cycles. The left side is *the biological cycle* and the right is *the technical cycle*. Figure 4.1 below illustrates the butterfly model by Ellen MacArthur.

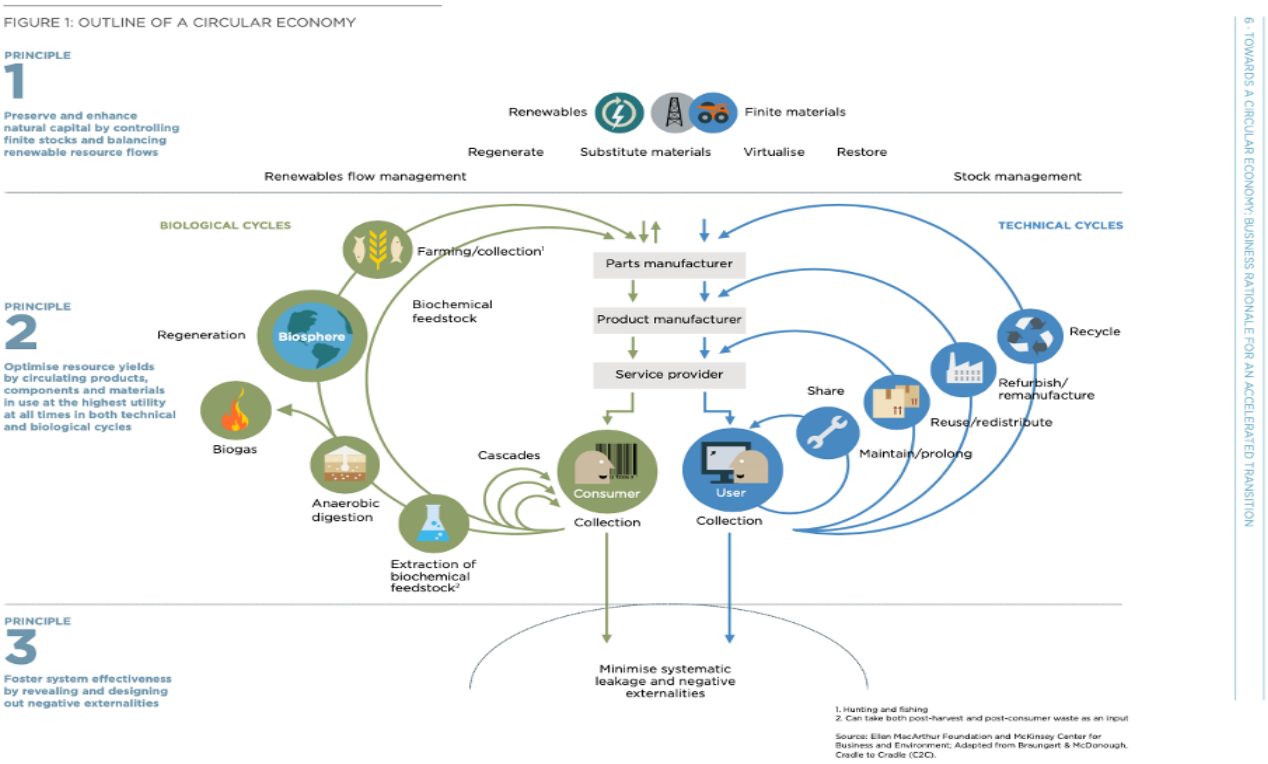


*Figure 4.1 Shows the butterfly model created by the Ellen Mac Arthur Foundation (2015)*

Compared to the linear economy, CE uses loops to the efficiency of the circularity of the resource cycles. To ensure high resource effectiveness, the smaller loops must be utilised rather than the outer ones, e.g. recycling and refurbishing/remanufacturing.

From a European perspective, there has been a focus on implementing the outer loop in the butterfly model, recycling, in the last couple of years. This involved disconnecting the waste management types from a linear economy, where the waste ends up in landfill—implementing legislation that ensures that the EU becomes a recycling society (The European Parliament and The Council, 2018).

Waste prevention is at the top of the waste hierarchy in the EU. Initiatives need to be implemented that e.g. *"(…) through the re-use of products or the extension of the life span of products"* (The European Parliament and The Council, 2008).

Loops share, maintain/ prolong and reuse in the butterfly model that can be utilised to extend the product's lifespan (The European Parliament and The Council, 2008; Corvellec , 2016; Willts, 2012). These initiatives can be used as waste prevention initiatives.

## 4.2 Circular strategies – the 9R framework

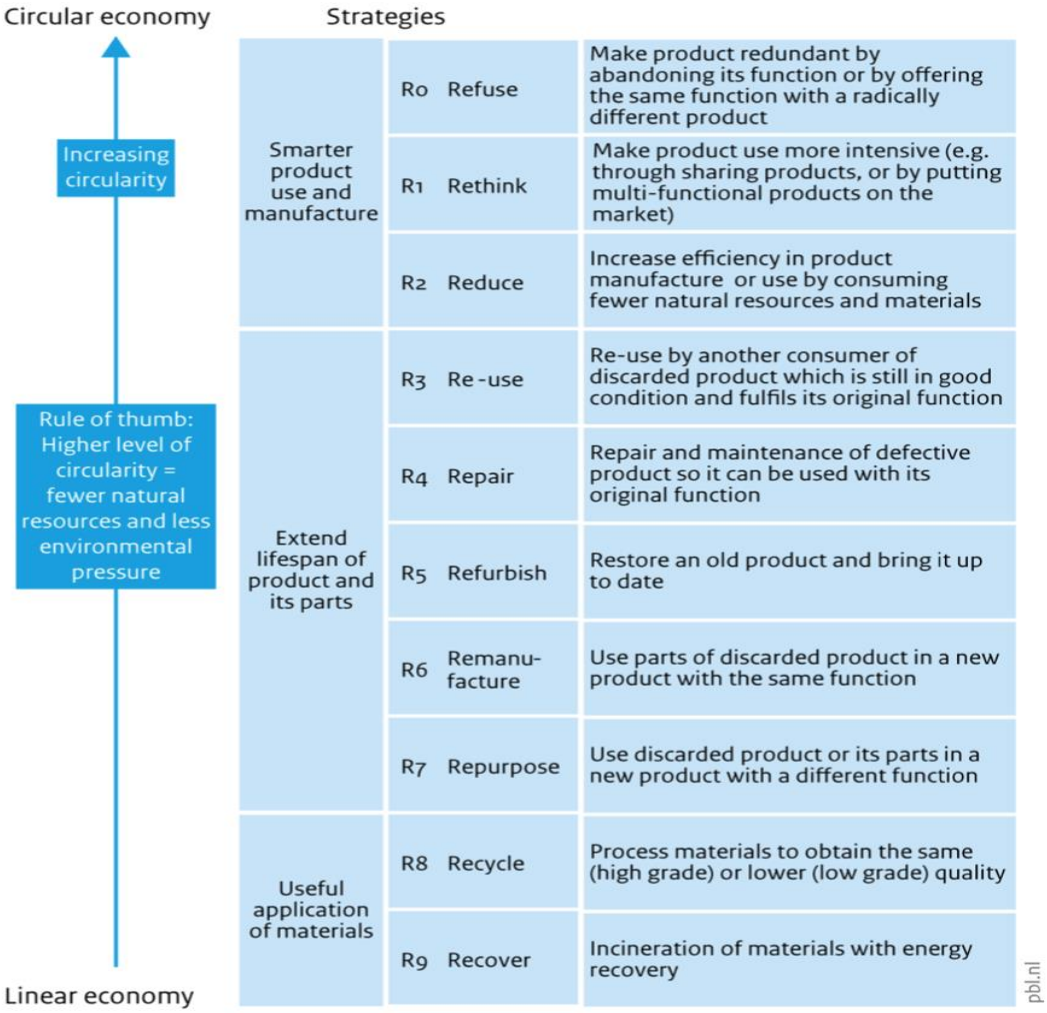


*Figure 4.2 The 9R framework by PBL Netherlands Assessment Agency (2017).*

Figure 4.2 illustrates the 9R framework. The framework shows different circularity strategies ranked based on the highest circularity, low R-number, and low circularity, high R-number ( PBL Netherlands Assessment Agency, 2017).

Compared to the butterfly model (see Figure 4.1 section 4.1.1), the 9R framework includes e.g. R0 refuse and R1 rethink. The strategies focus on decreasing the consumption of natural resources and materials utilised during the production chain by needing fewer products to provide the same function ( PBL Netherlands Assessment Agency, 2017).

R1 is somewhat in the butterfly model through the sharing loop. However, R1 also incorporates other initiatives not illustrated or incorporated into the butterfly model, so it is only somewhat present.

For waste management, the 9R framework can be seen as a tool for implementing circular strategies in the product chain and when wanting to implement the greatest amount of circularity.

Figure 4.3 below shows how the strategies in the 9R framework can be utilised throughout the product chain and at what stage in the product lifespan it should be used.

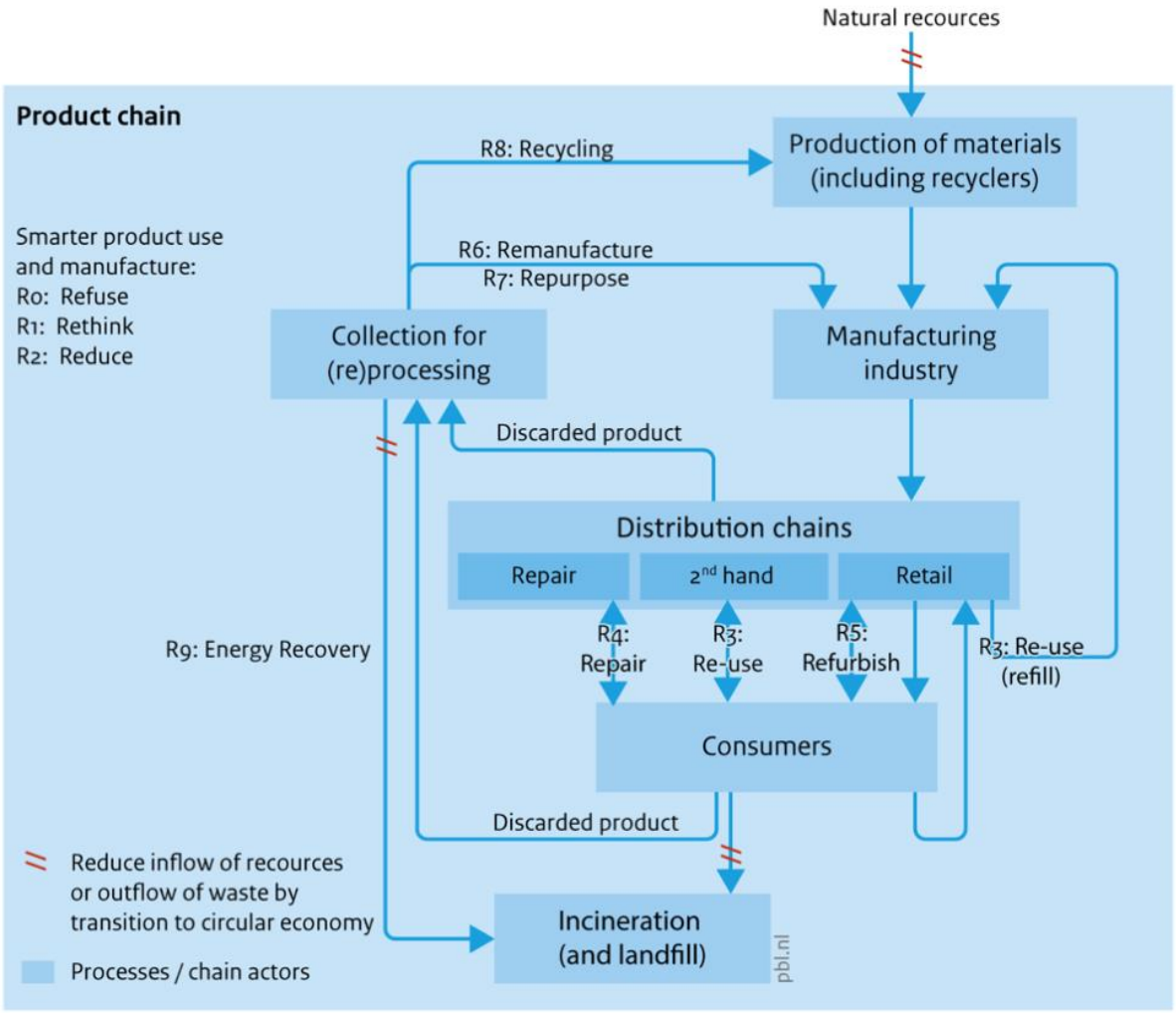


*Figure 4.3 shows where the R-list could be implemented in the product chain by PBL Netherlands Assessment Agency (2017).*

Strategies R0, R1 and R2 cannot be seen in the product chain, because the strategies depend on the decision-making done during the product's design phase, the business strategies used and other mechanisms that are harder to illustrate in this Figure.

Strategies from R3 to R9 can be seen in the Figure.

Strategies R3 to R5 are, in most instances, the distribution of goods between the consumer and the distribution chains. They occur before the product has been discarded.

Strategies R6 and R7 occur after a product or material has been discarded and returned to the manufacturer.

Strategies R8 and R9 occur after a product or material has been discarded and is either sent to the start of the product chain, production of materials or used for energy recovery.

The 9R framework extends to strategies that can be utilised in waste management. The placement of the strategies based on circularity aligns with the waste hierarchy from the EU, where the R9 framework adds more nuance to the hierarchy.

## 4.3 What is waste prevention?

This section outlines the definition of waste prevention that will be utilised in this report to gain an understanding of waste prevention and what it entails. Different definitions on regulatory and academic levels have been analysed. This was done to understand the complexity of waste prevention and what it is considered to be.

According to the European legislation definition of waste prevention, it can only occur before a product or material becomes waste.

Waste, according to European legislation, means: " *(…) any substance or object which the holder discards or intends or is required to discard"* (The European Parliament and The Council, 2008)—using the EU definition of waste. Suppose the waste producer intends to discard a product or material. It automatically becomes waste, which means that the waste holder's intentions determine whether something can be considered waste.

Products or materials intended to be discarded but sent to reuse may get a second use phase; it is only seen as preparing for reuse, not waste prevention.

Waste prevention, according to EU legislation, is *"(…) measures taken before a substance, material or product has become waste, that reduce:*"

1. *"the quantity of waste, including through the re-use of products or the extension of the life span of products;"*
2. *"the adverse impacts of the generated waste on the environment and human health; or"*
3. *"the content of harmful substances in materials and products;"* (The European Parliament and The Council, 2008)

When looking at the initiatives that can be utilised to implement waste prevention, it is clear they are intended for different phases of the life cycle.

Figure 4.4 below illustrates where the EU legislative initiatives for waste prevention are implemented in the product's life cycle.

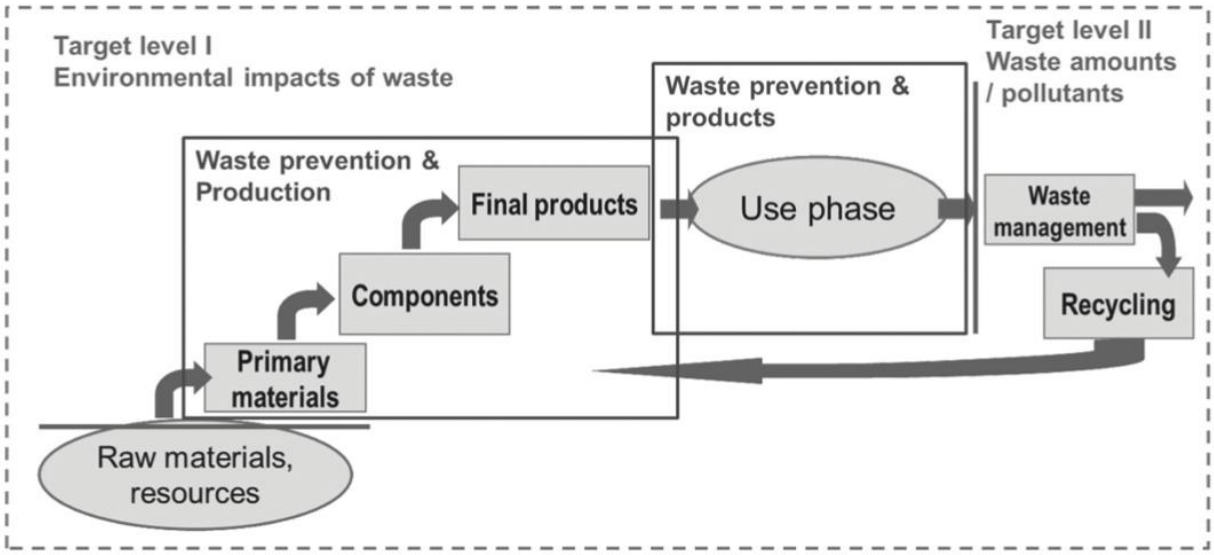


*Figure 4.4 The product life cycle for waste prevention initiatives based on the European definition of waste prevention. Figure by (Willts, 2012)*

Figure 4.4 illustrates where waste prevention can happen according to the EU definition - in the primary materials, components, final products and use phase.

Points 2 and 3 of initiatives are placed in the first box – waste prevention & production. Points 2 and 3 are more in line with the pollution prevention principle, eliminate toxic or hazardous materials from the production or in the product, which is implemented during the design phase (Thrane & Remmen , 2007).

Point 1 of initiatives is placed in the second box – Waste prevention & products. Point 1 is the design and use phase. It is placed in the design phase since lifespan extension can be related to designing products and to repairing and ensuring spare parts are available (Bocken , et al., 2016). It is placed in the use phase since repairing and using the spare parts must be done in the use phase.

The EU definition of waste prevention distinguishes between reuse as objects or waste, preparing for reuse, and as non-waste, reuse (Johansson & Corvellec, 2018).

The EU definition of reuse is unclear as it does not account for whether a product, such as a t-shirt, is sold directly (non-waste) or disposed of at a recycling station with the intent of reuse (waste).

For the product to be put back on the market for potential new ownership or a second use phase, it may need to be transported, cleaned, or repaired (Johansson & Corvellec, 2018).

According to both Johansson & and Corvellec, the current definition of waste prevention from the EU is lacking and can only be used from a legal perspective, not when addressing waste prevention in practise (Corvellec , 2016; Johansson & Corvellec, 2018).

The European definition of waste prevention's lack of nuances allows actors to implement waste prevention initiatives in many forms. However, some initiatives may be misplaced in the waste hierarchy since the initiatives have changed and become more nuanced and cannot fit the current definition.

Waste prevention initiatives have, over the last couple of years, changed, taking many different shapes and forms (Corvellec , 2016; Johansson & Corvellec, 2018).

In a study from 2016 on waste prevention iniquities in Sweden, only 1/3 were in line with the definition of *"the content of harmful substances in materials and products"* (The European Parliament and The Council, 2008)— some products were included, like food, which should not contain harmful substances (Corvellec , 2016).

Initiatives ranged from business models, information campaigns, 'training' in sustainable consumption and measuring waste (Corvellec , 2016; Johansson & Corvellec, 2018). According to Corvellec (2016), many different definitions are being utilised when implementing waste prevention in practice, which may differ from the EU definition.

Table 4.1 A three-dimensional definition of waste prevention in practice.

| Core activity | Type of initiative | Definition of waste prevention | Relationship to institutional order |
|---|---|---|---|
| Raising awareness | • Campaign<br>• Competitions<br>• Exhibitions | • Cognitive matter: acquiring knowledge | • Critical of current waste management<br>• In line with the priority given to waste prevention in the European waste hierarchy model |
| Improving efficacy | • Process improvements | • Technical matter: developing skills | • Supportive of conventional views on production and distribution |
| Promoting sustainable consumption | • Develop second-hand market place<br>• Promote repair<br>• Reduce consumption | • Economic matter: competing with conventional trade<br>• Political matter: conducting a radical anti-consumption policy | • Critical of conventional views on distribution and consumption<br>• Critical of conventional views on production, distribution, and consumption |

*Table 4.1 shows a three-dimensional definition of waste prevention over core activities, type of initiatives, the definition of waste prevention and relationship to instructional order—table from Corvellec (2016).*

Waste prevention initiatives should occur throughout the product's whole life cycle, e.g. smart product, as illustrated in the R9 framework, to ensure that end-of-life initiatives are not the only ones utilised (Willts, 2012; European Environment Agency a., 2020; Johansson & Corvellec, 2018; Corvellec , 2016). Initiatives that raise awareness, improve efficacy and promote sustainable consumption are still vital in implementing waste prevention, table 4.1 (Corvellec , 2016).

Based on the previous discussion on circular economy, the 9R framework and the EU definition of waste, the definition that will be utilised in this report is the same as the EU definition. However, due to the lack of nuance in the definition and not considering the intent of the waste producer, if a product is not intended for waste, e.g. sent to reuse through charity organisations or at recycling stations, it is not yet waste. Suppose the waste producer has discarded a product and doesn't send it to reuse, but another stakeholder does not see it as waste and repairs it. In that case, it is seen as preparing for reuse since the waste is deemed unsuitable for repair.

# 5. Analysis

## 5.1 Legislation framework for the handling of municipal waste from a Danish perspective

In this section, the legislation that impacts municipal waste from a Danish perspective will be presented. This is to understand the hierarchy between different legislation and how they affect one another. To understand how they impact one another, document analysis has been utilised. Action plans from both the EU and Denmark have been investigated to understand the underlying processes behind the decision-making, both on an EU and Danish level. Figure 5.1 shows how EU legislation impacts Danish legislation.


*Figure 5.1 How the legislation and strategies impact one another from a municipal waste perspective. It can be seen how EU legislation and plans impact Danish legislation and plans and what Danish legislation impacts the municipality.*

Figure 5.1 illustrates the regulatory hierarchy, the timeframe for when the legislation was implemented and how the legislation and plans impact one another. If legislation or an action plan are deemed to have impacted something else, it is indicated with an arrow from one to another. As illustrated in the Figure, the EU is at the top of the hierarchy since it sets the regulatory framework that Denmark needs to uphold. The Danish Government can decide to implement more legislation if it does not contradict EU legislation.

### 5.1.1 EU legislation

The EU legislation regarding municipal waste can be found in Directive 2008/98/EC on waste and repealing certain Directives and the amending of Directive 2008/98/EC on waste released in 2018. The amending of directive 2008/98/EC on waste introduced CE into the legislation (The European Parliament and The Council, 2018).
The waste hierarchy was introduced in the directive 2008/98/EC on waste to help move the EU in the direction of becoming a recycling society and reduce the amount of landfill in favour of incineration " (…) *of such recyclates whenever possible."* (The European Parliament and The Council, 2008).

Waste prevention plans and programs are introduced as a part of the member state's responsibility. This document needs to be sent to the EU.

For municipal waste, establishing an integrated and adequate network for waste disposal for the recovery of mixed municipal was the member state's responsibility (The European Parliament and The Council, 2008).

The amending of the directive in 2018 noted that the member states could give responsibilities to the municipalities or private actors, allowing them to be responsible for waste management systems and collecting municipal waste for systems where such services are contracted out (The European Parliament and The Council, 2018). Even with other actors being responsible for the waste management of municipal waste, it remains the member states' responsibility to ensure that it lives up to EU legislation (The European Parliament and The Council, 2018).

In 2011, targets and calculation methods for waste reduction were set for municipal waste and construction and demolishing waste, based on the directive 2008/98/EC on waste (The European Parliament and The Council a., 2011).

The new targets were revised with the introduction of the Circular Economy Action Plan (European Commission, 2015). It is stated that there is a need for a legislative proposal on waste that includes targets to reduce landfill and increase preparing for reuse and recycling for the key waste streams, e.g. municipal waste (European Commission, 2015).

EU legislation doesn't set any legislation that directly impacts the municipalities. However, they implement legislation that can indirectly impact them, depending on who is responsible for municipal waste in the member state. The legislation is still on a general level. The individual member states are still obligated to implement legislation to ensure they can uphold the ruling set on an EU level. Therefore, the next section will review legislation for Denmark as a member state and the country Hjørring Municipality is located in.

### 5.1.2 Denmark - legislation

Danish legislation regarding municipal waste can be found in the Environmental Protection Act [12], the Act regarding waste [13], the Act regarding waste regulation, charge and actors etc. [14] and Law no. 898, which have been incorporated into the Environmental Protection Act. These laws and acts will be referred to when addressing Danish legislation for municipal waste.

Act regarding waste [15] set the legislation directly, impacting the municipalities regarding municipal waste.

Municipal plans for handling waste must be drawn up and passed every 12 years and reviewed a minimum of every six years. The plans must contain the following:

a. A mapping part describing the status of the waste area in the municipality.
b. An objective part describing the municipality's overall objectives for the waste area.
c. A planning part focuses on planning for the first six years of the planning period.

Waste fractions must be managed according to the waste hierarchy, preparing for reuse, recycling, material recovery and disposal (The Danish Ministry of Environment, 2021).

The municipal council determines whether a material or an object is waste. The municipal council decides whether waste should be categorised as:

a. Hazardous
b. Packaging
c. Incineration qualified
d. Deposit qualified
e. Waste qualified for material recovery

The municipal council determines whether waste can still be seen as waste after it has gone through a recycling process or other utilisation operation using the following criteria:

a. Can/will the material or object be utilised for a specific purpose?
b. Does a market or demand exist for the material or the object?
c. Does the material or object meet a technical requirement based on the specific purpose or live up to current regulations or norms for a set product?
d. Will using the material or object negatively influence the environment or human health?

For the collection type 'bulky waste', the municipality must ensure that waste sent to bulky waste is sent to the treatment type preparing for reuse or that it has a high reel recycling (The Danish Ministry of Environment, 2021). Bulky waste is where citizens can send larger types of waste, such as domestic appliances, furniture or a large amount of one waste fraction, e.g. textiles (The Danish Ministry of Environment, 2021).

The Act regarding waste regulation, charge, and actors etc. [16], addresses agreements for waste, charges for waste, specifications concerning waste, reporting of waste and benchmarking of waste treatment facilities (Danish Ministry of Climate, Energy and Utilities a., 2022).

[12] Own translation from - Bekendtgørelse af lov om miljøbeskyttelse

[13] Own translation from - Bekendtgørelse om affald

[14] Own translation from - Bekendtgørelse om affaldsregulativer, gebyrer og aktører m.v.

[15] Own translation from - Bekendtgørelse om affald

[16] Own translation from - Bekendtgørelse om affaldsregulativer, gebyrer og aktører m.v.

The municipal council is responsible for implementing regulations for the municipal waste and companies' agreements, determining the collection and instruction –agreements that will be utilised in the municipality and determining direction regarding the collection agreement extent and planning, etc. Furthermore, in the event that regulations have been set for household waste and proven effective, citizens and property owners must utilise the agreement prescribed (Danish Ministry of Climate, Energy and Utilities a., 2022).

Law No. 898 was incorporated into the Environmental Protection Act. The new legislation was based on the requirement from the EU for the member states to produce waste prevention plans and programs. Law No. 898 is part of one of the initiatives stated in the Danish waste prevention plan (The Danish Environmental Protection Agency, 2021).

Following Law No. 898, municipalities are prohibited from managing waste management companies. They can, however, own them or have co-ownership.

Waste treatment for recycled materials has been privatised. Waste management companies are no longer allowed to do certain functions but must incorporate a company.

Additionally, having an established reuse area at the recycling station has become mandatory.

Materials or products hand-in at the recycling station must also first be available to private companies or charity organisations before being sold at the waste management companies' own second-hand store.

Danish legislation sets legislation that directly impacts municipalities in terms of the legal frameworks the municipalities need to implement in practice for municipal waste. Waste sorting must correspond to the waste hierarchy, waste streams, waste collection fees, etc.

The following section will review how the municipalities implement the legislation in practice, looking at fees and budgeting.

### 5.1.3 Municipalities' work with municipal waste in Denmark

The previous section has provided an overview of Danish legislation that impacts the municipalities concerning municipal waste, waste sorting in relation to the waste hierarchy, waste streams, waste collection fees etc. The legislation described in the previous section can be seen as the sector requirement for municipal waste.

Sector requirements are the requirements set for the particular task area that the municipality must uphold (Heeager & Olesen, 2018). The sector requirements will always be noted in the current legislation for the sector (Heeager & Olesen, 2018).

Waste prevention is not a part of the sector requirements the municipalities must uphold. They are, however, obligated to maintain other parts of the waste hierarchy.

Danish legislation states that municipalities must manage municipal waste according to the waste hierarchy, preparing for reuse, recycling, material recovery and disposal (The Danish Ministry of Environment, 2021). However, this does not mean that the municipalities can't work with implementing waste prevention initiatives.

Municipalities are given 'municipal authorisation' [17] to ensure a degree of freedom and independent decision-making, creating opportunities to implement initiatives that are not part of

[17] Own translation from – kommunalfuldmagten

the sector requirements set in the legislation (Heeager & Olesen, 2018). Furthermore, the municipality can assign themselves assignments they feel should be solved by municipalities.

Self-assigned tasks cannot be paid for with budget money (Heeager & Olesen, 2018).

Users pay for waste expenses through fees. Municipalities collect fees for waste collection to cover the costs of planning, establishing, operating and administering waste management or waste treatment types at recycling stations (The Danish Ministry of Environment, 2023). The user fee is a part of the council tax.

User fees are determined by budgeting and are only allowed to cover the expenses related to the tasks the municipalities are obligated to perform (Heeager & Olesen, 2018). The municipalities are not allowed to make a profit and should be based on a non-profit principle (Heeager & Olesen, 2018). Since waste prevention is not a part of the sector requirements budget money cannot be used.

Financing waste prevention incentives could be done using a block grant. The block grant is a sum of money allocated to Danish municipalities and regions. Block grants are usually designated for specific purposes, currently no block grant money will be given to municipalities for waste prevention initiatives. It is assumed that the municipality won't be granted any in the near future.

If municipalities want to finance waste prevention initiatives, they instead need to use funds they have available and can use freely. This could be money from the municipal tax. However, this can have some negative impacts.

By implementing waste preventive initiatives, money could be taken from other sectors that require it. Where the money is utilised is based on the political agenda in the municipal council and whether they want to prioritise waste prevention.

Municipalities have the power to prevent waste by municipal authorisation. However, it is up to the municipality to decide how to prioritise its funds for this purpose. As a result, it is unclear whether any resources will be allocated towards waste prevention or how much will be dedicated to it.

The following analysis will go over the chosen case study, Hjørring Municipality, and will address their waste prevention plan, how they currently work with municipal waste and what initiatives they have implemented.

## 5.2 Hjørring Municipality as a case study on waste prevention by a municipality

### 5.2.1 Hjørring Municipality as a case study

Hjørring Municipality is located in Northern Jutland. In the last couple of years, the municipality has been known for their environmental work, implementation of waste prevention initiatives, workshops with citizens in reducing food waste, etc. (Holm, 2020; AVV b., n.d.; Zacho, et al., 2018). Some initiatives have been done through the municipal-owned waste management company Affaldsselskabet Vendsyssel Vest I/S (AVV).

AVV was founded in 1988 and began working with reuse in its own municipal second-hand store (Nordværk c., n.d.; Guldmann, 2015). From 2012 AVV was co-owned by Hjørring and Brønderslev municipality (Affaldsselskabet Vendsyssel Vest I/S , 2012).

AVV aimed to prioritise the environment with CE and collaboration, using reuse and repair to extend the lifespan of products (Guldmann, 2015). AVV has, over the years, established repair workshops for products such as large household appliances, furniture, and leather (Guldmann, 2015). In addition to benefiting the environment, these initiatives have also provided job opportunities for citizens with special needs in the local community.

Repairing and reselling of large household appliances started in 2018 for AVV. Nordisk Ministerråd has contributed 500,000 kr. to assist with the testing, repairing, and reselling of the products (AVV a., n.d.). After conducting tests, it was discovered that approximately 1,300 large household appliances could be repaired and cleaned each year (AVV a., n.d.).

On 1 January 2022, it was merged with I/S Reno-Nord. On 1 October 2022, the new waste management company was named Nordværk (Nordværk b., n.d.). With the merger, Nordværk became owned by six of the municipalities north of Jutland; Hjørring, Brønderslev, Jammerbugt, Mariagerfjord, Rebild and Aalborg (Dansk Affaldsforening b., n.d.).

After going over the work that is done through the waste management company Nordværk, which is owned by, e.g. Hjørring Municipality, the next section will review Hjørring's plans for waste prevention initiatives.

### 5.2.2 Hjørring Municipality's waste prevention plan

Hjørring Municipality's waste prevention plan, From Waste to Circular Economy[18], was published in December 2022 (Hjørring Municipality a. , 2022). The two central initiatives are waste minimisation and improved recycling. The focus is on preventing products and materials from becoming waste in the first place and ensuring that waste collection effectively increases the number of recycled materials. These objectives are aligned with the goals of the Danish Waste Prevention Action Plan.

Based on the national action plan, and local plans and strategies for climate and energy, Hjørring Municipality formulated several objectives.
Hjørring Municipality has set 20 objectives under five different categories: *'Circular economy – waste minimisation'*, *'Circular economy – increased reuse and recycling'*, *'Arrangements for household waste'*, *'Industrial waste'* and *'Plant'*.

[18] Own translation from – Fra Affald til Cirkulær Økonomi

This report focuses on municipal waste and will not access the categories: *Industrial waste* and *Plant.* These categories and objectives are outside of this report's scope. Therefore, only the categories *Circular economy – waste minimisation*, *Circular economy – increased reuse and recycling* and *Arrangements for household waste* will be investigated.

Table 5.1 below illustrates the objectives under the different categories. Some of the objectives stem from Hjørring Municipality's Climate Action Plan. This is noted in the objective.

| Circular economy – waste minimisation | Circular economy – increased reuse and recycling | Recycling and Arrangements for household waste |
|---|---|---|
| Support and initiate the development of technologies and solutions in collaboration with Nordværk. Ensure products are kept in the use phase for as long as possible. | Ensure the full potential of the waste is utilised. | Hold resource/climate fair with actors from every stage in the lifecycle.<br>Ensure the fractions are as clean as possible and are correctly sorted. |
| Ensure that the recycled materials are used for something sensible of value (Hjørring Municipality c., 2022). | Create awareness regarding product groups that are difficult to recycle through knowledge sharing and dialogue. | For households with their own containers, it's possible to package textile waste in a bag and place it at the top of the container. Additionally, textile waste can be dropped off at a recycling depot. For collaborative efforts, we will provide a container exclusively for textile waste. |
| Build skills among citizens, companies and value chains, preferably in collaboration with Aalborg University, industry organisations or other stakeholders (Hjørring Municipality c., 2022). | Hjørring Municipality is working towards making North Jutland the hub for circular economies by implementing circular loops for as many waste fractions as possible. | |
| Get involved in project development to secure financial resources for researching and testing new products, technology development, collaborations, and other initiatives that can promote circular business models and value chains (Hjørring Municipality c., 2022). | Collaborate with companies to establish new business models and partnerships that can decrease commercial waste. We offer sustainability screenings and support throughout the development process to help achieve sustainability goals and minimize environmental impact. | |
| | Together with the municipalities in North Jutland, we aim to explore opportunities for local companies to efficiently process and recycle the waste fractions collected. | |
| | Municipal institutions are required to sort waste into a minimum of 10 fractions. To ensure compliance, it is necessary to review current methods, establish guidelines, and implement effective sorting systems (Hjørring Municipality c., 2022). | |

| | | |
|---|---|---|
| | Organise a resource/climate fair with actors from the entire value chain with the aim of creating a showcase for how products and resources will be kept in the "loop" and what we sort for recycling (private and business) can become. The fair must also convey what circular business models and value chains entail (Hjørring Municipality c., 2022). | |

*Table 5.1 The three categories related to waste prevention and municipal waste and the objectives under the categories—own table.*

To reach the objectives set, Hjørring Municipality plans to utilise different tools, e.g. the 9R framework, improve waste sorting and collaboration with charity organisations for textile waste, fuse RenoNord and AVV into Nordværk, and operate municipal recycling stations in implementing CE indicatives (Hjørring Municipality a. , 2022).

Hjørring Municipality will use the 9R framework to implement initiatives in the product's use phase, e.g. repairing the products (Hjørring Municipality a. , 2022).

The following section will delve into the topic of household waste in Hjørring Municipality, including household types and the waste fractions collected.

### 5.2.3 Household Waste in Hjørring Municipality

This section will utilise data from Hjørring Municipality's Action Plan for Waste 2022 - 2028 – Survey report from 2022, when addressing waste fractions, household types and rates (Hjørring Municipality b., 2022).

Hjørring Municipality experienced a decrease in population between 2014 and 2021, see Table 5.2, below.

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|---|
| **Household** | 30,527 | 30,735 | 30,869 | 30,979 | 30,955 | 30,876 | 30,869 | 31,059 |
| **Population** | 65,329 | 65,359 | 65,303 | 65,298 | 64,899 | 64,610 | 64,213 | 63,861 |

*Table 5.2 Changes from 2014 to 2021 for households and population in Hjørring Municipality. Own Figure based on table 3.1 from Hjørring Municipality b., (2022)*

The number of households increased from 30,527 in 2014 to 31,059 in 2019, while the population decreased from 65,329 to 63,861 in the same period.

Municipal waste from permanent residence households can be collected—however, the collection type differs depending on the household type.

Apartment buildings tend to utilise dug-down waste containers - joint solutions.

Single-family or terraced houses tend to use their own containers.

Summer cottages can also be changed to permanent residences. These will be considered a part of municipal waste since they are now used for household purposes.

In Hjørring Municipality, the number of permanent residents per household type can be seen under each category in Table 5.3 below.

| | 2014 | 2019 | Changes from 2014 to 2019 |
|---|---|---|---|
| **Number of households** | 33,854 | 34,426 | 1.7% |
| **Number of inhabitants** | 30,527 | 30,876 | 1.1% |
| **Apartment buildings** | 6,018 | 6,354 | 5.6% |
| **Single-family and terraced houses** | 23,955 | 23,980 | 0.1% |
| **Summer cottages** | 6,367 | 6,611 | 2.2% |
| **Permanent residence summer cottages** | 257 | 313 | 21.8% |

*Table 5.3 Number of households in Hjørring Municipality, the changes from 2014 to 2019, and the housing category. Own table based on data table 3.2 from Hjørring Municipality b., (2022)*

Hjørring Municipality has a majority of single-family and terraced houses, followed by apartment buildings and summer cottages.

As of 2019, the population in Hjørring Municipality was 30,876, while the number of buildings was 34,426. Out of these, 3,550 buildings are currently uninhabited.

Figure 5.2 above shows the percentage of inhabited buildings, single-family and terraced houses, apartment buildings and permanent residence summer cottages.

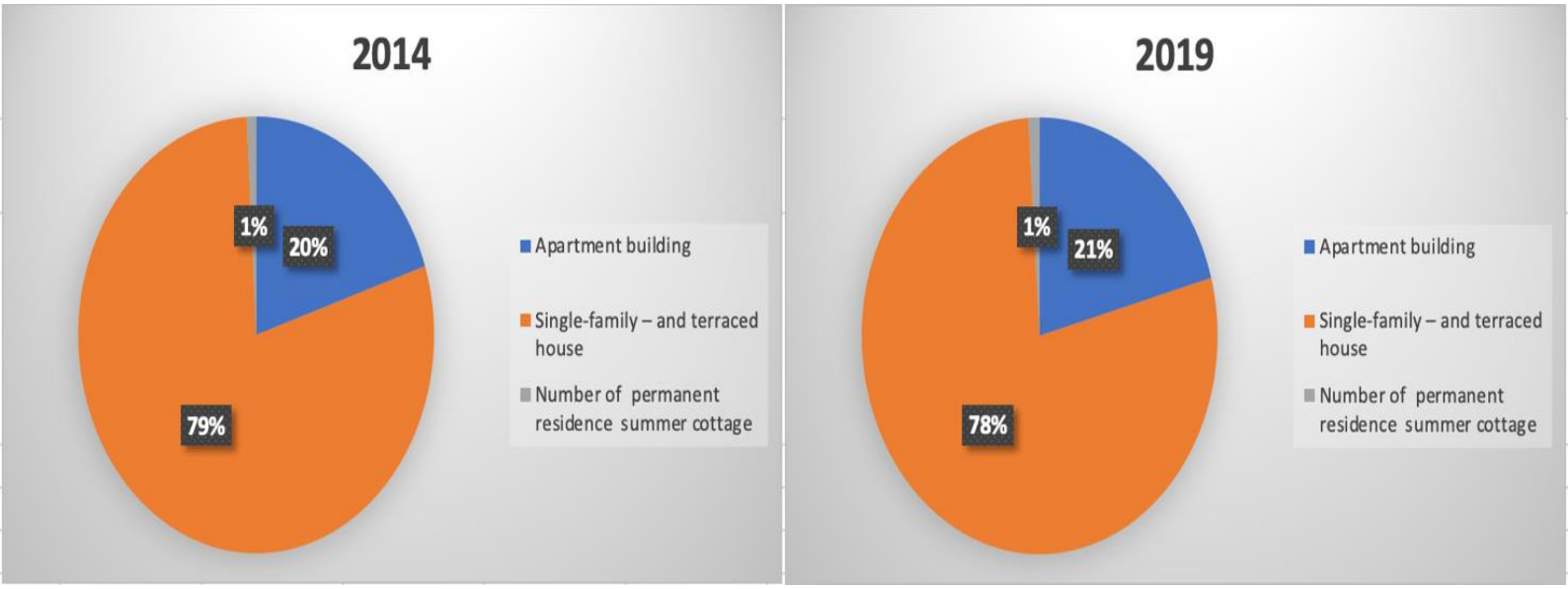


*Figure 5.2 - illustrate the percentwise division for permanent recent house types, single-family – and terraced house, apartment building and permanent recent summer cottages. Own figure based on data from table 3.2 Hjørring Municipality b., (2022)*

Single-family and terraced houses accounted for 78% of the permanent resident households in Hjørring Municipality in 2019. Single-family and terraced houses decreased by 1% from 2014 to 2019.

Apartment buildings accounted for 21% of permanent households in Hjørring Municipality in 2019. This increased by 1% from 2014 to 2019.

Permanent residence summer cottages accounted for 1% of permanent households in Hjørring Municipality in 2019. There were no major changes from 2014 to 2019.

In 2019, Hjørring Municipality utilised three different types of agreements for the management of the collection of household waste: collection, bring and various.

Collection refers to an arrangement whereby the municipality collects waste from the citizens. This also includes bulky waste collection.
Bringing refers to when the citizens utilised a municipal recycling station.
Various refers to a collection stemming from the 'bobble arrangement' or collection arrangements at the pharmacies, e.g. for hypodermic needles.

Table 5.4, below, shows the arrangement of household waste and the waste fractions collected in 2019.

| **Waste arrangements for households** | **Waste fractions** | **2019 [ton]** |
|---|---|---|
| **Collection arrangement** | Residual waste | 9,052 |
| | Food waste | 4,282 |
| | Paper waste | 1,993 |
| | Hazardous waste | 22 |
| | Plastic and metal waste | 874 |
| | Bulky waste collection | 78 |
| **The total amount of collected waste** | | 16,301 |
| **Bringing arrangement** | Reuse products | 1,616 |
| | Clean soil | 2,974 |
| | Garden waste | 9,461 |
| | Bulky recyclable waste | 14,435 |
| | WEEE and cables | 929 |
| | Special treatment | 792 |
| | Remains from the sorting and pressure impregnated wood | 7,875 |
| | Waste deposit | 2,472 |
| **The total amount of waste brought to municipal recycling depot** | | 40,554 |
| **Various** | Glass and bottles (bobble arrangement) | 1,361 |
| | Clothing (bobble arrangement) | 6 |

| | | |
|---|---|---|
| | Residual waste (housing association, pharmacies) | 688 |
| **The total amount of various waste** | | 2,055 |
| **Total amount of waste** | | 58,911 |

*Table 5.4 Amount of waste from households in Hjørring Municipality in 2019, sorted by collection type and waste fractions. Own table based on table 3.3 from Hjørring Municipality b., (2022)*

Most waste was collected using the bringing arrangements, where the municipal recycling depot was utilised. In 2019 40,554 tons were collected using municipal recycling depots, where most of the waste was under the waste fraction bulky recyclable waste, at 14,435 tons in 2019.

For collection arrangement, residual waste is the biggest fraction, at 9,052 tons in 2019. For various, residual waste is the biggest waste fraction, at 688 tons in 2019.

Figur 5.3, below, illustrates the percentage of waste fractions for each collection arrangement for household waste in Hjørring Municipality for 2019.

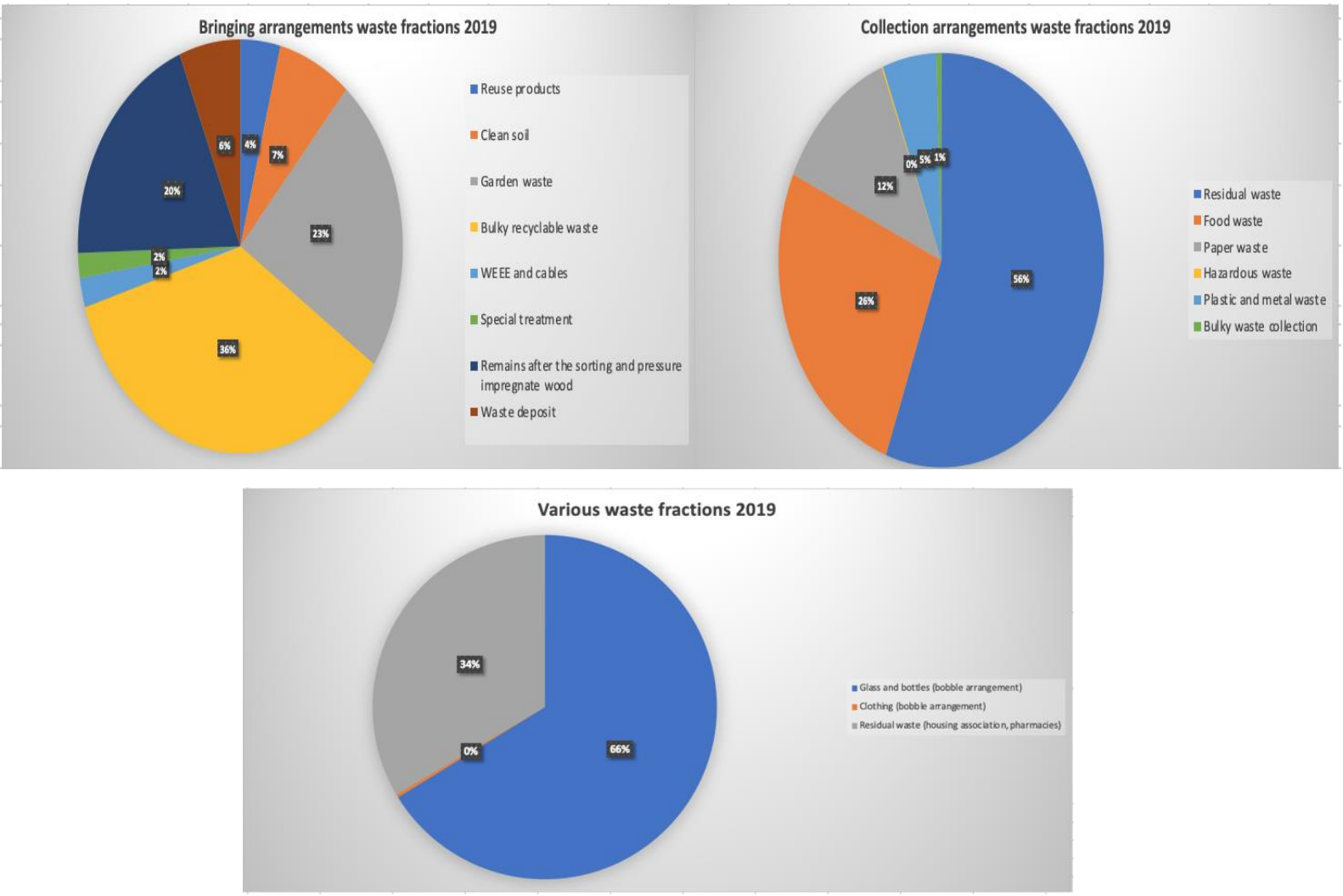


*Figure 5.3 Percent share of the waste fraction for the collection arrangements, collection, bringing and various for Hjørring Municipality in 2019. Own table based on table 3.3 from Hjørring Municipality b., (2022).*

For bringing arrangements, bulky recyclable waste contributes to 36% of the total amount - the largest waste fraction for bringing. Garden waste is the second biggest at 23%, with the third being remains from sorting and pressure-impregnating wood, at 20%. It is unknown what products and materials waste fractions bulky recyclable waste and reuse products comprise. It's assumed that reuse products stem from waste fractions like large household appliances, furniture, clothing, etc., sold in Nordværk's second-hand store. For bulky recyclable waste, it is assumed that it contains waste fractions that have been mentioned previously as well as plaster, PVC, tyres, iron and metal, etc. *(The Danish Environmental Protection Agency, 2022)*.

Special treatment and WEEE (Waste from Electrical and Electronic Equipment) and cables are the waste fractions with the lowest share for the brought arrangement. Both have a 2% share. For WEEE and cables, it is unknown how much has been sent to reuse, since AVV, Nordværk has been repairing large household appliances and sending them to reuse (Hjørring Municipality a. , 2022).

For collected arrangements, residual waste has the most significant share, contributing to 56% of the total collected. Food waste has the second highest percentage, contributing 26%. Hazardous waste has the lowest contribution, under one per cent. For various, glass and bottles have the most significant share. The contributed 66% of the total amount. Residual waste has the second highest percentage, contributing 34%. Clothing has the lowest contribution, under one per cent.

The waste fraction residual waste from the collected arrangement for the household waste was analysed in 2021 in Hjørring Municipality to ascertain whether there were other waste fractions in the waste intended for residual waste. Other waste fractions were present in residual waste that should not be present (Hjørring Municipality b., 2022).

Figure 5.4, below, shows the waste fractions percentages from the analysis of residual waste from single-family houses in Hjørring Municipality for 2021.

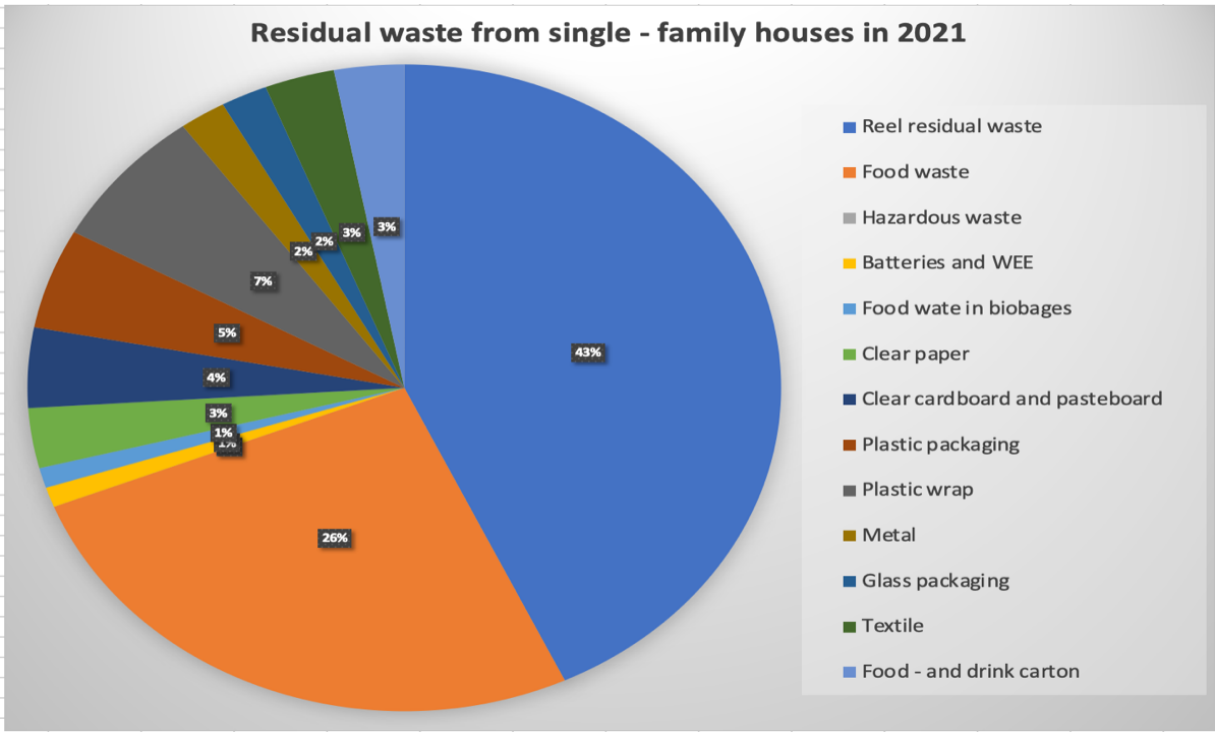


*Figure 5.4, Shows the waste fraction in per cent from waste fraction per cent in residual waste from single-family houses in Hjørring municipality. The analysis of the waste fraction was done in 2021. Own table based on data from Hjørring Municipality b., (2022).*

Food waste constitutes 26% of the waste found in residual waste. Waste types present in residual waste, even though they should not be present, e.g. hazardous waste, batteries, WEEE and glass packaging (Hjørring Municipality b., 2022).

Having now examined Hjørring Municipality's waste plan, waste collection and waste fractions, the next section will determine which waste factions will be selected throughout the rest of the report.

### 5.2.4 Critical waste fractions in Hjørring Municipality

This section describes the process utilised to identify the critical waste fractions in Hjørring Municipality.

It was desired to look at two radically different waste fractions from Hjørring Municipality to help identify similarities and sectoral barriers. This was chosen based on the maximum variation case strategy. The strategy type is based on choosing two or more cases with significantly different circumstances, in which an understanding of a specific topic is gained, where various angles are considered (Flyvebjerg, 2010).

First, the waste fractions in Denmark were examined (The Danish Environmental Protection Agency, 2022). Then, the waste fractions in Hjørring Municipality were analysed. After looking into the waste fractions, a meeting was set up with Hjørring Municipality.

During a meeting with Hjørring Municipality, it was discovered that they were actively pursuing waste prevention initiatives for textiles and planning to meet with local second-hand stores to collaborate on waste prevention. Since they were already working on textile initiatives, it was deemed a critical waste fraction for the report.

In addition, WEEE was also identified as a potential candidate due to Nordværk's repair of large household appliances, which may be impacted by Law no. 898.

The report will focus on these two waste fractions and will include stakeholder analyses and proposed initiatives for collaboration with Hjørring Municipality.

## 5.3 Textile

### 5.3.1 What are textile products?

In this report, there will be a focus on a specific type of textile product. Due to the broad range of textile products available, they cannot all be covered in this report.
Textile products can be made of various materials, e.g. materials of animal origin, organic material, synthetic marital or fibre mixtures (The European Parliament and The Council b., 2011; Ellen MacArthur Foundation, 2017).
The definition of textile products in the EU is "(…) *means any raw, semi-worked, worked, semi-manufactured, manufactured, semi-made-up or made-up product which is exclusively composed of textile fibres, regardless of the mixing or assembly process employed"* (The European Parliament and The Council b., 2011). The definition of textile products is rather broad, meaning there are many different product types when looking at textiles.

Products under textiles include footwear, clothing, household textiles, carpets, fabric, rope & net and technical & industrial textile products (European Environment Agency o. , 2022). There is a high degree of uncertainty regarding textile consumption in the EU between the studies and the yielded amount.

According to a study by the European Environment Agency, the average person consumes 25 kg of textile products, which includes clothing, footwear, and home textiles (European Environment Agency o. , 2022). By contrast, a study from 2018 found that the yearly consumption in a household was 10 kg, and per person, the annual consumption was 2.3 kg (European Environment Agency o. , 2022).
Based on an 'apparent consumption' calculation for textiles in the EU from 2020, clothing, household textiles and footwear were some of the more prominent textile product types (European Environment Agency o. , 2022). Clothing was estimated to be 6.0 kg per person, household textiles 6.1 kg per person, and footwear 2.7 kg per person. The products have different potentials from a CE point of view.

Textile products and clothing have a reuse market, with 60% of clothing consumption overall consisting of outwear, e.g. coats, shirts and trousers (Ellen MacArthur Foundation, 2017; European Environment Agency o. , 2022). The product types, however, have a short use phase despite their technical lifetime, since the product type is affected by fashion trends (European Environment Agency o. , 2022; Ellen MacArthur Foundation, 2017).

Household textiles are, however, less likely to be donated or sold in second-hand shops. Instead, they end up as textile waste or as mixed waste at the end of the use phase (European Environment Agency o. , 2022). Even with the reuse market for clothing compared to household textiles, the production of clothing products has increased.

Clothing production has doubled in the last 15 years, stemming from the increase of a growing global middle-class (Ellen MacArthur Foundation, 2017). The rise in consumption stems from the 'fast fashion' phenomenon, where new styles or collections are frequently pumped out, leading to lower prices and lower-quality products. Clothing textiles more often have a lifetime of under a year before being discarded (Ellen MacArthur Foundation, 2017; European Environment Agency o. , 2022).

The rest of this report will, therefore, focus on the textile product, clothing, given that it has the second-highest consumption in the EU and an extremely short life span of, on average, only a year.

### 5.3.2 Stakeholder analysis on textiles with Hjørring Municipality

This section will review the results of the stakeholder analysis conducted with representatives from Hjørring Municipality. It was conducted to identify what relevant stakeholders Hjørring Municipality could collaborate with to implementwaste prevention initiatives.

#### Step 1 – Brainstorm of relevant stakeholders for Hjørring Municipality

Figure 5.5 illustrates the stakeholders that were identified during a brainstorming with representatives from Hjørring Municipality. The stakeholders were identified based on whether they could impact textiles.

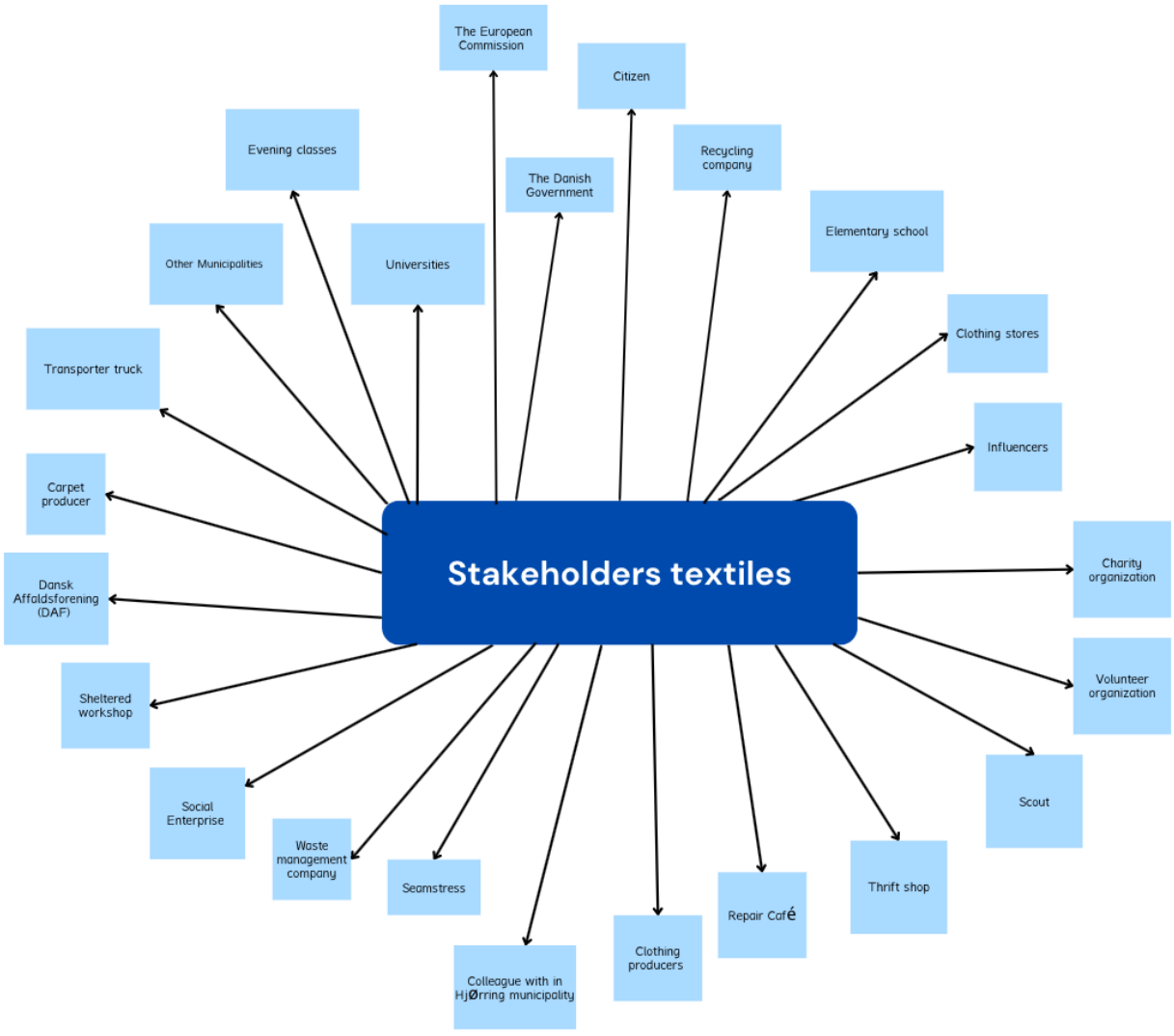


*Figure 5.5 Brainstorm identifing the possible stakeholders that could impact textiles—own Figure.*

The Figure illustrates that many different stakeholders could impact textile waste positively. It cannot be assumed that all the potential stakeholders are included; some might have been forgotten during the brainstorming process. When looking at the stakeholders that have been identified for textiles, some can be put under the same category.

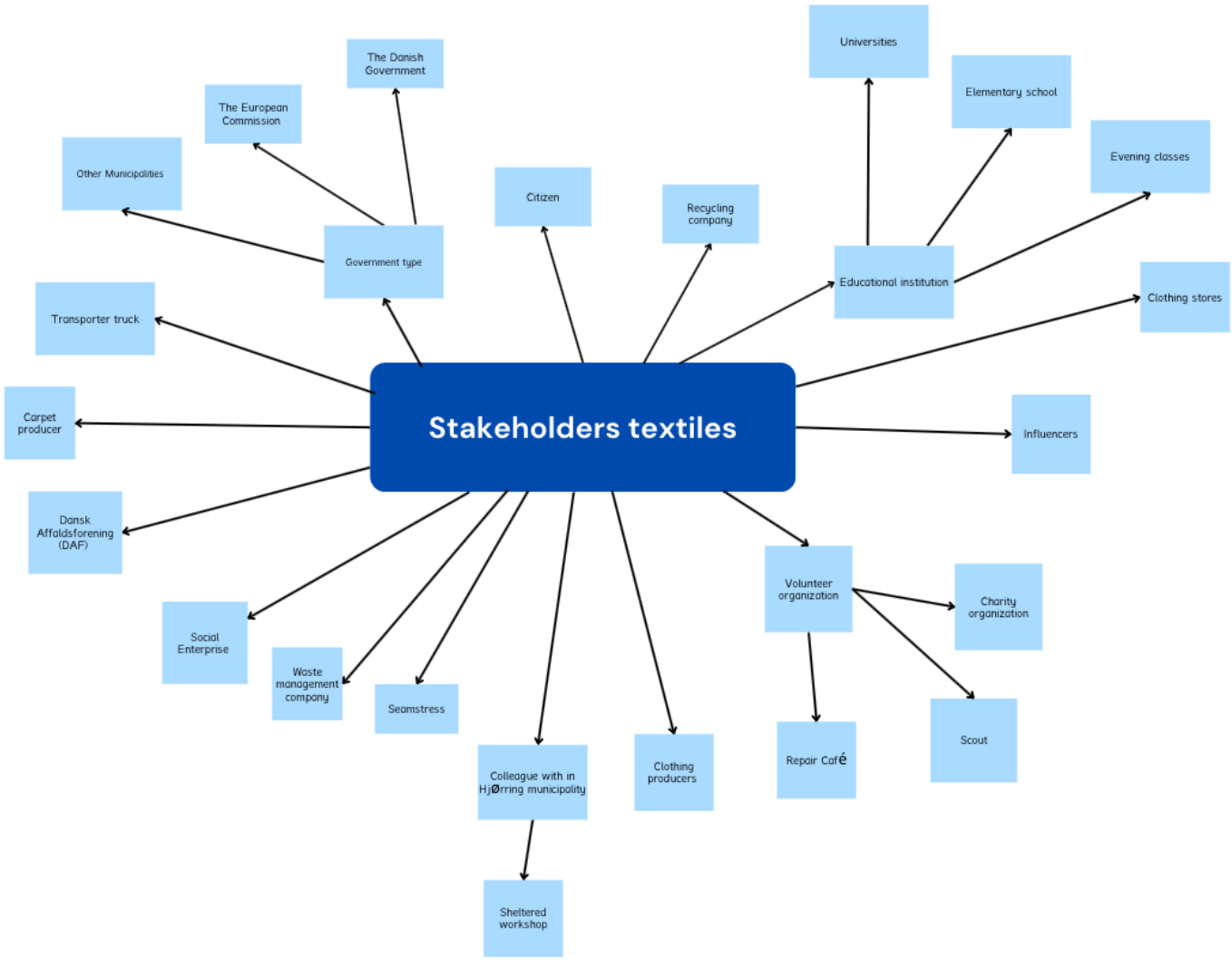


*Figure 5.6 shows the stakeholders that can impact textiles in categories - own figure.*

Figure 5.6 below illustrates the stakeholders that impact textiles, placed into categories.

The Figure shows that some of the stakeholders identified during the brainstorming can be categorised. Stakeholders can be classified into various types, such as government, educational institutions, volunteer organisations and more. As a result, stakeholders like volunteer organisations and colleagues in Hjørring Municipality will not be further included in the stakeholder analysis, as they serve as an overarching description for other stakeholders. The focus will only be on stakeholders falling under these categories.

### Step 2 – Categorising the relevant stakeholders.

The stakeholders identified during step 1 were then placed into a matrix based on their impact on the waste fraction (x-axis) and how close collaboration could be/is with the stakeholder (y-axis). The placement of the stakeholders was done in collaboration with representatives from Hjørring Municipality.

Figure 5.7, below, shows the matrix that was created during the meeting.

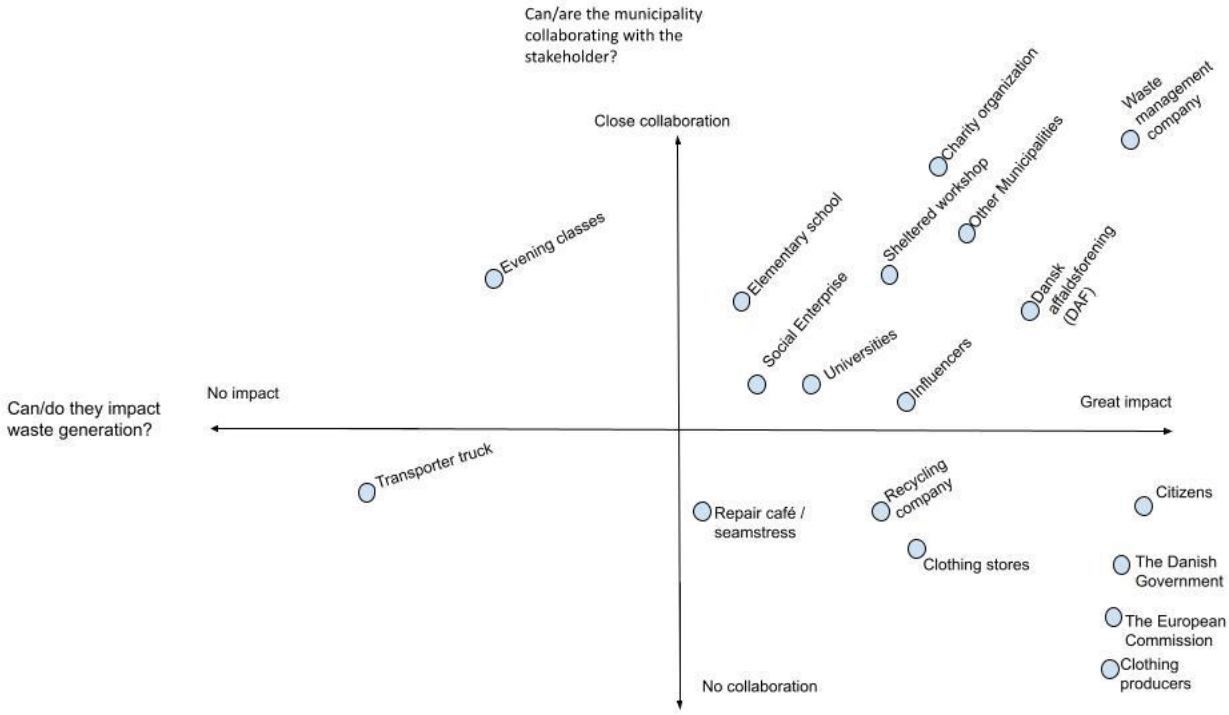


*Figure 5.7 Matrix created during the meeting with representatives from Hjørring Municipality. X-axis: impact on the waste fraction. Y-axis: how close collaboration could be/is with the stakeholder—own Figure.*

Figure illustrates the placement of the stakeholders doing the meeting. Some actors were not included in the matrix.

Scouts and carpet producers were not included since they were deemed not relevant.

The stakeholders identified stem from different levels - local, national and international - and impact textile products at various phases of their life cycle. They also have a greater impact on the environmental impact of the waste fraction, e.g. due to the number of products they can process.

These perspectives are not included in Figure 5.7.

They will be seen in the following Figures, 5.8 and 5.9, where the stakeholders will be placed. The result of the Figure be addressed further down in this section where relevant stakeholders will be identified for interview in step 3.

Figure 5.8, below, illustrates whether the stakeholders are international, European Union-only, national (Denmark), regional or local to Hjørring Municipality.

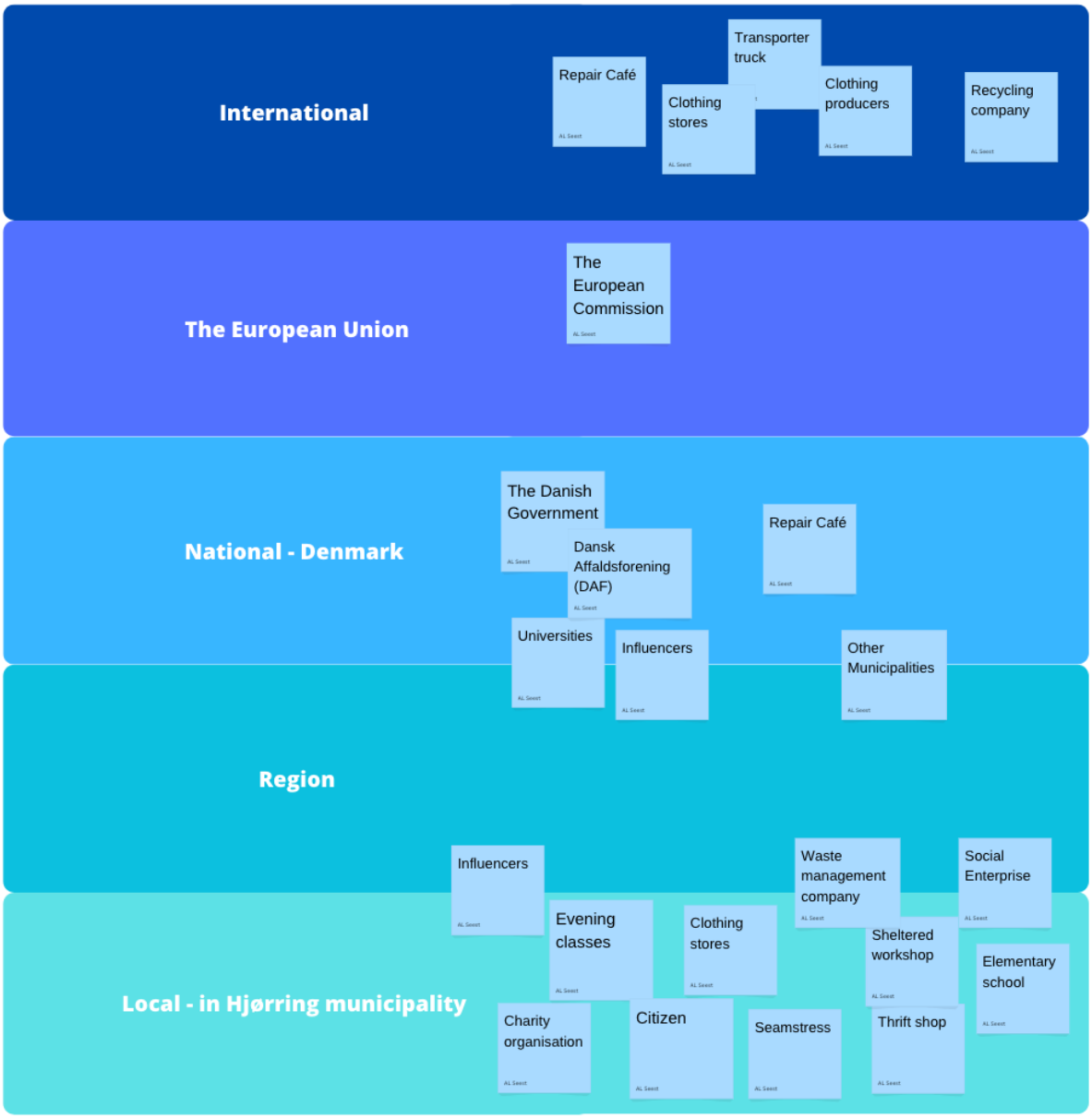


*Figure 5.8 Where the stakeholders are on a local, regional, national, EU or national level—own Figure.*

Figure shows that most stakeholders are local to Hjørring Municipality. Further description and placement descriptions can be found further down for the individual stakeholders.

Figure 5.9 shows when the stakeholders can impact the textile's life cycle.

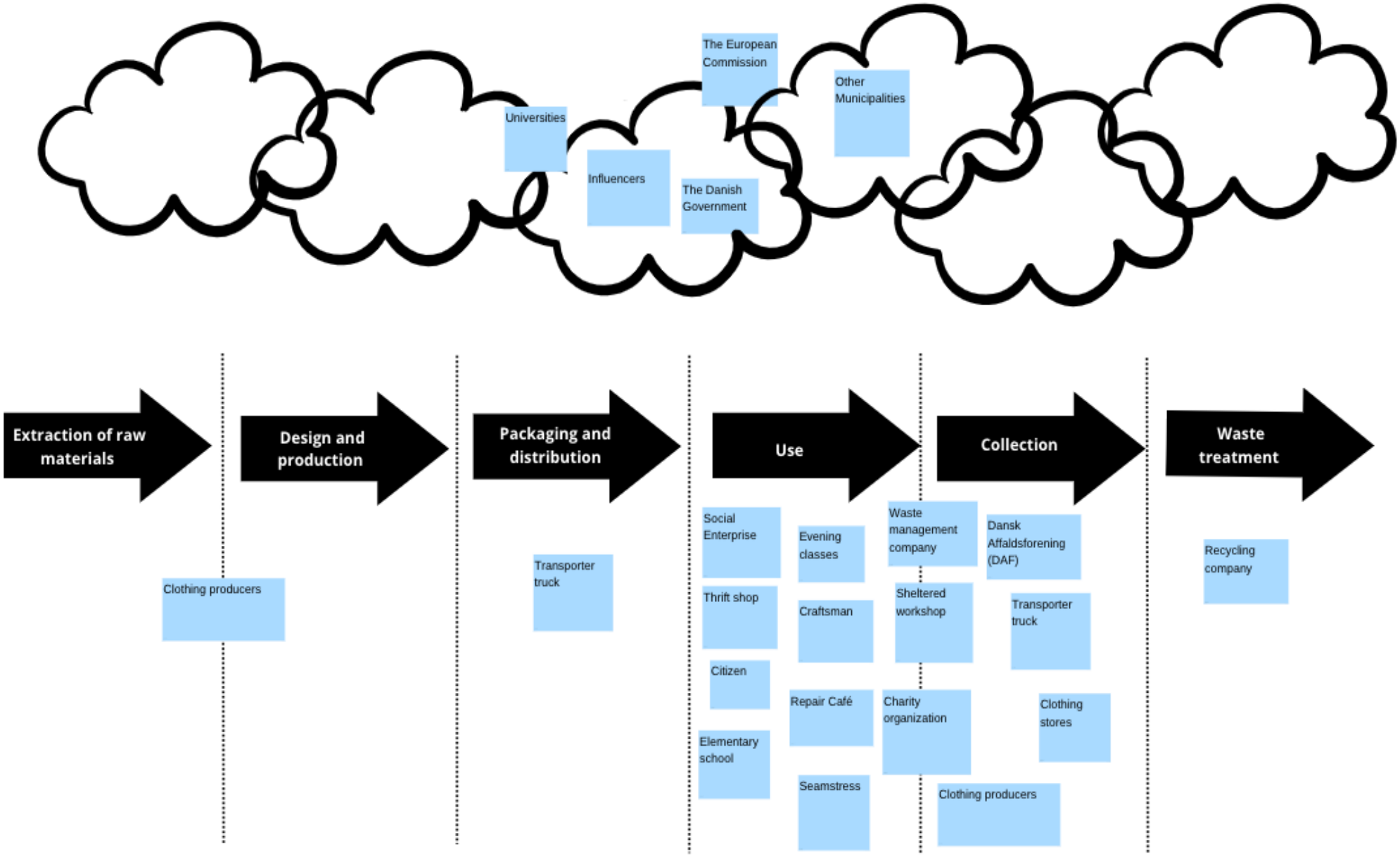


*Figure 5.9 illustrates where in the lifespan the stakeholders would impact the textile - own figure*

The Figure shows some stakeholders appearing multiple times because they impact various phases of the textiles life cycle The Figure shows some stakeholders are identified not to impact a single/specific phase of the product life cycle but contribute through knowledge or legislation that can affect the life cycle. More detailed descriptions and placements for each stakeholder can be found further down.

After illustrating where stakeholders are in terms of local to international and where they can impact textiles when looking at the product life cycle, the individual stakeholders and their interests will be briefly described.

Stakeholders will be chosen based on the result shown in Figures 5.7, 5.8 and 5.9.

The definition of waste prevention utilised in this report, see section 4.1, will also be used when determining relevant stakeholders.

The rationale for placing stakeholders from Figure 5.8, from the stakeholder meeting with representatives from Hjørring Municipality regarding textiles, will also be utilised. A transcription of the meeting can be found in Appendices B.

### *University*

University as a stakeholder can be categorised into two, collaboration with professors and with students. Hjørring Municipality is currently collaborating with professors from Aalborg University to improve the municipality's use of textiles.

Hjørring is also collaborating with students from Aalborg University on semester projects and a master's thesis.

Universities have been placed as having a low level of collaboration and having a relatively low impact on the generation of textile waste, see Figure 5.7. Placement is based on the University not necessarily having a direct impact but being indirectly associated by providing nuanced knowledge that can impact decision-making.

The stakeholder is identified to be active both on a regional and national level, see Figure 5.8. Aalborg University is in the north of Jutland, but Aalborg University also has campuses in, e.g. Copenhagen and Esbjerg (Aalborg Universitet , n.d.).

Universities are placed on a fluffy level, as seen in Figure 5.9, based on Aalborg University's response in the consultation phase for the Danish Action Plan for Circular Economy – National Plan for Prevention and Handling of Waste 2020-2032 [19]. Aalborg University, for example, pointed out that the majority of the initiatives in the plan were repetition from old plans and provided comments on how the plan could be improved (The Danish Ministry of Environment b., 2021).

Aalborg University also provided comments on Law No. 898 when it was in the consultation phase, commenting that legislation must set a framework that allows the municipalities to positively impact local actors (Danish Energy Agency, 2022).

Universities are deemed not to be relevant stakeholders based on waste generation for textiles. The stakeholder can be utilised to identify initiatives for waste prevention or barriers in place, but that is not an initiatives but rather information gathering.

[19] Own translation from – Handlingsplan for cirkulær økonomi – national plan for forebyggelse of håndtering af affald 2020-2032

### *The European Commission*

The European Commission was identified as having rather a large impact on the waste generation of textiles, see Figure 5.7. The European Commission set current waste legislation, and studies show that legislation is somewhat effective as a waste prevention initiative (Willts, 2012; Magrini, et al., 2020). Collaboration with the stakeholder is identified to be low (see Figure 5.7) as the European Commission sets the legislation impacting the municipality using a top-down approach.

The stakeholder is also identified to be on a European level (see Figure 5.8). The stakeholder is identified not to impact a single/specific phase of the product life cycle, see Figure 5.9. Based on that, the European Commission is implementing legislation and plans on a European level that impact all EU member states or set requirements for producers.

Since collaboration is not possible between the stakeholders, the European Commission is deemed irrelevant and will not be included further.

### *The Danish Government*

The Danish Government is identified as having a significant impact on the generation of textile waste, see Figure 5.7, based on being an EU member state and therefore required to implement initiatives for waste prevention.

Collaboration between the stakeholder is identified to be low. Collaboration can happen through other stakeholders, such as Kommunernes Landsforening, which speaks on behalf of Danish municipalities' interests.

The stakeholder is identified to be on a national level since the stakeholder is the state and has to plan development for the whole of Denmark, see Figure 5.8.

The stakeholder is identified not to impact a single/specific phase of the product life cycle, see Figure 5.9, since the stakeholder can utilise legislation that can impact any phase of the life cycle. To impact some phases, they need to collaborate with other actors, such as the EU, to impact the design phase of products (The Danish Environmental Protection Agency, 2021).
The stakeholder will not be included further in this analysis since collaboration cannot be established and because of the top-down relationship there is between the stakeholders.

### *Citizen*

Citizens were identified in the meeting as having one of the biggest impacts on the generation of textile waste, see Figure 5.7. The generation of household waste and current consumption patterns stem from them. Citizens were identified as having a low level of collaboration, see Figure 5.7. This was based on the fact that it was not feasible for the municipality to establish collaboration with the majority of the citizens in Hjørring Municipality.

Hjørring Municipality and the citizens could impact one another through top-down or bottom-up approaches. Hjørring Municipality can nudge the citizens to potentially utilise waste prevention initiatives. It is unclear whether or not they will be used since different factors impact one's decision-making (Ribeiro-Rodrigues, et al., 2021; Bortoleto, 2015; Bortoleto, et al., 2012).

Collaborating with some citizens may be done through collaboration with other local stakeholders in Hjørring Municipality, e.g. charity organisations or volunteer organisations.

Because these stakeholders are citizens of Hjørring Municipality, they are categorised as local level, see Figure 5.8.

Further, it was identified that the stakeholder could have a potential impact on extending the use phase, see Figure 5.9, by sending the product to reuse, repair or reducing their consumption of goods (Laitala, et al., 2021; Bocken , et al., 2016; Corvellec , 2016).

Textile waste is generated by citizens, making them important stakeholders. However, it is unclear if the citizens and Hjørring Municipality collaborate or impact each other, see Appendices B. Hjørring Municipality can collaborate with other stakeholders, like charities and voluntary organisations that citizens are a part of. However, it is uncertain if citizens prioritize their own interests in these situations or the organisation's interests. Due to this uncertainty, citizens are considered irrelevant and will not be included further.

### *Recycling Companies*

Recycling Companies were identified to have a mediocre impact on the textile waste fraction and a low level of collaboration with the municipality, see Figure 5.7.

Recycling textiles is lacking due to the lack of value in the materials or products after use; only some types of textile fibres are recycled (Ellen MacArthur Foundation, 2017; European Environment Agency c., 2023).

Used textiles are likely sent to Asia, downcycled into industrial rags or filling, and re-exported for recycling in other Asian countries (European Environment Agency c., 2023).

Recycling companies for textiles are seen as an international stakeholder because most textiles sent to recycling are sent to Asia, see Figure 5.8 (European Environment Agency c., 2023).

Recycling of textiles happens after a product has become waste and is therefore not a part of waste prevention. The stakeholder is, consequently, first active after the product has become waste. See Figure 5.9.

Since the stakeholder works with textile waste and focuses on recycling, it will not be included in this report as a relevant stakeholder since it is outside this report's scope.

### *Elementary school*

Elementary schools were identified as stakeholders impacting textile waste, where collaboration with Hjørring Municipality can be established, see Figure 5.7. Hjørring Municipality has already collaborated with some schools within the municipality, where they are currently working on sustainability initiatives. In one case the municipality acted as a judge when student were presenting sustainability projects.

The stakeholder is identified as being local since only schools within Hjørring Municipality were considered, see Figure 5.8.

The stakeholder is identified as impacting the use phase of the products, see Figure 5.9. The placement is based on whether they want to implement behavioural change. The change can be seen as a pyramid where schools are fundamental, as places where the younger generation can learn new pro-environmental behaviour (De Feo, et al., 2019).

Based on the potential the stakeholder can have on the newer generation regarding pro-environmental behaviour, collaboration has been established before. The stakeholder is chosen as a relevant stakeholder.

### *Clothing stores*

Clothing stores were identified as being a stakeholder with an impact on textile waste. However, collaboration was identified as being impossible to establish, see Figure 5.7.

Clothing stores as a stakeholder is placed on a local and international level, see Figure 5.8. A clothing store can be owned by a clothing brand where they sell their own products. However, a clothing store can also buy clothing from manufacturers of different brands they sell in their store (Ellen MacArthur Foundation, 2017). Therefore, the stakeholder has been placed at both a local and international level.

In Figure 5.9, clothing stores have been placed in the collection. If the stores are assumed to be part of a larger corporation, they may collect clothing and give discounts (Ellen MacArthur Foundation, 2017). However, it is unclear whether a clothing store that buys various brands would have a take-back system since various clothing brands could be sold in the store. Furthermore, it can be argued that waste prevention is not in the interest of clothing stores as it can mean the producer losing out on profits due to extending the life span of the product (Corvellec , 2016; Willts, 2012; Bocken , et al., 2016).
Therefore, the stakeholder will not be included further in this report as a relevant stakeholder, since the stakeholder is not interested in extending the life span of the product (Corvellec , 2016; Willts, 2012; Bocken , et al., 2016; Ellen MacArthur Foundation, 2017).

### *Influencers*

This stakeholder has been identified as having a possible impact on the textile waste fraction but has a low level of collaboration with the municipality, see Figure 5.7. The low level of collaboration stems from uncertainty about whether it could be considered collaboration if the person is paid for a service, see Appendices B.

The stakeholder has been placed on a local, regional and national level, see Figure 5.8. Influencers could be on many levels, however its assumed Hjørring Municipality would collaborate with some within these levels. Collaborating with an influencer with a higher media presence could lead to more pro-environmental behaviour (Dekoninck & Schmuck, 2022).

The stakeholder is identified not to impact a single/specific phase of the product life cycle, see Figure 5.9., since the stakeholder can provide information about different phases of the life cycle, e.g. fair trade, fewer chemicals in the colouring process, repairing, take back systems, etc. (Bocken , et al., 2016; Dekoninck & Schmuck, 2022; Ellen MacArthur Foundation, 2017).

The stakeholder is deemed not to be relevant, since they influence is unclear. Furthermore, the collaboration, if established, will only be over a short period of time, meaning that it will not be as effective in changing behaviour (Willts, 2012; De Feo, et al., 2019; Corvellec , 2016).

### *Charities*

Charities in Denmark have established a market for reuse textiles. The organisation focuses on where the textiles are donated, sorted and sold in the stores, with profits going to a social goal. They are, therefore, set to impact the use phase of the product, see Figure 5.9.
The stakeholder is placed as being possible to collaborate closely, with a relative impact on textiles, see Figure 5.7. This is based on Hjørring Municipality's current attempt to establish collaboration with the stakeholder.

The stakeholder is placed at a local level in Hjørring Municipality, see Figure 5.8. Some organisations, such as Red Cross, are international organisations, whereas others, such as Blå Kors and Kirkenskors hær, are Danish, where the surplus is used on a national level in Denmark (International Committee of The Red Cross, n.d.; Blå Kors, n.d.). However, only stakeholders present in Hjørring Municipality have been included.
Due to the stakeholder's impact on textiles in Denmark, and that collaboration with the stakeholder is already being established with Hjørring Municipality, it is deemed relevant.

### *Scout*

Currently, it is not possible to find any data on repairs done by Danish scouts. Other organisations related to the Danish scouts are doing repairs. This stakeholder was not included in Figure 5.7 since it was missed from the matrix after the brainstorm.
Spejder Sport is currently implementing a circular concept, where they will resell clothing and repair customers' products (Foget, 2023; CSR, 2023). Spejder Sport is owned by Det Danske Spejderkorps, profits will then be paid to Danish scouts (Spejder Sport , n.d.).

Since the stakeholder doesn't have any initiatives that directly impact textiles, but only indirectly through an organisation implementing a repair shop, the stakeholder will not be included.

### *Thrift store*

Thrift stores refer to stores that are not associated with a charity organisation. This can be privately owned stores or where citizens rent a booth or a coat hanger. This does not include antiques stores. This stakeholder was not included in Figure 5.7 since it was missed from the matrix after the brainstorm.

Thrift stores were placed as local stakeholders in Hjørring Municipality, see Figure 5.8. In Hjørring Municipality there are approximately 41 stores that can be categorised as thrift stores (novaindex, 2023). This includes charity organisations, antique stores, and thrift stores. About 19 of the stores can be categorised as privately-owned thrift stores.

The stakeholder is identified as it can impact the use phase by potentially extending it, see Figure 5.9. It is unclear what quantity of textiles are sold by the stakeholder. The decision as to whether textiles are sold there may be based on the brand, vintage or current demand.

The 19 stores in Hjørring Municipality are privately owned, meaning there are potentially 19 different agendas to consider. Due to the amount of potential stakeholders to consider and the uncertainty of their impact on the reuse of textiles, this stakeholder will not be included.

### *Repair Café*

Repair Café is a non-profit organisation that provides help with repairing products, e.g. clothing, phones, shoes and computers (Repair Café, n.d.)

Repair Café was identified to impact textile waste. However, it was identified as having a low level of collaboration with Hjørring Municipality, see Figure 5.7.

The stakeholder is identified to be on an international and national level, see Figure 5.8. This is based on the fact that Repair Cafés are a phenomenon that started in 2007 in Amsterdam and have since become an international foundation (Repair Café, n.d.). In Denmark, Repair Cafes are run by Repair Café Denmark, which helps start new Repair Cafes and impacts the political decision-making in Denmark e.g. the right to repair (Repair Café Danmark a. , n.d.). The Danish organisation

is under the international foundation. However, it operates independently in Denmark, albeit under the same values and viewpoints (Repair Café Danmark a. , n.d.; Repair Café, n.d.).

Repair Cafes in Denmark have exploded since they started in 2018, and it is expected that there will be 100 cafes by the end of 2023 (Repair Café Danmark a. , n.d.).

The stakeholder is identified as impacting the use phase, see Figure 5.9. The stakeholder is placed there since the organisation repairs goods that would otherwise have been discarded, thereby extending the product's lifespan by extending the use phase (Repair Café, n.d.; Repair Café Danmark a. , n.d.).

Repair Cafés can be identified as a relevant stakeholder despite low collaboration. It is unknown if collaboration can be done with the organisation, but it is valid to explore due to their success.

### *Clothing producers*

Clothing producers refers to companies that produce clothing, e.g. H&M, ELSK, ONLY, etc.

Clothing producers have been identified as having a potentially large impact on the generation of textile waste. However, collaboration with the stakeholder is not deemed possible, see Figure 5.7.

In Figure 5.8, the stakeholder is identified to be international. This is because the textile industry is an international actor, where the majority of companies are international, having their products produced in other countries such as India (Ellen MacArthur Foundation, 2017).

The stakeholder has been identified to impact three phases, the extraction of raw materials, design and packaging and the collection, see Figure 5.9, since the stakeholder can decide where the materials come from, synthetic or from biological sources. Furthermore, they can decide on how the material is produced, e.g. fair trade or using less harmful chemicals (Ellen MacArthur Foundation, 2017). For collection, some clothing producers have implemented collections at their stores, e.g. H&M, where the users will gain coupons if they come back with three products (Ellen MacArthur Foundation, 2017).

It could be argued that waste prevention is not in the clothing producers' interests, since extending the life span of the product could negatively impact their profits (Corvellec , 2016; Willts, 2012; Bocken , et al., 2016).

Therefore, the stakeholder will not be included further in this report as a relevant stakeholder since the stakeholder is not interested in extending the life span of the product, and it can be argued that they may work against it (Corvellec , 2016; Willts, 2012; Bocken , et al., 2016).

### *Seamstress*

Seamstresses are identified to be a stakeholder with a low impact on the generation of textile waste and where there is a low opportunity for collaboration, see Figure 5.7.

The stakeholder is identified to be a local stakeholder in Hjørring Municipality, see Figure 5.8. The number of seamstresses in Hjørring Municipality are between one to four, depending on the search engine used (Novaindex a., 2023). The low number of stakeholders may be because the repair price is higher than the cost of the clothing itself (Ellen MacArthur Foundation, 2017; Laitala, et al., 2021; Bocken , et al., 2016).

The stakeholder is identified as having a potential impact on the use phase, see Figure 5.9 since the stakeholder can repair the product and extend the life span of the product.

It's unclear how much influence the stakeholder will have, and there seems to be a shortage of seamstresses in Hjørring Municipality, which may be due to the cost of repairs. Given the number of stakeholders in Hjørring Municipality and the repair price, the stakeholder is not deemed relevant.

### *Waste Management Company - Nordværk*

In Figure 5.7, waste management companies are identified as having a significant impact on textile waste and a strong level of collaboration with the municipality. This is because doing the meeting there was referred to the waste management company Nordværk.

The stakeholder is placed as both a local and a regional actor, see Figure 5.8. As stated in section 5.2.1, Hjørring Municipality co-owns Nordværk together with other neighbouring municipalities.

In Figure 5.9, the stakeholder has been placed between the use phase and the collection. Placement is based on that AVV, before the merger, had established a second-hand store at one of their properties in Hjørring where they would, for example, sell clothing (Nordværk d., n.d.). The store is still open and is still selling textiles.

The stakeholder is deemed to be relevant, being a local actor who works with both waste prevention and waste handling and will be impacted by the new legislation from Law No. 898.

### *Social enterprise*

Social enterprise has been placed in Figure 5.7 as having a low level of collaboration with the municipality and a low potential impact on waste generation.

Social enterprise combines societal goals with an entrepreneurial spirit (European Commission c., n.d.). The main objective impacts social objectives rather than creating a surplus for an owner or shareholders (European Commission c., n.d.).

In Denmark, ten social enterprises are currently working with textiles (Socialøkonomiske virksomheder i DK a., 2023). The companies are located around Denmark, some in the neighbouring municipality in the north of Jutland. Therefore, they have been located between a local and regional level in Figure 5.8.

Figure 5.9 highlights how social enterprises can influence the product's use phase. For instance, certain organisations repair damaged textiles and sell them. Additionally, some organisations claim to have partnerships with various municipalities (Socialøkonomiske virksomheder i DK a., 2023).

Since this is a practice in other municipalities, which has a positive social impact, and some social enterprises are located in the north part of Jutland, the stakeholder is deemed relevant.

### *Sheltered workshop*

The shelter workshops are for citizens that may have tried to get out on the job market but sadly can’t be due to either physical or mental disabilities. The sheltered workshop is identified as having a medium level of collaboration with Hjørring Municipality since the sheltered workshop is offered by Hjørring Municipality, although it is under another section of Hjørring Municipality. The stakeholder is also identified as having a medium level of impact on textile waste, since the stakeholder can repair the product at the end of their life or up-cycle it, see Figure 5.7.
The sheltered workshop is identified as being local level, see Figure 5.8, since it is associated with Hjørring Municipality.

The sheltered workshop is identified to impact the use phase and the collection phase, see Figure 5.9. The shelters can repair clothing and extend the life span of the products, and prepare for reuse.
The stakeholder is deemed to be relevant since it is a local actor in Hjørring that has a connection with the municipality. Additionally, the organisation has a positive impact on social sustainability.

### *Dansk Affaldsforening*

Dansk Affaldsforening (DAF) is identified as having a medium level of collaboration with Hjørring Municipality, since Hjørring collaborates with them, see figure 5.7. The stakeholder was also identified as impacting the textile waste fraction, and this was chosen because DAF is an interest group that comments on, e.g. legislation, policies and requirements for waste in Denmark (Dansk Affaldsforening a., n.d.).

DAF is a professional organisation comprising of municipal waste management companies (Dansk Affaldsforening a., n.d.). Therefore, the stakeholder has been identified as being on a national level in Denmark, see Figure 5.8.

The focus of the organisation is waste management and the use of the generated waste. Therefore, they have been placed in the collection phase, see Figure 5.9. However, it has been noted that DAF have a focus on waste prevention as well.

DAF encourages initiatives focusing on the decoupling of waste and more initiatives focusing on waste prevention in the Action Plan for circular economy – National Plan for Prevention and Handling of Waste 2020-2032 [20] (The Danish Ministry of Environment b., 2021). Additionally, DAF pointed out that the definition of waste creates a barrier for waste prevention in practice (The Danish Ministry of Environment b., 2021). DAF also commented during the consolation phase for Law No. 898, regarding not setting specific requirements for reuse (Danish Energy Agency, 2022).

DAFs is involved in the treatment of waste. The stakeholder has commented on waste prevention. However, since this is not a focus for the stakeholder, the stakeholder will not be included further.

### *Carpet producer*

As stated in section 5.3.1, the focus of this report is on clothing for textile products. Therefore, this stakeholder will be deselected since it is outside of this report's scope.

### *Transporter trucks*

This stakeholder is identified as having a low level of collaboration, and a low impact on the generation of textile waste, see Figure 5.7. The placement is based on the stakeholder not impacting the waste transported for recycling, incineration, or reuse. The objective is to perform the task of transporting, which is unrelated to waste generation. Collaboration is set low since the transportation truck is paired. For services, this is not a collaboration based on similar interests but on services being fulfilled.

The stakeholder is identified as being on an international level, since production and waste treatment occurs in other countries outside of the EU. See Figure 5.8 (European Environment Agency o. , 2022; Ellen MacArthur Foundation, 2017).

[20] Own translation from – Handlingsplan for cirkulær økonomi – national plan for forebyggelse of håndtering af affald 2020-2032

The stakeholder is identified as impacting packaging and distribution, and collection, where the stakeholder can perform their service, see Figure 5.9.

Since the stakeholder provides a service due to a need, the stakeholder will not be included.

### *Other municipalities*

This stakeholder is identified as having a medium level of collaboration and an impact on the textile waste fraction, see Figure 5.7. This is because the municipality, through Nordværk, is collaborating with other municipalities on waste collection, see section 5.2.1.

The stakeholder is Identified to be regional; see Figure 5.8. This is because Hjørring Municipality collaborates with other municipalities in northern Jutland, see section 5.2.1.

The stakeholder is identified not to impact a single/specific phase of the product life cycle, see Figure 5.9, since the other municipalities have the same regulatory framework, see section 5.1.

The stakeholder is deemed not to be relevant due to their existing collaboration through Nordværk, and due to the regulatory framework dealing with the same issues as Hjørring municipality in terms of implementing waste prevention initiatives.

### *Evening classes*

This stakeholder is identified as having a medium level of collaboration with the municipality, see Figure 5.7, based on Hjørring Municipality collaborating with LOF to offer evening classes (LOF a., n.d.).

The stakeholder was identified as having no impact on the textile waste fraction. Evening classes can undertake initiatives around sewing. However, it is unclear how this would impact the consumption of textiles and whether it would lead to the repairing of clothing.

The stakeholder has been identified as being on a local level, see Figure 5.8. This is because AOF and LOF both have classes available in Hjørring (AOF a., n.d.; LOF b., n.d.). The organisations are located throughout all of Denmark and can be seen as national actors. However, this report will only focus on classes that are available in Hjørring since it is not realistic to assume that the citizens will travel, e.g. to Aalborg, for evening classes.

The stakeholder has been placed as impacting the use phase of clothing, see Figure 5.9, because the citizens could learn how to sew. However, neither AOF nor LOF have any sewing classes available in Hjørring at the current time (AOF b., n.d.; LOF c., n.d.).

Because no classes are available in Hjørring currently, the stakeholder is not deemed relevant.

After going over the stakeholders identified in collaboration with Hjørring municipality, relevant stakeholders will be analysed further in this analysis. Table 5.5, bellow, summarises the result for all stakeholders analysed and a short description of the argument for their inclusion or exclusion.

| Stakeholder textiles | Impact on waste generation | Level of collaboration | Local to international level | Impact on life cycle phase(s) | Key argumentation | Relevant or irrelevant |
|---|---|---|---|---|---|---|
| Universities | Small | Small | Region and National | No single/specific | Provides informaiton but not iniciatives | Irrelevant |
| The European Commission | Large | Non | The European Commission | No single/specific | No collaberation and top-down relationship | Irrelevant |
| The Danish Government | Large | Low | National | No single/specific | No collaberation and top-down relationship | Irrelevant |
| Citizens | Large | Low | Local | Use | Impact vs. collaberation | Irrelevant |
| Recycling Companies | Medium | Low | International | Waste treament | Focus on product after it is waste | Irrelevant |
| Elementary schools | Low | Medium | Local | Use | Potential to impact younger generation towards pro-environmental behaviour | Relevant |
| Clothing Stores | Medium | Low | Local and International | Collection | The stakeholder is not interested in extending the life span of the product | Irrelevant |
| Influencers | Medium | Small | Local, Region and National | No single/specific | Collaberation if paied? Uncertainties regarding impact | Irrelevant |
| Charities | Medium | High | Local | Use | Unicit system to DK with collaboration between the stakeholder established | Relevant |
| Scout | — | — | — | — | As no initiatives currently | Irrelevant |
| Thrift store | — | — | Local | Use | Privat stakeholder and uncertainties regarding impact | Irrelevant |
| Repair Café | Low | Low | National and International | Use | High success in DK | Relevant |
| Clothing producers | Large | Non | International | Extraction of raw matrials, design and production and collection | The stakeholder is not interested in extending the life span of the product/may work against it | Irrelevant |
| Seamstress | Low | Low | Local | Use | Few stakeholders and uncertainties regarding impact | Irrelevant |
| Waste Management Company – Nordværk | High | High | Local and Region | Use and collection | Local, works with waste prevenction and handeling. Will be impacted by Law No. 898 | Relevant |
| Social enterprise | Small | Small | Local and Region | Use | Collaberation with other municipalities and positive social impact | Relevant |
| Sheltered workshop | Medium | Medium | Local | Use | Local and positive social impact | Relevant |
| Dansk Affaldsforening | Medium | Medium | National | Collection | Focus on product after it is waste | Irrelevant |
| Carpet producer | — | — | — | — | Not the product type selected | Irrelevant |
| Transporter trucks | No impact | Low | International | Packaging and distribution, and collection | Provides a service | Irrelevant |
| Other municipalities | Medium | Medium | Region and National | No single/specific | Facing same problems regulatory problems | Irrelevant |
| Evening classes | Non | Medium | Local | Use | No classes available and unclear impact | Irrelevant |

*Table 5.5 Summarry of results from step 2 for textiles for each stakeholder.*

### Step 3 – Achieving a deeper understanding of the stakeholder's relation

This section will detail the relevant stakeholders identified for textiles in the previous section.

The stakeholders are elementary schools, charity organisations, Repair Café, waste management companies, social enterprises, sheltered workshops and evening classes.

Emails were sent to all relevant stakeholders inviting them for interview. However, only some responded. For the stakeholders that could be interviewed, the results from the interview will be referred to. For stakeholders that could not be interviewed, relevant literature will be referenced instead.

## *Elementary school*

It was not possible to get an interview with any elementary schools. Therefore, further insights were gained from data and research.

Danish elementary schools have a class "Craft and Design" [21]. In the class, students are taught how to repair textiles (Ministry of Children and Education , 2022). One of the learning targets is for students to be consumption and sustainability (Ministry of Children and Education , 2022).

In some schools, the class also combines sustainability and climate change, teaching the students about consumption, repair and self-sufficiency (Aisinger, 2023; Ministry of Children and Education , 2022). Combining this can be seen as a step to teach pro-environmental behaviour to the younger generation (Bortoleto, 2015).

## *Charity organisation – Kirkens Korshær*

An interview was conducted with Head of Reuse from Kirkens Korshær, Dorthe Egede Hansen to gain more information regarding the organisation. Transcription of the interview can be found in Appendices F.

It is unclear whether this information can be generalised for all charity organisations since the organisations have different issues they address and fundraise for (International Committee of The Red Cross, n.d.; Blå Kors, n.d.; Kirkens Korshær, n.d.). However, Kirkens Korshær can arguably give an overall idea of the opportunities and challenges charity organisations in Denmark currently face.

Kirkens Korshær is a Danish organisation that has existed in Denmark since 1912 (Kirkens Korshær, n.d.). The organisation helps people dealing with addiction, homelessness, etc. (Kirkens Korshær, n.d.; Hansen, 2023). They have 450 employees that run the shelter and drop-in centres for families (Kirkens Korshær, n.d.). Furthermore, they have around 9000 volunteers that help with social work and running the 240 second-hand stores around the country (Kirkens Korshær, n.d.). The second-hand stores are used to finance their initiatives (Hansen, 2023; Kirkens Korshær, n.d.).

Collaboration is also done with municipalities, where money is earmarked for certain activities (Hansen, 2023). The money earned through the organisation's stores can be used freely. The clothing in the stores is donated. The stores are excluded from VAT. However, this also creates some limitations (Hansen, 2023).

[21] Own translation from – "Hårdværk og Design

According to Hansen, since charity organisations are excluded from VAT, they are not allowed to repair products that have been donated. This creates a barrier for products that could be upcycled or repaired. However, this is a barrier that is accepted due to the alternatives.

The system in Denmark is unique within the EU. The EU tried to force Danish charities to pay VAT, which would remove 25% of their profit, but due to an organised effort from the Danish side, this was repealed. The EU stated that if the legislation was broken, it could be taken back again, obligating the charities to pay VAT.

The organisation can sell a product that is upcycled or repaired by others if it is donated to them (Hansen, 2023).

The organisation could also take an area where VAT is paid so repairs and upcycling can be done. However, it is unclear whether this is feasible since it needs to be done on such a scale that it gives an economic benefit to the organisation (Hansen, 2023).

Charity second-hand stores now have first priority for donated products and materials at the recycling stations due to the implementation of Law No. 898. According to Hansen, this has resulted in an increase in products for their stores. However, it is important to take precautions to ensure the proper handling of these donations.

Since citizens might place unsuitable items at reuse, such as broken sofas, chairs missing a leg or chipped cups. These are products that they cannot use since they cannot repair, or they sit in a grey area for reuse.

Therefore, it could be beneficial if a worker at the recycling station continuously discarded any products that can be clearly categorised as waste (Hansen, 2023). Donated materials or products to the recycling station should be placed somewhere they are safe from wind and weather, which is not done in all places (Hansen, 2023). Leaving materials and products outside means they can be damaged and no longer be fit for reuse. Therefore, leaving the product somewhere dry could increase reuse.

According to Hansen, some waste management companies want charity organisations to come every day of the week. "*This doesn't stem from a place of ill intentions"* (Hansen, 2023). The recycling depot receives a significant number of donated items that waste management companies must handle. However, since the organisation relies on volunteer workers, it is not practical to expect them to handle everything. They do not have the resources to provide backup in case of injury or illness. It would be best if collections were scheduled once or twice a week to ensure safety and efficiency.

Kirkens Korshær has also seen a decline in volunteers, as there has been a decline in Denmark in recent years (Danmarks Radio, 2022). They have employed volunteer coordinators and – counsellors (Hansen, 2023). They are currently trying to employ two more volunteer coordinators in Aarhus and Copenhagen.

### *Repair Café Danmark*

An interview was conducted with the President of Repair Café Denmark, Christen Monberg, to gain more information regarding the organisation. Transcription of the interview can be found in Appendices C.

As stated in step 2, Repair Café Denmark is a part of the international organisation Repair Café. The organisation is run by volunteers that repair products for free. Currently, in Denmark, there has been a decline in volunteers after the corona crisis (Danmarks Radio, 2022). Repair Café

Denmark is dealing with the same issues, with missing volunteers; however, since the volunteers need skills in repairing, it creates a further barrier when hunting for volunteers (Monberg , 2023). Nevertheless, Repair Cafes are still spreading over Denmark.

The cafes within the organisation differ in the number of repairs needed and the number of users present. Some have more repairs than users, while others have more users than repairs.

Monberg explains that there are various reasons why users choose to go to Repair Cafés, including their age. Specifically, those in the 18-29 age group tend to use Repair Cafés due to financial constraints, as this generation typically has less disposable income. Repair Cafés provide a cost-effective solution for them. People between the ages of 60 and 90 tend to value using and maintaining products for as long as possible. Additionally, they may have sentimental attachments to certain items. Some products from the 1960s and 1970s are perceived to have been made with better-quality materials compared to those produced today, which may explain why users may have a strong connection to them (Monberg , 2023).

Monberg clarified that the repair services provided by the Repair Café are only intended to save products from being discarded as waste. They do not offer repairs for fitting pants or fixing bike tires, as these types of repairs are better handled by companies with expertise in those specific areas. Some organisations may see Repair Cafés' work as market-distorting. In some Repair Cafés, collaborations have been done where users get discount if they have repaired (Monberg , 2023). Discounts can be at bike shops or tailors.

However, if a town does not, for example, have a nearby bike shop, the Repair Café can offer assistance.

Repair Cafés Denmark collaborates with other organisations, such as Aalborg University and LB Foreningen. The organisation also collaborates with municipalities. Repair Cafés Denmark also offers a starter pack that will help other organisations or individual Repair Cafés when starting up (Repair Café Danmark b., n.d.). Repair Cafés helped when municipalities started Repair Cafés. Repair Café Denmark has even created a document for municipalities that they send out when they hear a municipality wants to set up a Repair Café (Monberg , 2023). The document contains how to start the interaction with citizens and when to let the café progress from a municipality initiative to its own organisation completely run by volunteers.

According to Monberg, some municipalities have a harder time letting go than others, and some have a hard time discerning when it's the right moment. That is why they want to help both the municipality in deciding the best time to let the organisation change hands, but they will also help the volunteers with taking over the café.

During the interview, some spill over effect stemming from Repair Cafés was mentioned (Bortoleto, 2015; Bortoleto, et al., 2012; De Feo, et al., 2019). According to Monberg, more sustainable initiatives have emerged since the cafés have appeared. In one case, volunteers from Repair Café Denmark also converted t-shirts into bags that they donated to supermarkets as a free alternative to plastic bags.

### *Nordværk*

An interview was conducted with Chief of Reuse at Nordværk, Thomas Thomsen, to gain more information regarding the organisation. Transcription of the interview can be found in Appendices D.

As stated in section 5.2.1, AVV merged in 2022 and became Nordværk. Thomsen reports that, following the 2022 merger between AVV and I/S Reno-Nord, their work has remained consistent, with AVV continuing to operate as usual. The merger has allowed them to establish more stringent requirements due to the increased amount of waste they now manage (Thomsen , 2023).

AVVs' vision and viewpoint haven't changed but have been refreshed after the merge. Previously, their vision was "*Be Ahead. Think about the environment first. Show respect. Take responsibility*"[22].

AVV has been taking on assignments beyond their scope due to their vision for many years. It has been given full responsibility for handling waste from Hjørring and Brønderslev municipalities, which has allowed it to implement its desired initiatives (Thomsen , 2023). These initiatives include a leather workshop, thrift store, and large household appliances workshop. AVV's forward-thinking approach has also improved its collaboration with charity organisations.

For many years, AVV has had a second hand store in Hjørring and had no problems with the local charity organisations, compared to the waste management companies that are now implementing one (Thomsen , 2023). AVV, now known as Nordværk, has proactively collaborated with other organisations by holding meetings and referring to each other. Thomsen has stated that they will maintain their positive relationship with these organisations as Law No. 898 is implemented.

Thomsen has shared that used products will be distributed to charity organisations on a weekly basis, with one store per week allowed to collect items within a set timeframe. Any products left uncollected by charities may be sold in Nordværks' own thrift store. Items that cannot be sold there will be made available to citizens four times a year.

Nordværk in Hjørring has no plans to create an open reuse spot for. The reason behind this decision, according to Thomsen, is that it could cause problems for their employees. They fear that the increased workload of cleaning up after citizens and handling potential conflicts over who saw something first. As a result, they have deemed it better to hold an event four times throughout the year for this purpose.

According to Thomsen, having a designated day where citizens can freely take any object they want also provides an opportunity to establish certain conditions. To ensure greater awareness of the amount of waste being recycled and to calculate the reel recycling rate, citizens must weigh the products they take.

### *Social enterprise*

It was not possible to get an interview with any social enterprise. Therefore, data and research on the organisation have been used.

Using waste prevention at the top of the waste hierarchy will create jobs for struggling people who can find employment in repairing, dismantling, and cleaning products (Interreg Europe , 2022). Compared to general business, they have a mission to achieve both economic and social values, implying that the barriers for both will be more complex than for normal business (Davies & Haugh, 2018).

Compared to traditional business norms, social enterprises follow the same type of growth. However, there can be barriers in terms of ethical values differing from the social enterprise and other stakeholders (Davies & Haugh, 2018). Social enterprises may refuse financial aid due to conflict of interest.

[22] Own translation from – "På forkant. Tænk miljøet først. Vis respect. Tag ansvar."

This issue can arise with distributors or retailers as well. As a result, it is important for social enterprises to carefully assess their stakeholders and ensure that they align with their social and environmental impact goals to avoid negative consequences (Davies & Haugh, 2018).

There need to be both social and environmental considerations (Davies & Haugh, 2018). These factors can lead to a lack of funding for social enterprises from other stakeholders (Davies & Haugh, 2018).

Between 45% to 80% of social enterprise employees are in the disadvantaged groups in society (Interreg Europe , 2022). For this, there needs to be greater access to human resources than in a traditional enterprise (Davies & Haugh, 2018).

The growth of a business is often linked to consumer behaviour. Some companies have used communication strategies to boost revenue by highlighting their social and environmental initiatives to attract customers (Davies & Haugh, 2018). Few consumers know about social enterprises, but those who are environmentally conscious are more likely to use them (Davies & Haugh, 2018). The average consumer will keep following the same consumption patterns as before (Davies & Haugh, 2018).

### *Sheltered workshop*

An interview was conducted with Head of Department Activities- and Social-offer NBV, Mirabell, Anne Mette Drustrup, to gain more information regarding the organisation. Transcription of the interview can be found in Appendices E.

The shelter workshops are for citizens that may have tried to enter the job market but sadly couldn't due to either physical or mental disabilities (Drustrup, 2023). The priority of the organisation is to make the citizens happy. However, it is a plus that it goes in hand with sustainability. By using small initiatives in the organisation that give the citizens a positive experience, the organisation can fulfil the needs of its citizens and have a positive impact on the environment (Drustrup, 2023).

In some of the sheltered workshops, citizens of Hjørring Municipality can do sew, embroider or use a loom (Drustrup, 2023).

Textile products are made from materials donated by citizens or companies. These donations are used to create bags, rag rugs, or to embroider on. The finished products are sold, and the money generated goes towards funding initiatives.

The initiatives that are conducted in Hjørring Municipality sheltered workshops can be viewed to be up-cycling since the product or materials that are donated are used to make a new product or material that is of better quality or better for the environment (European Commissions c., 2022).

After addressing the interests of the stakeholders based on interviews and research the next section will contain what waste prevention initiatives can be conducted through collaboration.

#### Step 4 – Initiatives for waste prevention in collaboration with stakeholders

In this section, the results from the relevant stakeholders that have been described in Step 3 will be reviewed. Here, the type of collaboration that can be undertaken between the municipality and stakeholders will be examined, as well as what types of initiatives could potentially be implemented.

The initiatives that will be presented in this section arose for various reasons. Some of the strategies it is heavily based on the interviews and other where inspired form conversations with representees from Hjørring Municipality though out the semester.

## *Repair Café Danmark*

Through collaboration with Repair Café Denmark, Hjørring Municipality could start a Repair Café where, over time responsibility is given to volunteers, and it goes from being a municipal initiative to a volunteer initiative.

Repair Café Denmark has a template for municipalities that want to implement a Repair Café that could be utilised.

There are uncertainties related to whether the initiative will be utilised by citizens in Hjørring. However, it seems that Cafés vary in terms of users to repair (Monberg , 2023). However, this can be combated by prolonged information campaigns to the citizens making them aware of the initiative (Monberg , 2023; Bortoleto, 2015).

Repair Cafés can be held in public areas like libraries or community centres, and details about the event can be displayed in these facilities and on the municipality's website.

Although citizen participation may be low, starting a Repair Café in Hjørring city could still prove beneficial. An interview with Monberg revealed that positive spillover effects have occurred between volunteers and citizens, but the duration of these effects is unclear (Bortoleto, 2015; Bortoleto, et al., 2012; De Feo, et al., 2019).

Establishing a Repair Café through the municipality will require time and funding, which may need to be sourced from external means as it is not part of the budget. However, utilizing public spaces and volunteers for the events could potentially reduce costs. Tools and equipment necessary for the initiative could also be obtained through charity organisations or Nordværk, reducing costs further.

Before considering necessary tools and equipment, it is recommended that the municipality first establish a meeting to gauge citizen interest and skills.

## *Elementary school*

Hjørring Municipality has the potential to collaborate with elementary schools in Hjørring.

Hjørring Municipality has before acted as a judge for students sustainability projects. It is therefore recommended that Hjørring Municipality implement more of such initiatives. However, it is not feasible to collaborate with every school in Hjørring Municipality's districts.

As an alternative, the municipality could potentially host a presentation on International Climate Day, where elementary school students can present their findings, and the municipality could act as judges. This could be beneficial in multiple ways, increasing the focus on pro-environmental behaviour and initiatives that can be done, encouraging the younger generation’s engagement in sustainability, leading potentially to more pro-environmental behaviour, etc. If this initiative is implemented, it will be vital that citizens are informed about it via the municipality's social media platforms.

## *Charity organisation – Kirkens Korshær*

Hjørring Municipality has the potential to collaborate with charity organisations in Hjørring and potentially help set up a collaboration with other stakeholders.

Clear communication is crucial among all stakeholders regarding textile waste and which products can be reused, especially with the implementation of collection for textile waste (Hansen, 2023).

Charity organisations are collaborating with Nordværk. According to the interview with Thomas Thomsen, the collection plan aligns with the interests of the organisations. Collections will occur once or twice a week. Additionally, it is assumed that the materials and reuse will be placed in the same place as they currently are, which is covered and where the products are safe from wind and weather. This meets the needs of the organisations.

However, it could be recommended that there is a check-up on the donated products sent to reuse, identifying whether they are broken, minimising the time the charity organisations' volunteers need to spend looking through the products.

Charity organisations now have to pay for waste disposal due to EU legislation. Volunteers use their personal cars, which are registered as the organisation's vehicles and documented through photographs (Hansen, 2023). Even if the car is used for personal reasons or a volunteer leaves the organisation, the photograph will still be taken. The organisation will also be charged for the car entering the recycling station. To ensure this does not happen there may be a need for some level of communication between the charity organisation and Nordværk in the future.

During the interview with Hansen, it was identified that more initiatives could be established with charity organisations that do social work on a national level.

By earmarking money for the organisation, the municipality can set requirements that need to be met. Hjørring Municipality can potentially consider using funds for health care and social issues and set requirements that encourage waste prevention, e.g. sewing workshops for the citizens.

### *Social enterprise*

Hjørring Municipality could help establish collaboration between social enterprises and Nordværk.

A potential approach for a textile social enterprise is to focus on upcycling or repairing and selling the products. This could serve as an alternative to Nordværk's current practice of sending products to Africa. It is important to consider the interests of stakeholders to prevent any conflicts of interest. Conflicts with stakeholders may arise regarding growth, as social enterprises differ from traditional ones. However, if materials are free, the chances of conflict may lower.

The potential for implementing collaboration with Nordværk is deemed high since Nordværk already collaborates with social enterprises to handle some waste fractions, e.g. bricks (Thomsen , 2023).

To explore potential collaborations between Nordværk and social enterprises, it may be worthwhile for the municipality to investigate local start-up companies. However, it is important to first determine whether Nordværk is interested in pursuing such partnerships.

### *Nordværk*

With the new legislation with the privatisation of Nordværk, the collaboration will become lower between them and the municipality. However, the municipality will still have power over Nordværk to a certain extent. Therefore, there should still be conversations with Nordværk about waste prevention initiatives.

As a stakeholder, Nordværk can closely collaborate with many relevant stakeholders identified during step 2. These stakeholders include social enterprises and charity organisations.

Nordværk has already started a conversation with charity organisations about collaboration regarding products donated for reuse. The strategy the organisation has planned seems to consider some of the issues there might be for charity organisations (Thomsen , 2023; Hansen, 2023).

There are still some unresolved issues that are either unclear or haven't been addressed yet. These include the removal of products, and the registration of charity organisations' vehicles that are used when accessing the recycling depot (Hansen, 2023).

### *Sheltered workshop*

Hjørring Municipality can establish collaboration with the sheltered workshop. Currently, stakeholders are collaborating to upcycle old banners into bags that can be used by the municipality (Drustrup, 2023).

It is not clear whether the stakeholder can handle additional pro-environmental projects and tasks beyond what they are currently doing. However, implementing this initiative has brought about positive outcomes for both citizens and resource availability for treatment, as well as cost savings (Drustrup, 2023).

The organisation is already involved in many pro-environmental initiatives that are well-known within the community. If resources are limited, it is still recommended that Hjørring Municipality increase its efforts to inform the public about these initiatives, both those within the municipality and to private individuals.

After going over the initiatives that can be done in collaboration with Hjørring municipality and other relevant stakeholders a summary of the initiatives is precented below:

The initiatives that could be done in collaboration are:

1. Hjørring Municipality collaboration with local elementary schools where the municipality acts as a judge. Specifically, is it recommended setting up a event at the International Climate Day as a local event in the Municipality.
2. Hjørring Municipality could open up a Repair Café that over time will becomes run by volunteers. Its recommend that contact is taken to Repair Café Denmark to get the document for municipality outlining what steps can be taken.
3. Hjørring Municipality could collaborate with national charity organisation. Using earmarked funds from the social work budgets and setting requirements that also includes waste prevention initiatives e.g., sewing rooms.
4. Nordværk and charity organisation have set up collaboration regarding collection of product for reuse, where a majority of the concerns raised have been addressed. However, issues such as removing waste from reuse fraction donated and fees when volunteers use private cars when going to the recycling stations. These issues should be addressed between the stakeholders.
5. Hjørring Municipality could reach out to local social enterprises that could collaborate with Nordværk on reusing clothing.
6. Hjørring Municipality should increase their communication regarding initiatives done by the e.g., sheltered workshops to public.

In the next section, stakeholder analysis is presented for another critical waste fraction, WEEE, as identified in section 5.2.4.

## 5.4 Waste Electrical and electronic equipment

### 5.4.1 What is waste electrical and electronic equipment?

In this report, a specific type of electrical product will be focused on to ensure clarity and consistency. Given the broad range of electrical products, it is necessary to narrow it. Therefore, one product type will be selected to examine in detail throughout the rest of the report. Electronic devices and electrical equipment is an intergraded part of modern life, e.g. washing machines, vacuum cleaners, smartphones, computer headphones, etc. (European Parliament , 2023).

In 2020, the collection of electronic and electrical equipment in the EU consisted mostly of large household appliances, accounting for 52.7% of the total WEEE waste collected (European Parliament , 2023). Consumer equipment and photovoltaic panels made up 14.6%, while IT and telecommunication equipment comprised 14.1% of the collected WEEE (European Parliament , 2023).

The electronics lifespan differs significantly depending on the product type, and there can be a differentiation between 'actual lifetime', 'designed lifetime' and 'desired lifetime' (European Environment Agency b., 2020).

Smartphones have a lifetime of 1.8 years, are designed for 2 years and it is desired that they have a lifespan of 5.2 years. On average, a washing machine is classified as a large household appliance and is expected to last for 8 years. However, it is designed to last for 10 years, and it is desirable for it to have a lifespan of 12.7 years (European Environment Agency b., 2020).

In Denmark, the average lifespan for washing machines in 2020 was 9 years (Mogensen, 2021).

The average lifespan for large household appliances in Denmark is estimated to be 13 years (Mogensen, 2021). However, the lifespan differs significantly depending on the type of large household appliance being analysed. The lifespan for a refrigerator, on average, is 15 years, for an upright freezer is 18 years, and the average lifespan for an electric oven is 10 years (Mogensen, 2021).

The reason for buying a new large household appliance in Denmark 71% to 89% of the time is because the old appliance broke down (Mogensen, 2021).

In recent years, repairing large household appliances has become less common due to obstacles like expensive spare parts and labour costs (European Environment Agency r., 2022). In addition, there is a widespread shortage of expertise and understanding when it comes to fixing major household appliances. This issue is evident in Denmark, where recently the last educational institution shut down (European Environment Agency r., 2022; Freiesleben, 2023).

The amount of collected WEEE is mainly made up of large household appliances. Nordværk repairs large household appliances. Therefore will large household appliances be selected as the product type there will be worked with for the rest of this analysis.

### 5.4.2 Stakeholder analysis on electrical and electronic equipment with Hjørring Municipality

This section will present the results from the stakeholder analysis that was conducted with representatives from Hjørring Municipality. It was conducted to identify what relevant

stakeholders Hjørring Municipality could collaborate with in implementing waste prevention initiatives for WEEE.

### Step 1 – Brainstorm of relevant stakeholders for Hjørring Municipality

Figure 5.10 illustrates the stakeholders that were identified during a brainstorming with representatives from Hjørring Municipality. The stakeholders were identified based on whether they could impact textiles

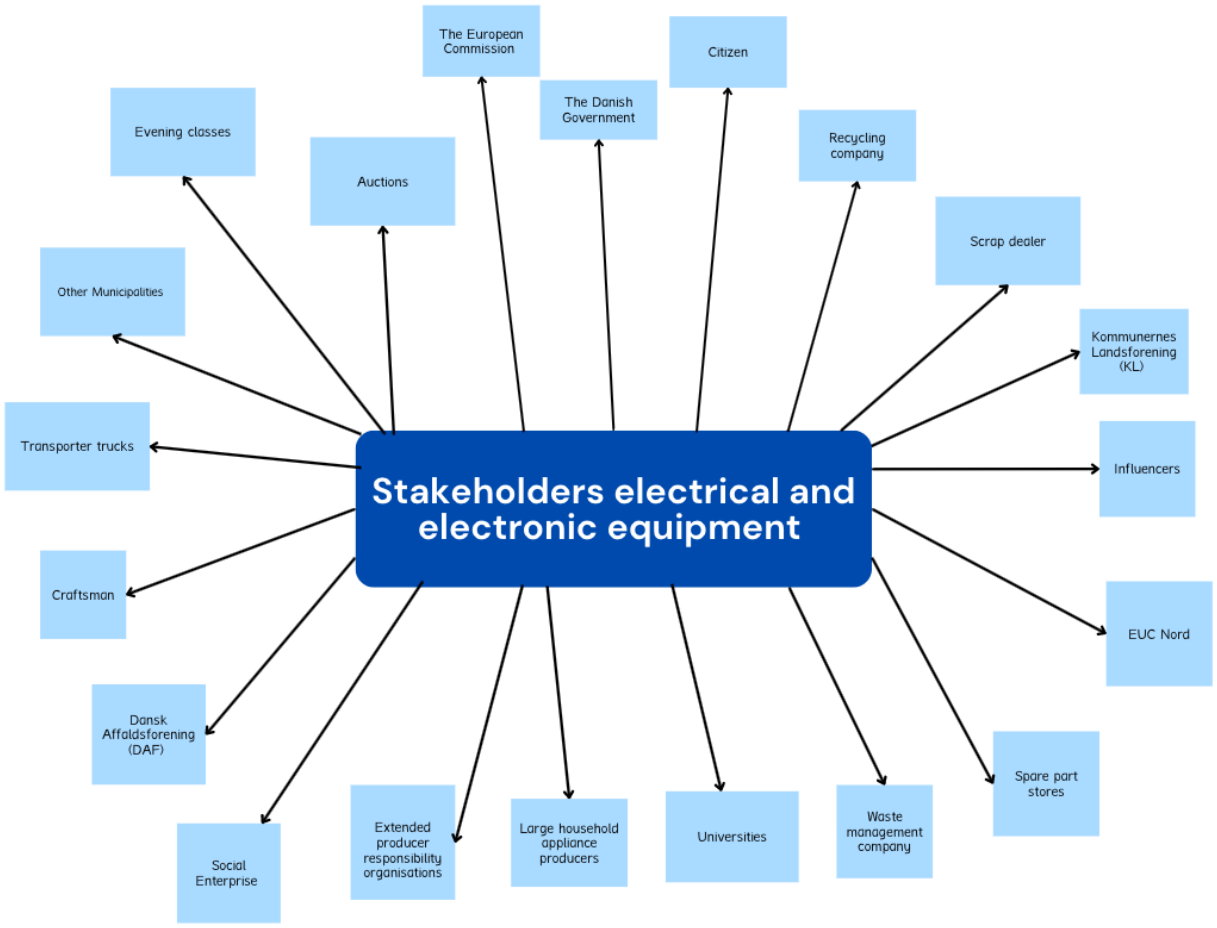


*Figure 5.10 shows a brainstorm identifier of the poseable stakeholders that can impact WEEE—own figure.*

The Figure illustrates that many different stakeholders could impact WEEE positively. It cannot be assumed that all the potential stakeholders are included; some might have been forgotten during the brainstorming process. When looking at the stakeholders that have been identified for electrical appliances, some can be put under the same category.

Figure 5.11 below illustrates the stakeholders that impact WEEE, placed into categories.

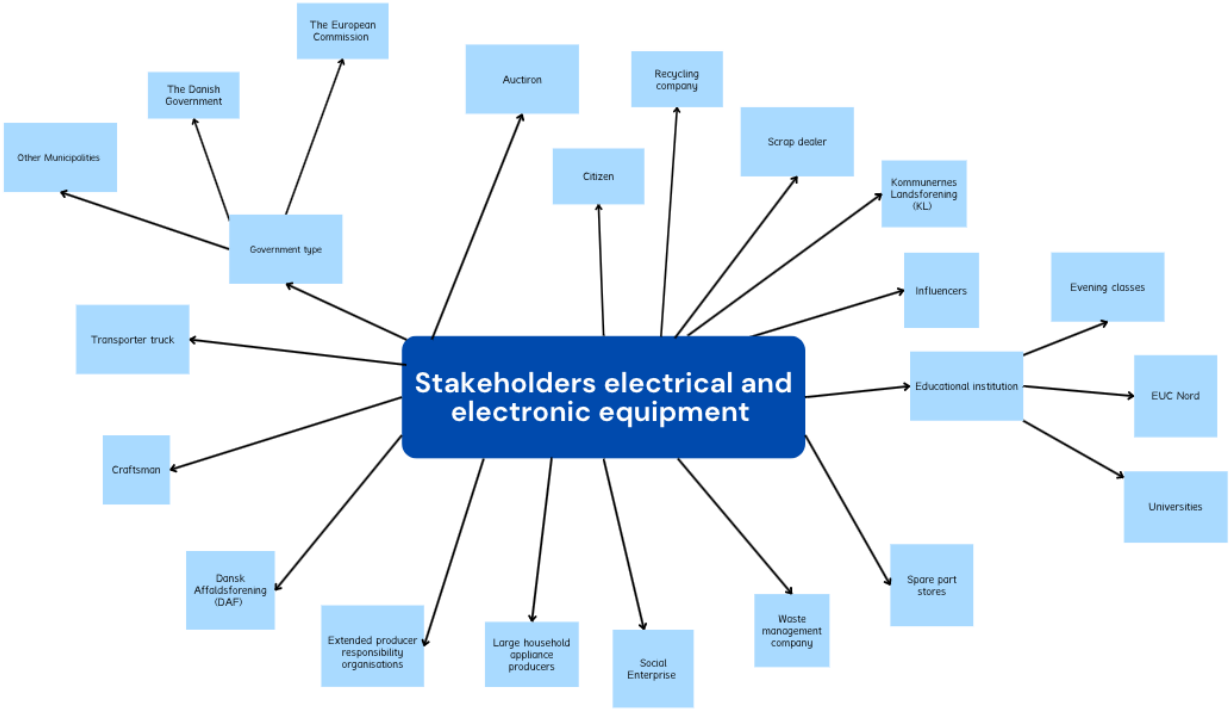


*Figure 5.11 shows the stakeholders that can impact WEEE in categories - own figure.*

The Figure demonstrates that stakeholders identified during the brainstorming session can be grouped into different categories. These categories include government and educational institutions.

### Step 2 – Categorising the relevant stakeholders.

During the meeting, the stakeholders identified in Step 1 were organised into a matrix. This matrix was based on two factors: their impact on waste (represented on the x-axis) and their level of collaboration with other stakeholders (represented on the y-axis). Figure 5.13 displays the resulting matrix.

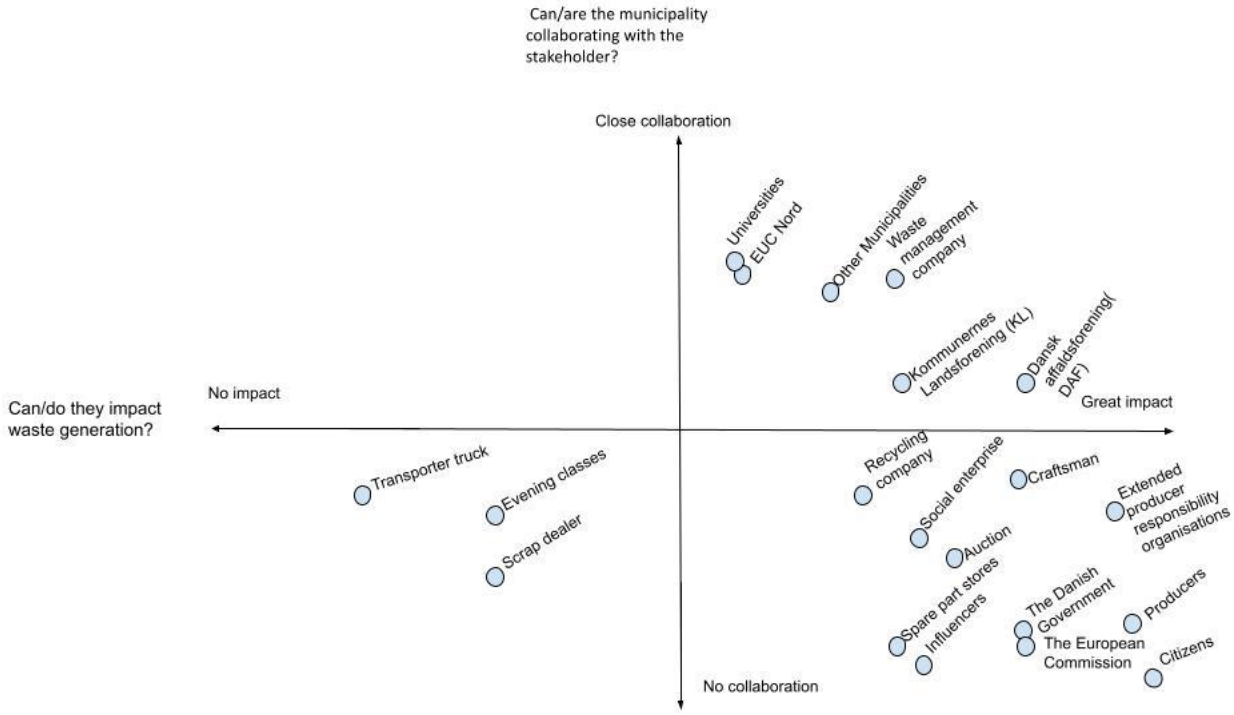


*Figure 5.12 shows the matrix done during the meeting with representatives from Hjørring Municipality. X-axis their impact on the waste fraction. Y-axis - how close collaboration could/are with the stakeholder—own figure.*

Figure displays the resulting matrix. The stakeholder's placement can be seen.

These stakeholders come from different levels - local, national, and international - and have an impact on electrical appliances at various stages of their life cycle.

They also have an impact on the environmental impact of waste, depending on the number of products they can process.

However, these perspectives are not shown in Figure 5.12.

They will be seen in the following Figures, 5.13 and 5.14, where the stakeholders will be placed. The result of the Figure be addressed further down in this section where relevant stakeholders will be identified for interview in step 3.

Figure 5.13, below, illustrates whether the stakeholders are international, European Union-only, national (Denmark), regional or local to Hjørring Municipality.

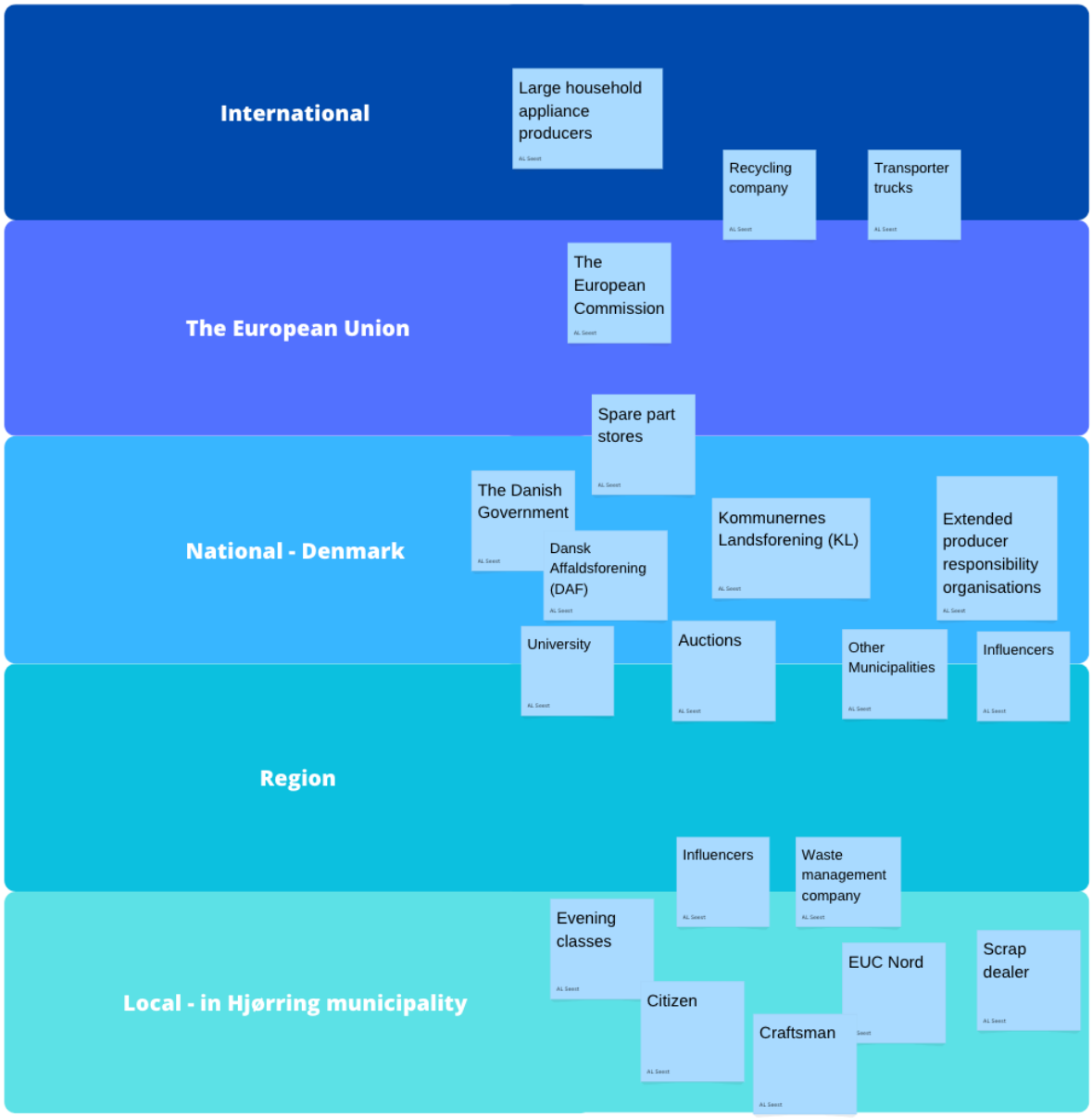


*Figure 5.13 illustrates where the stakeholders are on a local, regional, national, EU or national level—own figure.*

The Figure illustrates that most stakeholders are involved at a local level in Hjørring Municipality. However, a significant amount has been placed on a national level or bordering. More detailed descriptions of placements for each stakeholder are provided below.

Figure 5.14 shows when the stakeholders can impact the textile's life cycle.

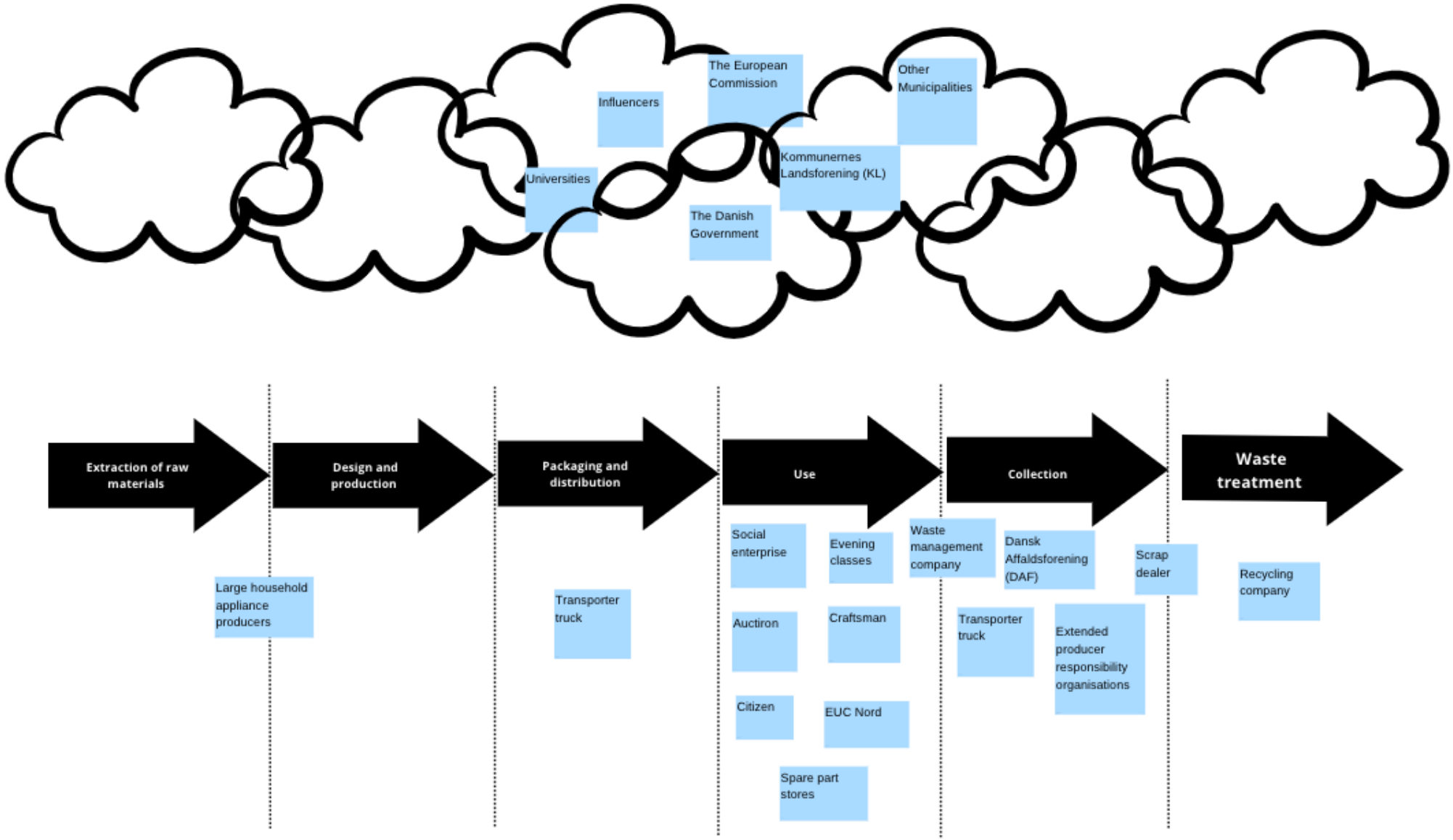


*Figure 5.14 illustrates where in the lifespan the stakeholders would impact the electrical and electronic equipment - own figure*

The Figure shows some stakeholders appearing multiple times because they impact various phases of the electrical and electronic equipment life cycle The Figure shows some stakeholders are identified not to impact a single/specific phase of the product life cycle but contribute through knowledge or legislation that can affect the life cycle. More detailed descriptions and placements for each stakeholder can be found further down.

After illustrating where stakeholders are in terms of local to international and where they can impact WEEE when looking at the product life cycle, the individual stakeholders and their interests will be briefly described.

Stakeholders will be chosen based on the result shown in Figures 5.12, 5.13 and 5.14.

The definition of waste prevention utilised in this report, see section 4.1, will also be used when determining relevant stakeholders.

The rationale for placing stakeholders from Figure 5.12, from the stakeholder meeting with representatives from Hjørring Municipality regarding WEEE, will also be utilised. A transcription of the meeting can be found in Appendices B.

### *The European Commission*

The European Commission was noted to have a significant impact on the generation of WEEE, as shown in Figure 5.12. According to studies and EU regulations, the legislation has some effectiveness in terms of waste prevention efforts (Willts, 2012; Magrini, et al., 2020; The European Parliament and of The Council, 2012). The level of collaboration is low, as shown in. As a result, the European Commission implements legislation affecting the municipality. As explained in section 5.1, a top-down approach is used to manage municipal waste from a Danish perspective.

Figure 5.13 identifies the stakeholder as being on a European level.

The stakeholder is identified not to impact a single/specific phase of the product life cycle, see Figure 5.14. The European Commission is creating legislation and plans that affect all member states of the EU, implementing laws that impact WEEE producers and encourage them to adopt more sustainable production practices (The European Parliament and of The Council, 2012).

Due to the inability to collaborate among the stakeholders, the European Commission will not be included any further.

### *The Danish Government*

The Danish Government is identified as having a significant impact on the generation of WEEE, see Figure 5.12, based on being an EU member state and therefore required to implement initiatives for waste prevention. Collaboration between the stakeholder is identified to be low. Collaboration can happen through other stakeholders, such as Kommunernes Landsforening, which speaks on behalf of Danish municipalities' interests.

The stakeholder is identified to be on a national level since the stakeholder is the state and has to plan the development of Denmark, see Figure 5.13.

The stakeholder is identified not to impact a single/specific phase of the product life cycle, see Figure 5.14. To affect certain phases, the stakeholder must collaborate with other actors, such as The European Commission, to influence the design phase of products (The Danish Environmental Protection Agency, 2021).
The stakeholder will not be included further in this analysis since collaboration cannot be established and because of the top-down relationship there is between the stakeholders.

## *Citizens*

Citizens were identified in the meeting as having one of the biggest impacts on the generation of WEEE waste, see Figure 5.12. The generation of household waste and current consumption patterns stem from them. Citizens were identified as having a low level of collaboration, see Figure 5.12. This was based on the fact that it was not feasible for the municipality to establish collaboration with the majority of the citizens in Hjørring Municipality.

Hjørring Municipality and the citizens could impact one another through top-down or bottom-up approaches. Hjørring Municipality can nudge the citizens to potentially utilise waste prevention initiatives. It is unclear whether or not they will be used since different factors impact one's decision-making (Ribeiro-Rodrigues, et al., 2021; Bortoleto, 2015; Bortoleto, et al., 2012).

Figure 5.13 highlights that stakeholders at a local level in Hjørring Municipality are identified as municipality citizens.

The stakeholders possess the power to significantly increase the product's longevity, as depicted in Figure 5.14, by opting to reuse, repair, or reduce the overall consumption of goods (Laitala, et al., 2021; Bocken , et al., 2016; Corvellec , 2016).

Large household appliances in Denmark typically last around 13 years before needing replacement due to various reasons, such as breakdowns, desire for something new, or moving (Mogensen, 2021). Some citizens want to make repairs, but the high cost of repairing makes it difficult for them to do so. As a result, the overall costs of the behaviour become too high, leading to reduced engagement levels (Bortoleto, 2015; Ribeiro-Rodrigues, et al., 2021; Hovgaard, 2023; Mogensen, 2021).

WEEE is generated by citizens, making them important stakeholders. However, it is unclear if the citizens and Hjørring Municipality collaborate or impact each other, see Appendices B. Due to this uncertainty, citizens are considered irrelevant and will not be included further.

## *Recycling Companies*

Recycling Companies were identified to have a limited impact on WEEE and a low level of collaboration with the municipality, see Figure 5.12. The recycling rate for WEEE is also below the average rate of recycling in the EU (European Environment Agency l., 2022).

Certain materials in WEEE can be recycled at a higher rate compared to other metals that have a lower recycling rate (European Environment Agency a., 2023).

As shown in Figure 5.13, the stakeholder is positioned at both the European and international levels. It is common for WEEE to be exported to EU countries or developing nations where environmental regulations are less strict, and labour costs are lower. This practice increases environmental and health risks for these areas (European Environment Agency a., 2023).

Figure 5.14 shows that recycling companies are positioned between the collection and waste treatment. This is because these companies are responsible for recycling the materials that can be recycled, such as copper and gold. On the other hand, any materials in the WEEE that cannot be recycled will be disposed of.

Since the stakeholder works with WEEE and focuses on recycling, it will not be included in this report as a relevant stakeholder since it is outside this report's scope.

### *Scrap dealer*

Scrap dealers are individuals or businesses that specialise in buying and selling scrap metal and other waste products.

The stakeholder is identified as having a minimal impact on the generation of WEEE. This is because they typically handle products after they have been classified as waste, see Figure 5.12. The stakeholder has low collaboration with Hjørring Municipality.

The stakeholder is identified to be on a local level in Hjørring municipality, see Figure 5.13. This is because there are eight scrap dealers (Novaindex b., 2023).

In the product life cycle, the stakeholder has an impact on two phases: collection, waste treatment. This is shown in Figure 5.14. The scrap dealer collects scrap metal and sells it to recycling companies for money, influencing the type of waste treatment that will be carried out.

Since the stakeholder works with electrical appliances after it has become waste, it will not be included in this report as a relevant stakeholder since it is outside this report's scope.

### *Kommunernes Landsforening*

Kommunernes Landsforening (KL) has a moderate impact on the generation of WEEE and has a low level of collaboration with Hjørring Municipality, see Figure 5.12.
The organisation's impact is because it comments on plans or legislation from The Danish Government (The Danish Ministry of Environment b., 2021; Danish Energy Agency, 2022).

The stakeholder is identified at a national level, see Figure 5.13. Since the stakeholder represents municipalities throughout Denmark (Kommunernes Landsforening, 2023; Kommunernes Landsforening , n.d.).

The stakeholder is identified not to impact a single/specific phase of the product life cycle, see Figure 5.14. To have an impact on a specific phase, they would need to collaborate with other actors, such as The Danish Government (Kommunernes Landsforening, 2023)

The stakeholder will not be included in the analysis any further since they do not directly impact the waste fraction but rather collaborate with others.

### *Influencers*

This stakeholder has been identified as having a possible impact on the WEEE fraction but has a low level of collaboration with the municipality, see Figure 5.12. The low level of collaboration stems from uncertainty about whether it could be considered collaboration if the person is paid for a service, see Appendices B.

Figure 5.13 shows that the stakeholder has been identified at the local, regional, and national levels. While influencers can be found at various levels, it is assumed that Hjørring Municipality will work with some of them.

The stakeholder is identified not to impact a single/specific phase of the product life cycle, see Figure 5.14., since the stakeholder can still inform about pro-environmental behaviour related to different life cycle phases such as consumer rights, right to repair, and take-back systems (Willts, 2012; De Feo, et al., 2019; Corvellec , 2016).

The stakeholder's level of influence is uncertain and is therefore deemed not to be relevant. Even if they collaborated, it would be brief and less effective in changing behaviour (Willts, 2012; De Feo, et al., 2019; Corvellec , 2016).

### *EUC Nord*

EUC Nord is an educational institute for vocational education, e.g. electricians (EUC Nord a., n.d.). The stakeholder is determined to have a minimal impact on waste generation, see Figure 5.12. This is because education for repairing large household appliances is decreasing in Denmark (Freiesleben, 2023). The level of collaboration is set high since collaboration with Hjørring Municipality is established.

The stakeholders have been placed on a local and regional level, see Figure 5.13. The organisation has buildings both in Hjørring and Frederikshavn (EUC Nord b., n.d.).

The stakeholder is identified not to impact a single/specific phase of the product life cycle, see Figure 5.14. Although the stakeholder possesses the ability to educate individuals on repairing large household appliances, there is no guarantee that their skills will be utilised.

The stakeholder is deemed to be relevant, since educations are shut down in Denmark. It's crucial to understand the reasons behind this decision as it could cause future obstacles.

### *Spare-part stores*

Spare-part stores are expected to have a moderate level of impact on WEEE generation, see Figure 5.12. However, there is a low level of collaboration in this area.

The stakeholder is positioned at national and European levels, as shown in Figure 5.13. This is because the store can only be located in Denmark or another European country, where spare parts are ordered online and shipped to the final destination.

Spare-part stores are identified to impact the use phase of the lifecycle, see Figure 5.14. The stores are responsible for making spare parts available, allowing for the repair of products. However, the availability of spare parts does not guarantee that the user will choose to extend the product's life due to factors such as cost, time and information (Šajn, 2022).

The stakeholder will not be included in this analysis since there are factors such as cost, time and information that hinder their impact.

### *Waste Management Company – Nordværk*

In Figure 5.12, waste management companies are identified as having a significant impact on WEEE and a strong level of collaboration with the municipality. This is because doing the meeting there was referred to the waste management company Nordværk.

According to Figure 5.13, the stakeholder has a dual role as a local and regional actor. This was explained in Section 5.2.1.

The stakeholder is positioned between the use phase and the collection, see figure 5.14. This is based on AVV's previous work with repairing large household appliances in collaboration with 'De grønne Hvidevarer' (Nordværk d., n.d.).

The stakeholder is considered relevant since they work locally with waste prevention and waste management and will be affected by the new legislation outlined in Law No. 898.

## *Universities*

Universities as a stakeholder can be categorised into two, collaboration with professors and with students. Hjørring Municipality is working with professors from Aalborg University to improve the use of large household appliances. The university can also collaborate with municipalities regarding projects. The municipality is also collaborating with students from Aalborg University on semester projects and a master's thesis.

Universities have been placed as having a low level of collaboration and having a relatively low impact on the generation of WEEE, see Figure 5.12. Placement is based on the University not necessarily having a direct impact, but they provide valuable knowledge that can indirectly influence decision-making (Hovgaard, 2023; Jørgensen, 2022; Hovgaard, 2022).

The stakeholder operates at both regional and national levels, see Figure 5.13. Aalborg University is situated in the northern part of the Jutland region. The university also has other campuses located in cities such as Copenhagen and Esbjerg (Aalborg Universitet , n.d.).

The stakeholder is identified not to impact a single/specific phase of the product life cycle, see Figure 5.14, based on Aalborg University's responses on the consultation phase for the Danish Action Plan for Circular Economy – National plan for prevention and handling of waste 2020-2032 [23].

Aalborg University provided feedback on the plan, stating that many of the initiatives were repetitive from previous plans (The Danish Ministry of Environment b., 2021). They also offered suggestions for how the plan could be enhanced. During the consultation phase of Law No. 898, Aalborg University provided comments that emphasized the importance of creating a framework that enables municipalities to have a positive impact on local actors (Danish Energy Agency, 2022).

Universities are deemed not to be relevant stakeholders based on waste generation for textiles. The stakeholder can be utilised to identify initiatives for waste prevention or barriers in place, but that is not an initiatives but rather information gathering.

## *Large household appliance producers*

The term producers refers to companies that manufacture major household appliances, such as LG Electronics, Samsung and Frigidaire. The producers have a significant level of impact on the generation of WEEE. However, collaboration with the stakeholder is not deemed possible, see Figure 5.12.

The stakeholder is identified as being on an international level due to the electronic industry's global presence, see Figure 5.13. Most companies have international connections and production often occurs in countries like China (European Environment Agency c., 2020).

Figure 5.14 shows that the stakeholder affects the raw materials, design and production, use phase, and collection. As the producer has control over the materials used and the production process, they can make decisions in those areas (European Environment Agency c., 2020). The impact on the use phase stems from the right to repair and that spare parts need to be made available by the producer (European Environment Agency a., 2023; The European Parliament and of The Council, 2012; Hovgaard, 2023). The impact on the collection phase stems from the producer responsibility, where producers are responsible for the waste treatment. The producers

[23] Own translation from – Handlingsplan for cirkulær økonomi – national plan for forebyggelse of håndtering af affald 2020-2032

are obligated to pay for the collection of their products once they have become waste (The European Parliament and of The Council, 2012).

It is unclear whether large household appliance producers would be interested in implementing waste prevention initiatives (Corvellec , 2016; Willts, 2012; Bocken , et al., 2016). There has been a lack of initiative from them in recent years whilst working against other stakeholders trying to implement waste prevention initiatives for large household appliances (Hovgaard, 2023; Winther, 2021).

Therefore, the stakeholder will not be included further in this report as a relevant stakeholder since the stakeholder is not interested in extending the life span of the product, and it can be argued that they may work against it.

### *Extended producer responsibility organisations*

Extended producer responsibility organisations, are organisations such as ELretur, Recipo and EPR Danmark that handle WEEE on behalf of the companies (Elretur, n.d. ; EPR Danmark , n.d. ; Recipo, n.d.). The organisations have a significant level of impact on the generation of WEEE, see Figure 5.12. However, collaboration with the stakeholder is not deemed possible.
The organisations operate on a national level, see Figure 5.13. Since this report only focuses on Denmark.

The organisations impact the collection and waste treatment phases, see Figure 5.14, focusing on recycling the product.

It should be noted that organisations also promote reuse and waste prevention and have stated that they are interested in increasing reuse (Elretur, 2023; EPR Danmark b., n.d.). However, it is also noted that the stakeholders have opposed waste prevention initiatives in the past within the Danish context (Winther, 2021; Jørgensen, 2022)

Extended producer responsibility organisations is involved in the treatment of waste. The stakeholder has commented on waste prevention. However, since this is not a focus for the stakeholder, the stakeholder will not be included further.

### *Dansk Affaldsforening*

Hjørring Municipality has established collaboration with Dansk Affaldsforening (DAF), which is considered to have a moderate level of collaboration. DAF has an impact of the generation of WEEE, see Figure 5.12, since provides comments on Danish waste legislation, policies and requirements (Dansk Affaldsforening a., n.d.).

The stakeholder has been identified as being on a national level, see Figure 5.13, since DAF is a professional organisation comprised of municipal waste management companies (Dansk Affaldsforening a., n.d.)

The organisation mainly focuses on managing waste, therefore, impacting the collection phase of the life cycle, see Figure 5.14. However, it's worth noting that DAF places emphasis on waste prevention.

In the Action Plan for circular economy - National Plan for Prevention and Handling of Waste 2020-2032, DAF raises concerns about the necessity of separating waste and suggests that more incentives should be taken for waste prevention (The Danish Ministry of Environment b., 2021). DAF states that the definition of waste creates a barrier to waste prevention in practice (The

Danish Ministry of Environment b., 2021). DAF has shared its thoughts on Law No. 898 stating that it does not set specific reuse requirements (Danish Energy Agency, 2022).

DAFs is involved in the treatment of waste. The stakeholder has commented on waste prevention. However, since this is not a focus for the stakeholder, the stakeholder will not be included further.

### *Craftspeople*

A craftsperson is someone who repairs major household appliances as part of their job. In terms of the impact on WEEE, the stakeholder is identified as having a moderate impact, as they can repair and prolong the product's use phase. The collaboration level is set to be low, see Figure 5.12.

The stakeholder is on a local level in Hjørring Municipality, see Figure 5.13. Two companies were identified within Hjørring Municipality that provide repair services for large household appliances (Aktiv Hvidevareservice, n.d.; Lørslev Hvidevareservice, n.d.).

The stakeholders can impact the product's use phase, see Figure 5.14. This is because they can provide services that extend the product's lifespan. Despite the availability of repair options, users may consider factors like cost, time and information when (Šajn, 2022).

The stakeholder will not be included in this analysis since there are factors such as cost, time and information that hinder their impact.

### *Transporter trucks*

The stakeholder has been identified as having a low level of collaboration with Hjørring Municipality and a minimal impact on the generation of WEEE, see Figure 5.12. The placement is based on the stakeholder not impacting the waste transported for recycling, incineration, or reuse. The objective is to perform the task of transporting, which is unrelated to waste generation. Collaboration is set low since the transportation truck is paired. For services, this is not a collaboration based on similar interests but on services being fulfilled.

The stakeholder is identified to operate between an EU level and international level, see Figure 5.13, since most WEEE is exported to other countries and most electrical appliances are produced in, e.g., China (European Environment Agency a., 2023; European Environment Agency c., 2020).

They impact packaging and distribution and collection, where they can perform their service, as shown in Figure 5.14.

Since the stakeholder provides a service due to a need, the stakeholder will not be included.

### *Other municipalities*

The stakeholder has a moderate level of collaboration and on the generation of WEEE, see Figure 5.12. This is because Nordværk municipality is working with other municipalities to collect waste, see section 5.2.1.

The stakeholder is Identified to be regional; see Figure 5.13. This is because Hjørring Municipality collaborates with other municipalities in northern Jutland, see section 5.2.1.

The stakeholder is identified not to impact a single/specific phase of the product life cycle, see Figure 5.14, since the other municipalities have the same regulatory framework, see section 5.1.

The stakeholder is deemed not to be relevant due to their existing collaboration through Nordværk, and due to the regulatory framework dealing with the same issues as Hjørring municipality in terms of implementing waste prevention initiatives.

### *Evening classes*

the stakeholder has a moderate level of collaboration with the municipality, see Figure 5.12, as Hjørring Municipality collaborates with LOF to offer evening classes (AOF b., n.d.; LOF c., n.d.). However, the stakeholder does not impact the generation WEEE since no classes related to repairing or learning to repair large household appliances are available.

The stakeholder has been identified as a local actor, as both AOF and LOF offer classes in Hjørring, see Figure 5.13 (AOF a., n.d.; LOF b., n.d.). Although the organisation is a national actor, this report will only focus on classes that are available in Hjørring since it is not realistic to assume that the citizens will travel, e.g. to Aalborg, for evening classes.

The stakeholder is placed to potentially impact the use phase of large household appliances, as shown in Figure 5.14, because repairing them could have been learned.

Since there are currently no classes available, the stakeholder is not considered relevant.

### *Auctions*

Auctions have been identified as impacting the generation of the WEEE, see Figure 5.12. However, the stakeholder has been identified as having a low level of collaboration with Hjørring municipality.

The stakeholder is identified as acting both on a regional and national level, see Figure 5.13. The placement is determined because auctions are held at various locations throughout the country. (Auktionshuset dab A/S, n.d.; Campen Auktioner, n.d.; Kingo Auktioner , n.d.).

The stakeholder is identified to impact the use phase, see Figure 5.14. The placement stems from the stakeholder reselling large household appliances. The appliance can be either used or new.

The stakeholder won't be involved in the analysis due to minimal collaboration with the municipality and uncertainty about the impact they may have.

### *Social enterprise*

Figure 5.12 shows that social enterprises have limited collaboration with the Hjørring Municipality and may not have a significant impact on waste generation.

Currently, there are no social enterprises that repair large household appliances in Denmark. Therefore, the stakeholder has not been included in Figure 5.13 (Socialøkonomiske virksomheder i DK b., 2023).

Figure 5.14 indicates that social enterprises can potentially impact the product's use phase.

Although it is assumed that a company repairing large household appliances would function similarly to Nordværk, this stakeholder will not be analysed further since there are no social enterprises repairing large household appliances in Denmark.

After going over the stakeholders identified in collaboration with Hjørring municipality, relevant stakeholders will be analysed further in this analysis. Table 5.6, bellow, summarises the result for all stakeholders analysed and a short description of the argument.

| Stakeholder textiles | Impact on waste generation | Level of collaboration | Local to international level | Impact on life cycle phase(s) | Key argumentation | Relevant or irrelevant |
|---|---|---|---|---|---|---|
| The European Commission | High | Non | The European Commission | No single/specific | No collaberation and top-down relationship | Irrelevant |
| The Danish Government | High | Non | National | No single/specific | No collaberation and top-down relationship | Irrelevant |
| Citizens | High | Non | Local | Use | Impact vs. Collaberation. | Irrelevant |
| Recycling Companies | Medium | Low | International | Waste treament | Focus on product after it is waste | Irrelevant |
| Scrap dealer | Non | Low | Local | Collection and Waste treatment | Focus on product after it is waste | Irrelevant |
| Kommunernes Landsforening | Medium | Low | National | No single/specific | No direct impact. Just collaborates | Irrelevant |
| Influencers | Medium | Non | Local, Region and National | No single/specific | Collaberation if paied? Uncertainties regarding impact | Irrelevant |
| EUC Nord | Low | Medium | Local and Region | Use | Educations are shutting down. May be lack in the future | Relevant |
| Spare-part stores | Medium | Non | National and European | Use | Low impact. Other factors as cost, time and information hinder their impact. | Irrelevant |
| Waste Management Company – Nordværk | Medium | Medium | Local and Region | Use and collection | Local, works with waste prevenction and handeling. Will be impacted by Law No. 898 | Relevant |
| Universities | Low | Medium | Region and National | Extraction of raw matrials, design and production and collection | The stakeholder is not interested in extending the life span of the product/may work against it | Irrelevant |
| Large household appliance producers | High | Non | International | Extraction of raw matrials, and design and production | Not interested in extending the life span of the product/may work against it | Irrelevant |
| Extended producer responsibility organisations | High | Low | National | Collection | Focus on product after it is waste | Irrelevant |
| Dansk Affaldsforening | Small | Small | National | Collection | Focus on product after it is waste | Irrelevant |
| Craftspeople | Medium | Low | Local | Use | Low impact. Other factors as cost, time and information hinder their impact. | Irrelevant |
| Transporter trucks | No impact | Low | The European Union and International | Packaging and distribution, and collection | Provides a service | Irrelevant |
| Other municipalities | Medium | Medium | Region and National | No single/specific | Facing same problems regulatory problems | Irrelevant |
| Evening classes | No impact | Low | Local | Use | No classes available and unclear impact | Irrelevant |
| Auctions | Medium | Low | Region and National | Use | Facing same problems regulatory problems | Irrelevant |
| Social enterprise | Medium | Low | — | Use | No enterprices available and unclear impact | Irrelevant |

*Table 5.6 Summarry of results from step 2 for WEEE for each stakeholder.*

### Step 3 – Achieving a deeper understanding of the stakeholder's relation

This section will detail the relevant stakeholders identified for WEEE in the previous section.

The stakeholders are universities, waste management companies and EUC Nord.

Emails were sent to all relevant stakeholders inviting them for interview. However, only some responded. For the stakeholders that could be interviewed, the results from the interview will be referred to. For stakeholders that could not be interviewed, relevant literature will be referenced instead.

## *Nordværk*

An interview was conducted with the Chief of Reuse at Nordværk, Thomas Thomsen, to gain more information regarding the organisation. Transcription of the interview can be found in Appendices D.

As stated in section 5.2.1, AVV merged in 2022 and became Nordværk. According to Thomsen, since the merger between AVV and I/S Reno-Nord in 2022, their work has continued as before.

Vision and viewpoint haven't changed but have been reworded - previously, it was "*Be Ahead. Think about the environment first. Show respect. Take responsibility*"[24].

AVV has been taking on assignments beyond their scope due to their vision for many years. They have been given full responsibility for handling waste from Hjørring and Brønderslev municipalities, which has allowed them to implement their desired initiatives allowing them to implement initiatives such as repairing large household appliances. However, there has been some backlash regarding the repairing of large household appliances at Nordværk (Thomsen , 2023; Winther, 2021).

The discussion focused on whether Nordværk is repairing waste or whether they can be considered products when donated.

Citizens can donate their large household appliances for reuse. Information has been provided regarding the benefits of sending appliances for reuse, however, it is solely up to citizens to decide whether they want their appliances to be repaired (Thomsen , 2023).

Workers may try to convince citizens to donate their appliances if they appear to be in good condition, but it is ultimately the citizens' decision. Nordværk is not allowed to take products that have been declared waste, as repairing them would create conflicts.

The new legislation, Law No. 898, prohibits Nordværk from running the repair station for large household appliances. However, there is a plan to continue repairs by renting out the facilities to another company. The appliances will no longer be sold at Nordværks second-hand store but somewhere else (Thomsen , 2023).

## *EUC Nord*

Despite attempts to secure an interview with an EUC Nord representative, it was not possible. However, over the phone, a conversation was held with Steffen Damgaard, Head of Education for Energy & Construction at EUC Nord, to inquire about their involvement with repairing large household appliances.

[24] Own translation from – "På forkant. Tænk miljøet først. Vis respect. Tag ansvar."

Damgaard clarified that EUC Nord does not offer any classes related to repairing large household appliances. While some students may choose to work on repairs as part of their final project.

The repairing of large household appliances is only taught at one educational institution in Zealand, according to Damgaard. The educational institution he referred to is the one that is closing down (Freiesleben, 2023).

He also stated that he is unaware of the current practices of any relevant companies and does not wish to comment on the matter.

### Step 4 – Initiatives for waste prevention in collaboration with stakeholders

In this section, the results from the relevant stakeholders that have been described in Step 3 will be reviewed. The type of collaboration that can be done between the municipality and stakeholders will be examined, as well as what type of initiatives could potentially be implemented. The initiatives that will be presented in this section arose for various reasons. The strategies are based on the interviews.

## *Nordværk*

Due to a change in legislation, Nordværk is no longer legally allowed to repair large household appliances. Repairs will be done by an external stakeholder that will be responsible for selling the appliances.

This means a partnership between the municipality and Nordværk cannot be established for repairing large household appliances.

## *EUC Nord*

The stakeholder is not identified to help with any initiatives related to repairing large household appliances. Based on the phone call, it is unclear whether the stakeholder would be interested in educating students in repairing large household appliances. It can be argued that the institute might not be interested in this since it was not mentioned during the interview (Freiesleben, 2023)

No waste prevention initiatives can be for electrical and electronic equipment product type large household appliances.

After going over the waste prevention initiatives that can be done for the waste fractions textiles and electrical and electronic equipment in collaboration with relevant stakeholders. It is evident that more initiatives can be done for textiles than electrical and electronic equipment.
Through the interviews with relevant stakeholders and the document analysis of the regulatory framework, some barriers have been identified. Therefore, in the next section these barriers will be reviewed and categorised.

## 5.5 - Barriers to implementing waste prevention initiatives from a municipal perspective.

In this section, barriers that were discovered through analysis and interviews with stakeholders will be discussed. The identified barrier categories are 'cultural', 'regulatory' and 'financial'. Some of the identified barriers for both waste fractions are a mix of different types and will be noted.

**Cultural barriers** refer to those that exist in a social, behavioural and managerial context.

**Regulatory barriers** are those that exist due to policies, the regulatory environment and specific problematic legislation and regulation.

**Financial barriers** relate to financial issues in the market.

Figure 5.15 shows the identified barriers separated into three categories: textile, WEEE and overlapping.

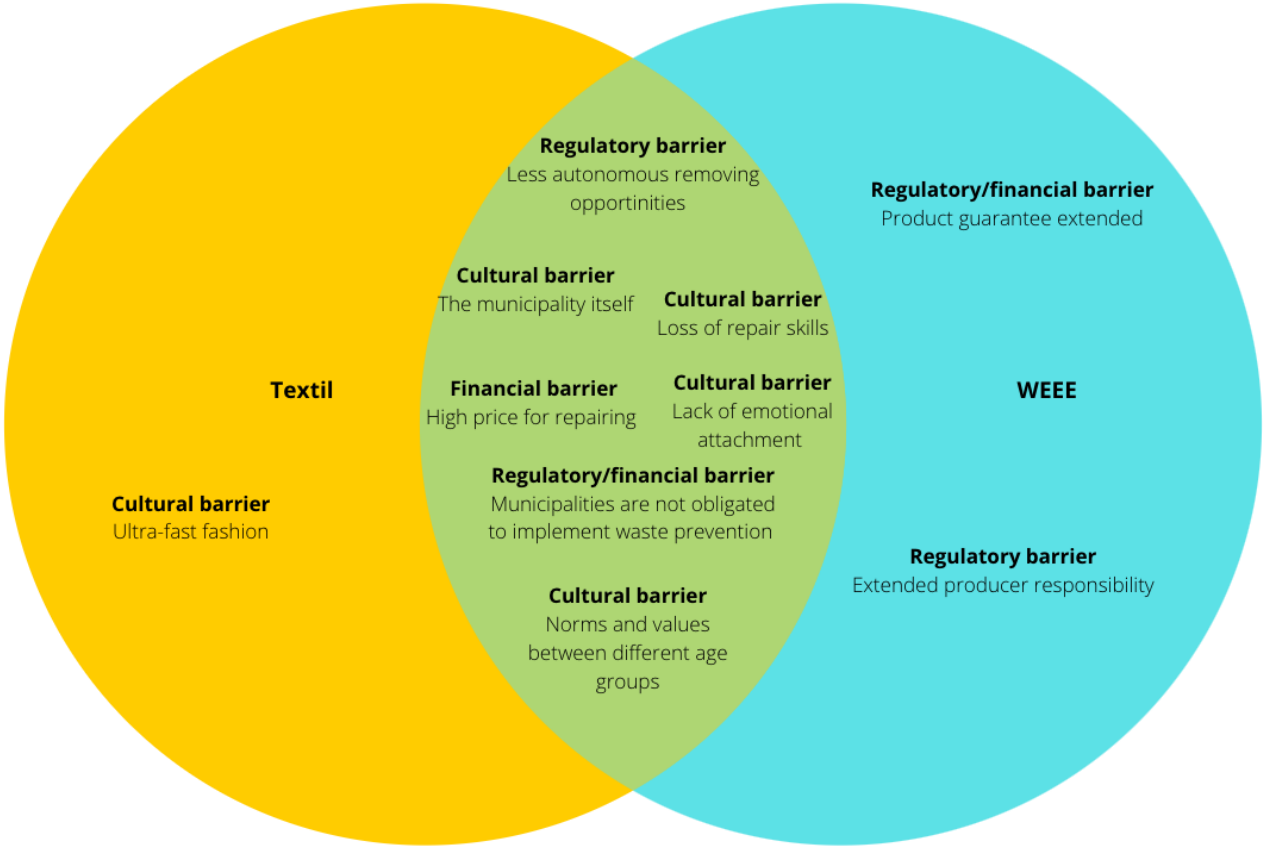


*Figure 5.15 Venn diagram for the sectoral barriers for the textile and WEEE, as well as the overlapping barriers.*

### 5.6.1 Textile sector barriers

**Cultural barrier** - During an interview with Dorthe Egede Hansen, the concept of ultra-fast fashion was discussed as a modern phenomenon that emerged after COVID-19.

This involves individuals ordering between 20 to 30 items from China, costing them anywhere from 1700 to 1800 Kr. Consumers can purchase multiple items in various sizes, and these products hit the market within a week. Unfortunately, this trend creates a mass consumption of clothing that quickly becomes waste.

The trend of ultra-fast fashion is growing rapidly, with clothing produced quickly and at a much cheaper quality than traditional fast fashion.

### 5.6.2 WEEE sector barriers

**Regulatory/financial barriers** - Christien Monberg has identified a barrier to extending the lifespan of products - the short product guarantee of only two years. This results in high repair costs, making it more economically viable for consumers to purchase new products instead of repairing.

**Regulatory barriers** - There is a regulatory framework in place for Electronic and Electrical Equipment waste, with extended producer responsibility as a key focus. However, the report highlights that producers may not always comply with waste prevention initiatives. This can lead to confusion and rigidity in waste management practices.

### 5.6.3 Overlapping barriers

**Cultural barriers** - The municipality seems to be hindering itself. As a legal body responsible for enforcing legislation at a larger scale and having closer connections with citizens than other legal entities, it has certain expectations from stakeholders.

**Cultural barriers** – Christien Monberg suggests that people often seek to repair their products due to sentimental attachments. Unfortunately, as repair skills have become less common and products more difficult to fix, it has become increasingly challenging to maintain these emotional connections to our possessions.

**Cultural barriers** – Based on the interview with Christien Monberg and Dorthe Egede Hansen and reports and articles read throughout the report a barrier that can be identified is the loss of skills and knowledge related to repair (Freiesleben, 2023).

**Cultural barriers -** During interviews with Christien Monberg and Dorthe Egede Hansen, it was discovered that different age groups have distinct norms and values that may impede decision-making. Individuals aged 60 to 90 years or more are inclined to fix things due to sentimental attachment or their belief in the value of repair. On the other hand, young people aged 18 to 29 are motivated by economic advantages, such as cheaper clothes or higher repair costs. The generation can be divided into two categories: those who are highly committed to environmental concerns and those who prioritize financial incentives. The latter group may still engage in pro-environmental practices, such as shopping at second-hand stores or buying used items.

**Regulatory barriers** - During an interview with Thomas Thomsen, it was identified that the waste management sector is facing a barrier in the form of increased legislation. This legislation limits the flexibility of waste management companies and can lead to further complications. For example, under new Law No. 898, waste management companies are prohibited from performing certain functions, such as breaking down wood chips. Instead, they must involve a private company in the process, which can hinder their ability to utilise advanced technologies and complicate the process.

**Regulatory/financial barriers –** As concluded in analysis 5.1, the municipalities are not legally obligated to implement preventive waste initiatives but can utilise municipal authorisation to do so. However, waste prevention cannot be funded by fees set aside for waste management since it is not a part of the legal obligation. If they want to implement waste prevention, money must come from elsewhere.

**Financial barriers –** Based on the interview with Christien Monberg, one of the motivating factors for utilising Repair Cafés was the high repair price. The higher prices create a barrier for citizens interested in extending the product's use phase.

# 6. Discussion

## 6.1 Method discussion

### 6.1.3 Stakeholder analysis

This report utilised the stakeholder method in collaboration with Hjørring Municipality to identify relevant stakeholders. However, this approach can be debated. During the brainstorming phase, Repair Café was initially deemed to have low collaboration with municipalities.

Despite this, the stakeholder was still identified as relevant, and an interview was conducted with the President of Repair Café Denmark, Christen Monberg. Through this interview, it was discovered that the initial assessment of the stakeholder was incorrect. Repair Cafe Denmark has collaborated extensively with municipalities and had initiatives to help implement Repair Cafés and offer consultation.

If this stakeholder had been discarded as irrelevant, this vital information would not have been uncovered. It is essential to consider whether this information could have been gathered elsewhere, such as through a literature review, however, when gathering information on the stakeholder this was not found.

Additionally, conducting brainstorming sessions with various municipalities known for implementing waste prevention initiatives could provide further insight into stakeholders and potential loopholes in current legislation.

It is also worth considering whether every stakeholder should be interviewed rather than deeming some relevant or irrelevant. However, it would have been unrealistic to interview all stakeholders during the report's timeframe.

During interviews, questions were raised regarding electrical appliances, which led to the discovery of previously unidentified stakeholders, such as sheltered workshops and charity organisations. It was discovered that these stakeholders had the potential to repair large household appliances, but issues such as time, financing and knowledge were identified as barriers (Drustrup, 2023; Hansen, 2023).

Doing the interview with Monberg from Repair Café Danmark, it was noted that repairing large household appliances would pose several challenges. These included the time required to diagnose the problem, which could be better utilised on other products, as well as difficulties in transportation (Monberg , 2023).

While some influential stakeholders may yet to be noticed, their input could still be gathered through interviews or brainstorming sessions with other municipalities. While the results are still relevant, it cannot be claimed that all relevant stakeholders have been identified

## 6.2 Discussion of the results of the report

### 6.2.1 What is a critical waste fraction?

In this report, textiles and WEEE were chosen as two critical waste fractions. There may be differing opinions regarding whether these waste fractions are critical and whether other conclusions should have been reached.

The two waste fractions were chosen based on the case study. It could be argued that other waste fractions, such as food waste, could have been chosen.

Prevention plans from European countries show food waste is a vast topic based on the ethical question regarding wasting food when others are starving (European Environment Agency a., 2022; European Environment Agency b. , 2022; European Environment Agency f. , 2022; European Environment Agency d. , 2022; European Commission d., n.d.).

A study from 2014 found that Danish households were responsible for 50% of all food waste in Denmark (Sánchez, 2020). When looking at the food that has been discarded, 24% of the food waste from households could have been eaten (Sánchez, 2020).

Plastic waste is another waste fraction that can be identified as critical based on the environmental impact. Plastic is utilised in multiple products and is part of our daily lives. The lack of proper material treatment has led to severe negative impacts on the environment and human health (European Commission f., n.d.).

Plastics have a low recycling rate. It is estimated that only about 9% of plastics produced are recycled, and 12% are incinerated (European Environment Agency g., 2023). The remaining amounts are either still in use, have been disposed of in landfills or are in the environment, including the oceans.

Plastics account for approximately 85% of marine litter (European Environment Agency g., 2023). The marine life that can eat it, choke on it or feed it to its young. Plastics also affect human health by impacting marine life since marine life will consume them and enter our food chain.

Residual waste could also be considered as a candidate, being comprised of multiple materials and resources left over after sorting (Nordværk i., n.d.). This can also be a product or material that, at the current time, cannot be recycled, such as diapers, gum, small dead pets, pizza boxes, etc. (Hjørring Municipality, n.d.).

In Denmark, residual waste is incinerated and the excess heat is used in the district heating sector. The emissions from waste incineration vary depending on the specific components present in the waste. For one ton of plastic waste that is incinerated, ca. 2.8 tons of $CO_2$ is emitted (Danish Ministry of Climate, Energy and Utilities & Ministry of Food, Agriculture and Fisheries of Denmark , n.d.). If one wants to do waste prevention for this waste fraction, the report could have looked at specific waste types, for example, diapers where there are cloth alternatives that could be washed (Hoffmann, et al., 2020; Renkert & Filippone, 2023).

Multiple different fractions could have been looked at; however, since this was a case study, it was found to be most optimal to choose the waste fraction the municipality had worked with or was going to work with at the time. If another municipality had been chosen, other waste fractions could have been identified as critical.

### 6.2.2 Gaps in legislation hindering waste prevention initiatives

This report compares the legal definition of waste prevention to practice, addressing issues where regulation and practises don't align. However, this is not only an issue regarding the dictionary definition of waste prevention but also the regulatory framework for handling and managing municipal waste.

EU regulations require member states to implement waste prevention plans. This gives member states the flexibility to choose how they want to handle waste prevention, whether through legislation, campaigns or local government initiatives, as outlined in Section 1. Nevertheless, this remains a common issue for environmental legislation (Börzel & Buzogány, 2019; Farber, 2016; Rose, 2011).

One of the issues related to environmental legislation is the monitoring and covering of all types of acts over a long period (Börzel & Buzogány, 2019). The European Commission is neither capable nor willing to monitor all issues or violations (Börzel & Buzogány, 2019).

It is possible to argue that only a small portion of cases related to violations in member states are visible. This is because many cases may go unnoticed due to citizens' lack of awareness about the situation and its potential consequences (Börzel & Buzogány, 2019; Farber, 2016).

When waste prevention is not given specific targets, it can lead to a chaotic situation where various initiatives are implemented without considering their impact. This can result in some initiatives negatively affecting waste prevention efforts while increasing recycling rates.

This seems to be the case in Denmark, as organisations have raised concerns during the consultation phase of the Action Plan for Circular Economy - National Plan for Prevention and Handling of Waste 2020-2032, pointing out that the initiatives were more focused on recycling than waste prevention (The Danish Ministry of Environment b., 2021). It was criticised that there was not enough focus on repairing and reusing. Aalborg University commented that the waste prevention initiatives presented by The Danish Government could work as barriers to implementing waste prevention initiatives (The Danish Ministry of Environment b., 2021).

During the consultation phase for Law No. 898, concerns were raised by multiple organisations on the scope. Fagligt Fælles Forbund stated that more focus should be on minimising the waste streams and further pointed out that the initiative did not match the focus set in the Climate plan for a Green Waste sector and Circular Economy from 2020 (Danish Energy Agency, 2022).

The lack of initiatives from the Danish side could stem from the instruction for the implementation of EU regulations set by the Danish Business Authority, stating that Denmark should only implement the minimum obligation set by EU-regulation (Danish Business Authority , 2019).

Targets have yet to be set on an EU level for waste prevention. It is unclear whether targets will be set on an EU level with the revision of the waste directives since the EU seems to be removing targets for reuse from the packaging waste draft law (Taylor , 2023). The lack of a target set by the EU creates a problematic barrier if one member state decides to only implement the minimal requirements set by EU regulation. However, as discussed before, the problem lies with more than just the lack of targets but also in the definitions utilised in the waste directive. According to some organisations, the definition of waste creates a barrier on its own.

Therefore, it can be argued that a new definition for waste and waste prevention must be implemented and concrete targets must be set.

It needs to be clarified whose responsibility it should be to implement waste prevention initiatives. Unfortunately, the current strategy is not effective in practice, especially when member states are unwilling to participate beyond their required obligations.

### 6.2.3 Textiles vs WEEE initiatives

This report examines waste fractions for textiles and electronic appliances where product types clothing and large household appliances was focused on. Coming with suggestions for what the municipality can collaborate with other stakeholders to implement waste prevention initiatives. By analysing the stakeholders, it becomes clear that more initiatives can be done for textiles than for electronic appliances.

The difference in the initiatives can be influenced by several factors that impact the citizens' ability to adopt pro-environmental behaviour, such as increased behavioural costs, regulatory barriers, cultural barriers and economic incentives (Bortoleto, 2015; Bortoleto, et al., 2012; Ribeiro-Rodrigues, et al., 2021).

Based on interviews with Christen Monberg and Dorthe Egede Hansen, it can be argued that repairing clothing is easier to learn than repairing large household appliances. Therefore, sewing and repairing have been introduced into Danish schools, teaching children about pro-environmental behaviour and making them aware of the possibilities. Unlike with clothing, the necessary skills for repairing large household appliances seem to have been lost due to a lack of education (European Environment Agency r., 2022; Freiesleben, 2023).

Repairing clothing is receiving more attention compared to fixing large household appliances due to personal effort and low behavioural costs (Bortoleto, 2015). It is easier for citizens to engage in pro-environmental behaviour with clothing than with large household appliances.

Although the cost of repairing both types of products is high, information on repairing clothing and the cost of the tools needed is relatively low compared to that for large household appliances. However, it is important to note that even with the low cost of repairing clothing, there is a lack of economic incentive for repair in most cases, as the price for new products continues to decrease (Ellen MacArthur Foundation, 2017; Hansen, 2023).

Clothing and household appliance repairs still depend on societal norms and values (Bortoleto, 2015). There are financial and cultural barriers in place that are increasing the behaviour cost. However, values and identity may encourage citizens to continue to engage in this pro-environmental behaviour (Bortoleto, 2015).

For the reuse of clothing products, there is a well-established market in Denmark for clothing run by charity organisations that is unique to the rest of the EU (Hansen, 2023). Clothing having a well-functioning reuse market can also be based on the lack of legislation that is in place, whereas legislation for electrical appliances has been in place for years, involving producer responsibility, repairing, etc. (The European Parliament and of The Council, 2012).

Arguably, the legislation has backfired, with the right to repair and spare parts being swapped with a manual, and education is closing down (European Environment Agency r., 2022; Freiesleben, 2023; Hovgaard, 2023). Instead, large household appliance producers have chosen to recycle over reuse and are trying to hinder or stop other initiatives (Freiesleben, 2023; Hovgaard, 2023; Winther, 2021).

Since March 2020, the EU has been looking at adopting a sustainable and circular strategy for textiles (European Commission g., n.d.). The goals are to implement producer responsibility, combat fast fashion, and the right to repair and be free of hazardous substances in the product.

It is uncertain whether the newly proposed legislation will have a negative impact on the existing reuse market in Denmark, leading to a shift towards recycling over reuse.

Additionally, the producer's responsibility for electrical appliances has not been effective in promoting repair and reuse. If no measures are taken to address this issue and learn from past mistakes, similar problems may arise for textiles.

### 6.2.4 Lack of information regarding Hjørring Municipality's pro-environmental initiatives

In this report, when addressing the initiatives that could be done, the provision of information was mentioned consistently as an initiative that should be implemented.

Throughout the report, it became clear that Hjørring Municipality needs to increase their focus on informing external and internal stakeholders about the pro-environmental initiatives.

Communicating to external stakeholders has been commented on by representatives of Hjørring Municipality as something they are aware of and want to increase their focus on. Informing external stakeholders can help other stakeholders learn about what initiatives can be done.

As stated in the stakeholder discussion, some stakeholders were identified as irrelevant during the identification process with representatives from Hjørring Municipality; however, when interviewing them, it was found that this was not the case—indicating that communication is not only an issue for Hjørring Municipality but also for other stakeholders that have been identified in this report and not identified.

According to Hansen, consistent and clear communication about initiatives can reduce confusion and misunderstandings for citizens. As a result, the municipality should prioritize communication with external stakeholders.

During the interview, Drustrup shared her experience of attempting to discuss pro-environmental initiatives with colleagues from the disability network in the municipality. However, it became apparent that her colleagues were either unaware of these initiatives or lacked knowledge of the area.

This communication issue within the municipality highlights a silo mentality where individuals tend to focus on their area without looking into what happens in other sectors. Despite this, there is still communication between colleagues in Hjørring Municipality regarding these initiatives. They work together to increase their pro-environmental efforts. However, Hjørring Municipality should increase their focus on communication to internal stakeholders.

# 7. Conclusion

The point of this report is to answer the research question:

***How can Hjørring Municipality potentially impact the implementation of waste prevention initiatives?***

To answer this research question, three different sub-research questions were created. The first question was: *what is the municipality legally allowed to do for waste prevention?* It was formulated to identify the regulatory framework Danish municipalities need to navigate

Based on an analysis of EU and Danish legislation and action plans, it has been determined that municipalities are not required by law to implement waste prevention initiatives. However, Danish municipalities have the option to express their desire to work towards waste prevention through their municipal authorisation.

The municipalities cannot use waste fees to finance these initiatives. This may create conflicts when funds are taken away from other important areas that rely on them.

The second sub-research question was: *what municipal waste fraction is most critical for Hjørring Municipality?* It was formulated to identify two waste fractions that were radically different.

Based on Hjørring Municipality as a case study and their current work at the time of this report, textiles and WEEE were selected. Where there was chosen to focus on the product types clothing and large household appliances.

The third sub-research question was: *which stakeholders could Hjørring Municipality potentially impact in terms of waste prevention?* It was formulated to identify the stakeholders Hjørring Municipality could collaborate with, and from this select stakeholders for the two waste fractions in collaboration with Hjørring Municipality.

During the analysis, the stakeholders identified in collaboration with Hjørring Municipality were analysed based on their level from local to international to determine whether collaboration could be done and what part of the life cycle the stakeholders impacted in terms of waste prevention initiatives. The stakeholders that were deemed relevant for each waste fraction were:

- Clothing - universities; elementary schools; charities; Repair Café Demark; Nordværk; social enterprises and sheltered workshops.
- Large household appliances – Nordværk; universities and EUC Nord.

After the discussion, it was apparent that certain stakeholders, like charities and sheltered workshops, could potentially repair large household appliances.

It was determined that the municipality can implement waste prevention initiatives for textiles, but not for WEEE due to regulatory, financial and cultural barriers.

To promote textile waste prevention, it is recommended that the municipality starts a Repair Café and host sustainability events with elementary schools annually. Additionally, earmarking funds for social work when collaborating with local charities and seeking out social enterprises or facilitating stakeholder collaboration are also helpful actions to take.

In Denmark, municipalities face funding constraints and regulatory barriers that limit their ability to implement waste prevention initiatives effectively.

To address this issue, changes must occur at both the European and Danish regulatory levels. Specifically, the definition of waste prevention and waste needs to be updated to reflect the difficulties stakeholders have encountered with the current definitions.

Additionally, Denmark should move beyond implementing only mandatory waste prevention initiatives at the European level and enact more comprehensive policies. Denmark should introduce acts setting targets for waste prevention instead of utilising old targets or targets that might be harmful for waste prevention. There is a lack of consistency in the plans presented The Danish Government that needs to be rectified

Ideally, the European waste prevention directive would establish clear criteria for waste prevention initiatives, but this outcome seems unlikely at present.

Hjørring can take steps towards waste prevention by implementing these initiatives. However, the root of the problem lies in the regulatory frameworks which have been broken for years.

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