

Exploring waste prevention possibilities through public procurement in public institutions

A case study from Bornholm, Denmark

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Abstract

The thesis explored how waste could be prevented through public procurement in the public institutions on the Danish island, Bornholm. The island has set an ambitious vision, '*Bornholm showing the way – without waste 2032*', aiming for 100 % waste recycling and reuse by 2032. To reach the vision, it is essential to include waste prevention, particularly dematerialisation before goods are procured on to the island. The study aimed to look at how decision-makers could work towards preventing waste in public institutions. The thesis narrowed down to particularly focus on public procurement as a tool to steer towards waste prevention, hence to steer consumption. The study examined closer barriers and enablers to utilise public procurement of goods as a waste prevention method. To reach conclusion, this thesis took a qualitative approach with in-depth interviews with various stakeholders. Findings showed that key success factors to prevent waste in public institutions by using public procurement was to include strong political will, the presence of front runners in public procurement that can champion the cause, and strong propagation of the vision, independent of the tenure of the front runners in public office. Another important finding was the misconception that “greener” products are more expensive than conventional ones. Hence, what is necessary is the allocation of resources and particularly knowledgeable human resources, with the necessary sourcing expertise to seek these products out which has fewer materials used during production phase but also when procuring, for example, less packaging around goods. Furthermore, Bornholm would benefit from a clear definition of waste prevention and how it should be implemented on Bornholm. By positioning itself as a leader in green thinking, Bornholm can attract crucial partnerships with other municipalities, as well as private industries to partner on the waste prevention and dematerialisation initiatives, in public procurement.

Keywords: Waste prevention, dematerialisation, public institutions, public procurement, Bornholm

Executive Summary

Bornholm is a relatively small Regional Municipality in Denmark with a diverse political climate that has united under the same vision, *'Bornholm showing the way – without waste 2032'*. The overall objective of this thesis was to contribute to Bornholm's 2032 vision and increase knowledge about waste prevention possibilities through public procurement of goods, particularly by utilising economic instruments such as green public procurement. The focus of this thesis was to examine dematerialisation as a precursor to waste prevention during public procurement processes.

From a life cycle perspective, waste prevention by dematerialising (the absolute reduction of raw materials used in the production process and use phase) has shown more climate benefits than any other waste management procedure. Waste prevention requires looking closely at the source of production but also when procuring goods because once the waste is generated, there is not much that can be done to prevent it. In Bornholm, public institutions account for a large proportion of the budget; procurement of goods on the island accounts for about 225 million Danish crowns in purchasing power. However, public procurement has not received much attention in how it could contribute to waste prevention in Bornholm and ultimately help to reach the 2032 vision. Hence, this thesis can serve as a starting point to incorporate a waste prevention agenda in public procurement.

Besides the fact that this thesis aims to contribute in reaching Bornholm's 2032 vision, this thesis also aims to increase knowledge in the waste prevention field, especially to better understand how decision-makers can contribute to waste prevention by utilising public procurement. Research questions to be answered in order to achieve the aim:

RQ1: What barriers do decision-makers in public institutions on Bornholm face in applying waste prevention measures as part of public procurement?

RQ2: How can decision-makers in public institutions on Bornholm prevent waste during the procurement processes?

In order to answer the research questions, this research was a qualitative case study to gain an in-depth understanding of Bornholm's case. In line with good qualitative design principles, this thesis process started deductively by acquiring different literature based on the thesis topic. Additional themes and nuances were also drawn from first-hand interviews and observations in the field and corroborated by a literature review. Thus, though the process started deductively, inductive reasoning played an important role in data collection and the analysis processes. For the data collection, 15 semi-constructed interviews were conducted. These interviews had a combination of pre-set interview questions and open-ended questions, allowing for holistic and in-depth interviews with various stakeholders on the decision-making level to understand better their barriers and how to overcome them to include waste prevention while procuring.

Findings revealed three major themes: politics, economics and an organisational dimension, which all presented barriers and opportunities for decision-makers in realising waste prevention through public procurement. Findings showed that key success factors to green public procurement include strong political will, the presence of front runners in public procurement that can champion the cause, and strong propagation of the vision, independent of the tenure of the front runners in public office. Another important finding was the misconception that "greener" products are more expensive than conventional ones. Hence, what is necessary is the allocation of resources and particularly knowledgeable human resources, with the necessary sourcing expertise to seek these products out, which has fewer materials used during production phase but also when procuring. Bornholm has not allocated resources to look into green public

procurement (GPP), creating a disconnect in procurement budgeting when compared to waste prevention ambition. Findings also showed that applying economic instruments, such as GPP, can assist in steering strategically waste prevention while procuring.

Further, findings showed that collaboration and cooperation with other municipalities on joint procurement can strengthen Bornholm's ability to strategically apply waste prevention during procurement by leveraging its larger purchasing power. However, before co-operation, it is crucial for Bornholm to define clearly waste prevention in an objective manner. Interviews revealed that there was not a cohesive and uniform understanding of the 'what' and 'how' of waste prevention among key decision-makers.

Based on the findings, the following recommendations are proposed to relevant stakeholders:

Recommendations to BOFA:

- Define what waste prevention means
- Co-operate with the public procurement department
 - It is good to specify at the beginning who is the responsible individual or the team who will take in charge of keeping up on how co-operation is progressing
- Assist public institutions in identifying which waste fraction is the largest in public institutions; the information helps to target correctly to prevent waste flow before such products or materials are procured to the island
 - Such identification could help procurement department set new procurement criteria
- Have a plan B how to work towards waste prevention, if the vision 2032 fails
- Help to develop Bornholm's green public procurement criteria, which includes dematerialisation

Recommendations to Bornholm's procurement department:

- Co-operate with BOFA because they know what waste is easy to recycle or reuse
- Utilise already existing sources such as the Copenhagen city's GPP calculations
- Utilise already existing format on the Ecolabel website to make tenders with greener features
- Join the POGI (the Danish GPP Partnership); it is free and gives access to support and guidance from other municipalities which are part of POGI
- Debunk the myth that the GPP is more expensive all the time
- Ensure that waste prevention criteria will remain in place while procuring, even if a committed and environmentally-minded procurement officer leaves the position.

Recommendations to Bornholm's public institutions:

- Identify which waste fraction or material is the largest, so public institutions can potentially address it while procuring
- Request from politicians that more budget is allocated to find a way to prevent waste in public institutions
- Have a continues dialogue with public procurement department about how could public institutions reduce/prevent waste while procuring
- Request budgeting from Bornholm regional municipality to use environmental managers who are already located on Bornholm as a consultant to work on the environmental topics, such as waste prevention.

Recommendations to Bornholm's politicians:

- Reach a political consensus on the definition of waste prevention, and
- Clarify how Bornholm will prevent waste, particularly dematerialisation, in the first place.
- Try not to treat GPP as a more expensive option, because mostly it is not
- Utilise knowledge from other municipalities and cities, such as Copenhagen, and the way they have been able to reach their waste prevention approach and procure more environmentally friendly products
- Support dematerialisation criteria while procuring, because of politician's support is crucial to driving GPP beyond its' current criteria

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Abbreviations

BOFA	Bornholm's municipal solid waste management company
DKK	Danish Crown (currency)
EPA	Environmental Protection Agency
EU	European Union
EUR	Euros
GPP	Green Public Procurement
IIIEE	International Institute for Industrial Environmental Economics
LCC	Life Cycle Costing
MSW	Municipal solid waste
MSWM	Municipal solid waste management
SWM	Solid waste management
PP	Public Procurement
SKI	Staten og Kommunernes Indkøbsservice (Danish state and municipal procurement service)
SPP	Sustainable Public Procurement
UN	United Nations
WASTEMAN	Integrated Sustainable Waste Management Systems decreasing pollution discharges in the South Baltic area
WM	Waste management

1 Introduction

“ *Disposal*’ never means disappearance. Treating waste is transforming it ” -Van Weenen, 1990

Waste management has evolved over the past few decades gradually to combat the waste problems which have been growing alongside economic and population growth (Johansson & Corvellec, 2018; OECD, 2002). Currently, the European Commission estimates that in the EU, one person consumes 16 tons of materials annually, of which six tons are wasted as municipal solid waste, and half of it ends up in landfills (Kirakozian, 2016). In order to make progress in waste management towards more sustainable options, the EU Waste Directive in 2008 adopted the Waste Hierarchy. The hierarchy represents a preferential order of waste treatment, where the most wanted option in the hierarchy is waste prevention, and the least wanted is landfilling (See figure 1) (EU Waste Directive, 2008). Preventing, before the material becomes waste, has been an especially important factor since the globe has reached the point where extraction of virgin materials and scarcity of various materials has become one of the 21st century’s pressing issues (COM 571, 2011).

Figure 1-1. ‘The Waste Hierarchy’.



Source: European Commission Environment (2016) <http://ec.europa.eu/environment/waste/framework/index.htm>

In order for the Member States to achieve waste prevention targets, the EU stated that all the members have to implement a waste prevention/reduction strategy by 2013 (EU Waste Directive, 2008). Some of the waste prevention targets are linked to waste reuse, recycling and a push towards a circular economy (definition on page 14) (EU Environment, 2019; EU Waste Directive, 2018). However, this thesis author looked into waste prevention through the *dematerialisation* lens, which refers to the absolute reduction of the total material to be used in the production or/and use phase (Cleveland & Ruth, 1998). Such an approach takes waste prevention one step further in “preventing” form. Because, no matter how waste is managed, from recycling or reusing, to incinerating or landfilling, waste is transformed into something else and does not disappear (Weenen, 1990). Therefore, waste prevention is essential to tackle at the source, before goods are produced or/and procured, for example, through public procurement.

Public institutions are big procurers around the World. In the EU alone, 1.8 trillion Euros are spent on goods and services through public procurement to operationalise public institutions (European Commission Environment, 2019b). Since the purchasing power is extensive, it is vital to pay attention to what public institutions can do to prevent waste or avoid certain

materials while they are procuring (Svensson Myrin, Rytterstedt, Zeidlitz, Åberg, & Hagelin, 2018). Also, the Waste Framework Directive 2018 Amendment has addressed the importance of waste prevention, suggesting that, for example to “promote and support sustainable production and consumption models [;]target products containing critical raw materials to prevent that those materials become waste...” (EU Waste Directive, 2018, p. 126).

One EU country, Denmark, has set the National Waste Prevention Strategy and has given focus to stimulating waste prevention through economic instruments, such as public procurement and particularly focusing on the Green Public Procurement (GPP) (The Danish Government, 2015). The GPP pays more attention than regular public procurement to environmental aspect when procuring products. The National Strategy allows municipalities to either follow it or develop their own, more ambitious plan (The Danish Government, 2015). The national budget allocated 300 billion Danish crowns (40 billion Euros¹) to procure goods and services for public institutions (The Danish Government, 2015). Hence, the amount municipalities are procuring is extensive and therefore, can have a significant environmental impact (Kjær, 2019).

One of the municipalities which, has decided to develop their ambitious plan, is located on the Danish island called Bornholm. The Regional Municipality of Bornholm aims to become a green and sustainable island; hence waste management issues comprise an important component in the plan. Bornholm’s municipal solid waste management company (BOFA), with whom the author collaborate on this thesis, has introduced the vision of, ‘*Bornholm viser vej – uden affald 2032*’ (Bornholm showing the way – without waste 2032), meaning that “the vision of a cleaner, healthier, and greener Bornholm[,] boosting growth and development”(BOFA, 2018, p. 4). The vision is ambitious and has a goal, which no other municipality has yet set in the EU: by the year 2032, all the island’s waste will be recycled and reused (BOFA, 2018).

The Regional Municipality of Bornholm allocates approximately 225 million Danish crowns (over 30 million Euros²) to procure goods for public institutions to operate on the island (Damgaard Madsen, 2019). Naturally, all waste cannot be prevented in public institutions that provide public services. However, a waste prevention approach can reduce material flow into the island; for example, some unnecessary packaging, through public procurement can be prevented (Kragsskov, 2019).

The approaches of how to reach various waste prevention targets vary from soft tools, such as informative instruments to harder tools, such as economic instruments (Johansson & Corvellec, 2018). However, the softer tools are used more widely in waste prevention compared to the harder tools. Hence, there is a need to explore harder tools such as economic instruments, which are fundamental for a more significant transformation (Corvellec et al., 2018). The Waste Framework Directive 2018 Amendment highlights that “economic incentives for regional and local authorities, in particular to promote waste prevention” should be utilised (EU Waste Directive, 2018, p. 139). In this thesis the author sought to contribute with more knowledge about economic instruments, such as, public procurement and the Green Public Procurement (GPP) and how it can be utilised as a tool to prevent waste in public

¹ Currency exchange rate was based on rate in July-August, 2019

² Currency exchange rate was based on rate in July-August, 2019

institutions. Also, this thesis author sought to contribute with the findings and recommendations to the 'Bornholm showing the way – without waste 2032' vision.

1.1 Background

Since the 2008 EU Waste Framework Directive introduced the Waste Hierarchy, waste prevention has been emphasised alongside waste recycling and reuse as management options in the European Commission's Community Strategy for Waste Management. However, waste prevention was and still is perceived as one of the hardest and controversial topics because it is connected to so many areas, from economics to political structure (Corvellec et al., 2018; Kjær, 2019). Corvellec (2016), encapsulated in his study, about the complexity of waste prevention and that change does not happen only from top-down:

“Waste decision-makers, practitioners, and waste scholars therefore need to understand that waste prevention is a multisided social change process: it sheds new light on waste; sets new priorities for production, consumption, and waste management; requires new actions from individuals as well as companies and authorities; and demands dedicated legal, physical, and human infrastructures.”

Source: (Corvellec, 2016, p. 9)

Although waste prevention is a challenging topic, in the 2018 EU Waste Framework Directive Amendments, waste prevention was emphasised as an important topic that should be developed because “waste prevention is the most efficient way to improve resource efficiency and to reduce the environmental impact of waste”(EU Waste Directive, 2018, p. 113). Waste prevention is possible to approach from various angles, institutions and definitions (elaborated in the 1.4). This thesis author focused on waste prevention by specifically focussing upon the public institutions and what they could do to prevent waste.

Public institutions provide services funded by the government, usually through taxation (Thai, 2001). Such institutions are schools, hospitals, elderly care facilities, military, social services and higher education. In order for the institution to operate, they rely on goods that need to be procured. This thesis solely focused on goods which are procured and not on the services which are provided in public institutions. In this process, municipalities have significant purchasing power (Damgaard Madsen, 2019). In the EU, public institutions are major consumers with annual spending of approximately 1.8 trillion Euros annually (European Commission Environment, 2019b). In Denmark, the public sector is also a critical player, with the purchasing power of almost 300 billion Danish crowns (about 40 billion Euros³) (The Danish Government, 2015). Hence, it is critical to look at the source, when procuring and if there is a possibility to dematerialise in the first place.

Denmark has a state and municipal procurement service, *Staten og Kommunernes Indkøbsservice*, (hereafter, SKI) where the majority of procurement contracts are signed. The SKI does have an emphasis on sustainable sourcing, however waste prevention is not on agenda when

³ Currency exchange rate was based on rate in July-August, 2019

contracts are made (Terkelsen, 2019). Danish procurement system is to a certain degree centralised because all the 98 municipalities in Denmark have to use the SKI's contract based products for some products, such as computers, paper, pen and many other products (Lauritsen, 2019). The SKI is owned 55 % by the Danish Ministry of Finance, and the rest of the 45 % is shares in SKI by association of municipalities (Dreyer, 2019). Municipalities do have the permission and ability to coordinate some of their own procurement outside of the SKI contracts. However, this is dependent on its financial and human resource capabilities (Kragsskov, 2019). Hence, public institutions and municipal procurement offices are usually dependent on the government, and therefore, procure straight through SKI contracts which are overlooked by centralised municipality procurement departments (Damgaard Madsen, 2019). The Danish National Waste Prevention Strategy puts a focus on the procurement of products designed for reuse or recycling. In so doing, public procurement has the ability to stimulate the market for green and resource-efficient products (The Danish Government, 2015). It is important to highlight that "greener" product does not automatically mean that it is or was produced from "waste preventing" criteria. But, public procurement has significant purchasing power, and by using this power to choose carefully goods and services that are environmentally conscious could have a significant positive impact in reducing waste streams and environmental benefits (Svensson Myrin et al., 2018).

1.2 Problem definition

The *'Bornholm showing the way – without waste 2032'* vision and their target of 100 % waste recycling and reuse is not the easiest target when, for example, the current household recycling rate is about 35 %. The combined recycling rate for incoming waste to the BOFA's facility from public institutions, small businesses, larger businesses and households is 62 % (Hjul-Nielsen, 2018). Also, currently nearly all recycled waste is transported outside of the island for recycling (Gerdes, 2019). Geyer et al. (2016) point out, that even though the majority of the waste would be recycled and recycled material is properly managed, there is a naïve perspective that recycling alone can solve the waste problem and reduce environmental impacts, there is critical need to preserve more and more raw materials before they are extracted. Furthermore, scholars elaborate that "recycling reduces waste generation only if it reduces primary material production; otherwise, it merely delays it" (Geyer, Kuczynski, Zink, & Henderson, 2016, p. 1010). Moreover, a recent study in Sweden showed that from a life cycle perspective, in all of the cases of waste management they looked at, waste prevention by dematerialisation showed more climate benefits than any other waste management procedures (Miliute-Plepiene, Sundqvist, Stenmarck, & Zhang, 2019).

Waste prevention is a topic which should be looked at more closely because once the waste is generated, there is not much that can be done to prevent it (Zacho & Mosgaard, 2016). In Bornholm, the public institutions account for a large proportion of the budget, allocated towards procurement of goods on the island, accounting about 225 million Danish crowns in purchasing power (Damgaard Madsen, 2019). Yet, the public procurement processes have not received much attention in how it could contribute to waste prevention in Bornholm and ultimately, reaching the 2032 vision. Hence, this study can serve as a starting point to incorporate waste prevention agenda in public procurement.

Also, Corvellec et al. (2018) pointed out in their recent study that more research is needed to be allocated to understand better how it is possible to prevent waste by utilising harder tools, such as economic instruments. Such tools, for example economic instruments, are not studied as much as softer tools, for example, informative tools.

Another reason why the author of this thesis worked with BOFA and the case study is Bornholm is because BOFA and the author were part of a project called, Integrated Sustainable Waste Management Systems decreasing pollution discharges in the South Baltic area (hereafter, WASTEMAN). To the project, the author of this thesis, contributed with a research paper which, was focused upon the factors in Bornholm that influenced people to recycle in mature waste management systems. BOFA and Bornholm are still part of the WASTEMAN project, however this thesis author moved to the master's thesis project and continued collaboration with BOFA and Bornholm. This author found both, the topic and the challenge of reaching Bornholm's 2032 vision, interesting and wanted to continue investigating how and if waste prevention, particularly dematerialisation, could serve as a means to the 2032 vision.

1.3 Aim and Research questions

Besides the fact that this thesis was designed to contribute to reaching Bornholm's the 2032 vision, this thesis was also designed to increase knowledge in the waste prevention field, especially to understand better how decision-makers in public institutions can contribute to waste prevention by utilising public procurement. This thesis focused solely on procured goods, not services. Research questions to be answered to achieve this objective included:

RQ1: What barriers do decision-makers in public institutions on Bornholm face in applying waste prevention measures as part of public procurement?

RQ2: How can decision-makers in public institutions on Bornholm prevent waste during the procurement processes?

1.4 Scope

The decision to focus on public institutions comes from a request by BOFA, who asked that the author explores waste prevention in public institutions. The author narrowed down public institutions based on who procures from the municipal procurement fund. For example, public institutions are public elderly homes, kindergartens, schools, citizen related centres, psychiatry, and IT department, as well as, municipal building, recreational areas and road caretakers (Damgaard Madsen, 2019). This thesis author has consciously excluded Bornholm's public institutions' employees such as teachers in schools or kindergartens, and nurses from the elderly care or psychiatry because the target group of this thesis was decision-makers and the ones in power to change practices from 'top-down'. Despite the fact that hospitals are also public institutions, they were excluded from this thesis because their budgeting is regional not municipal (Damgaard Madsen, 2019). The military has its own budget and procurement practices which, are not from the regional municipality but directly from the state, hence the military is also excluded from this thesis (Damgaard Madsen, 2019).

Waste prevention is possible to approach from various ways, for example, preventing while designing products, having strict conscious avoidance of goods when possible, considering to re-use, repair or refurbish before discarding, and focusing on qualitative prevention which means to reduce the hazardous content of waste from goods (European Commission, 2012). This thesis was particularly focussed upon strict avoidance of goods when possible. None of those solutions is one single best solution, all of them can make positive contributions to

achieving waste prevention targets. This thesis author did not choose to participate in the debate about which is the strongest method to prevent waste.

There are various ways how ‘waste prevention’ terminology is used and defined in the literature and documents, however, given the context of the case study, this thesis author chose to focus on waste prevention through the *dematerialisation* lens, which refers to the absolute reduction of the total material to be used in the production or/and use phases (Cleveland & Ruth, 1998). The definition of dematerialisation can vary, however, more or less it has the same aim, to prevent or use minimal amount of raw material during production and use phase.

Waste prevention, as an idea, is frequently used interchangeably in the context of the circular economy, the Zero Waste and the 3R. Which all have similar emphases to prevent waste, however, does not necessarily have the same angle as *in this thesis*. The meaning of the circular economy according to the Ellen MacArthur Foundation is represented in three principles: designing out waste and pollution, keeping products and materials in use, and regenerating natural systems (Ellen MacArthur Foundation, 2017). The author in this thesis did not utilise the circular economy terminology because the focus in this thesis was not on the circularity of waste, even though the circular economy is overlapping and is sometimes used interchangeably with waste prevention.

Another term which is widely used and has risen in popularity over the past decades is the “Zero Waste”. The Zero Waste International Alliance defined Zero Waste: “The conservation of all resources by means of responsible production, consumption, reuse, and recovery of products, packaging, and materials without burning and with no discharges to land, water, or air that threaten the environment or human health” (ZWIA, 2018). The reason why this thesis author did not utilise “Zero Waste” is that the 2008 EU Waste Framework Directive and the 2018 Waste Framework Directive Amendment do not utilise the term.

A third terminology, 3R (Reduce, Reuse, Recycle) policies, are also used when talking about waste hierarchy and waste prevention as a prioritised option (Sakai et al., 2011). However, this thesis author decided not to use the wording because it is also not utilised in the EU Waste Framework Directive 2008 nor in the 2018 Waste Framework Directive Amendment, also because the focus has also given to reuse and recycle, and that does not fit in the context of this thesis. This thesis does not take any part in the debate which definition is the best to use.

Above presented terminologies are not only ones which are used, however, in the limit on the thesis, just a few, more widely used ones were presented.

1.5 Limitations

As any study, this thesis has limitations. By default, because of the author’s interdisciplinary studies, Environmental Management and Policy, and the angle of the author’s topic, waste prevention, author looked into literature from different disciplines, however the author stayed within social sciences. As a result, the author could have missed important findings on waste prevention from other disciplines. More limitations of research strategy, data collection and analysis can be found in the methodology chapter.

1.6 Audience

In the academic realm, the primary audiences for this paper are scholars in different disciplines from academia, such as environmental studies, social science, economics and policy studies. Because this thesis was designed to develop a better understanding how waste could be prevented in the public institutions by studying regulations and national procurement structures, therefore scholars who work on a similar topic could utilise the thesis in their research.

This thesis was designed to assist BOFA, which in turn is working continuously to reach Bornholm's 100 % waste recycling and reuse rate by 2032. Also, this thesis was prepared for the Regional Municipality of Bornholm, procurement department, Bornholm's politicians, and other local governing bodies. The author also envisioned that the Danish Environmental Ministry or the Danish Environment Protection Agency, or any other national governing body could utilise this thesis in future waste prevention strategy planning.

Even though Bornholm is an island community and this paper could be used in insular communities, the topic of waste prevention in public institutions could be applied in other Danish municipalities, or in municipalities which have similar legislation as those in Denmark, for example, in other Nordic countries.

1.7 Disposition of the thesis

Chapter 1 introduced the topic and the nature of the problem addressed in this research. Based on the gaps in knowledge outlined, specific research questions are presented. The reviewed the research limitations and scope. Further, in the chapter, the audience is identified, and an outline was provided.

Chapter 2 introduced Bornholm and BOFA. The chapter provided details about the quantities of waste produced and how much is recycled. This chapter provided information about Bornholm's procurement budget.

Chapter 3 presented the methods of how this paper has come together and why it needed to come together. This chapter addressed, step-by-step, how the author approached the research, and why certain decisions were made to develop this thesis.

Chapter 4 is the literature review chapter. It reviewed information from the literature about the waste hierarchy, economic instruments and the roles of public procurement and green public procurement.

Chapter 5 presented the thesis findings based upon three major themes: politics, economics and organisational dimensions.

Chapter 6 discussed the results of the analyses of the analytical findings in relation to the insights gained from the literature review. This chapter also highlighted areas for future research.

Chapter 7 summarised the thesis with key findings and recommendations for the stakeholders.

2 Bornholm and BOFA

The Bornholm island is closer to the Swedish, German and Polish border than to the Danish mainland (See Figure 2, circled in red). The size of the island is 544 km², with a population of about 39 700 (Regnskab, 2017) and with about 600 000 visitors per year (CRT, 2019). Bornholm has its own procurement department but uses mostly the SKI contracts which are drafted in Copenhagen. Public procurement has central administration and decentralised public procurement process (Damgaard Madsen, 2019). Public institutions, such as, elderly care, kindergartens, schools, accounting, citizen related services, IT department, psychiatry, to name few, are all using Bornholm's procurement department services (Damgaard Madsen, 2019). In 2019, Bornholm's budget is 2.866 billion Danish crowns, and out of that, 2.398 billion Danish crowns is allocated to public institutions (Hansen, 2019). In the estimate, about 225 million Danish crowns (over 30 million Euros) are spent on public institution's goods from the 2.398 billion Danish crowns budget (Damgaard Madsen, 2019).

Figure 2-1. 'Danish mainland map and Bornholm's location'



Source: *Vemaps.com* <https://vemaps.com/denmark/dk-05>

Waste prevention, especially in places like Bornholm is a vital consideration as a means to prevent or to minimise the negative impacts of wastes and the costs associated with waste management. Bornholm, which is a relatively distant island from the mainland of Denmark, is not big enough to handle all its recycled waste, yet big enough to produce a large amount of waste annually. During summer months since a significant tourism season, waste cannot be handled and has to be stored or sent out of island. Due to a large amount of waste is produced annually, waste prevention becomes a necessity. Bornholm, like the rest of Denmark, is one of the biggest waste producers within the EU per capita (Eurostat, 2018). During 2018, BOFA registered 74 617 tons of waste at disposal facilities (public institutions, small businesses and households waste). Out the total waste composition, 46 433 tons (62 %) was recycled, 21 106 tons (28 %) was incinerated, and 7 078 tons (9 %) was discarded to landfill (Gerdes, 2019). There are generally higher transport costs and more difficult outlets for recyclable materials on Bornholm compared to the rest of Denmark (Jakobsen, Neidel, & Norengaard, 2017). Yet, nearly all the 62 % of recycled waste which was brought to BOFA facilities, had to be shipped across the Baltic to the Danish mainland, to Sweden and twice a year to Germany, for recycling.

But recycled waste can be shipped all around the world, and that depends upon the best available price (Gerdes, 2019).

BOFA has been handling Bornholm's waste since 1989 (Gerdes, 2019). BOFA's supreme authority is the local council/regional municipality, though it is managed daily by BOFA's management team, which consists of the director and the four department managers who include: the finance manager, the operations manager, the environmental manager, and the branch manager. BOFA employs 40 staff (Hjul-Nielsen, 2018). BOFA receives waste from public institutions, households, small and large businesses (large businesses are out of Waste Directive scope and are in line with the single market principle); however, all businesses can decide independently how they will handle their recyclables disposal. For the rest of the waste disposal, the municipal environmental supervision authority informs the businesses on disposal measures (Gerdes, 2019).

The biggest waste fractions on Bornholm are construction residues and wood. Wood which has paint or other chemicals needs to be landfilled due its' toxic chemical content and also according to the EU's legal framework (Gerdes, 2019). On Bornholm, households and small businesses have only two recycling bins: incineration, and paper and cardboard. Despite two bins for recycling, five fractions are collected at household level: residual, paper, cardboard, small-sized WEEE and batteries). Furthermore, Bornholm has six recycling stations around the island. At each station there is possibility to waste into 36 different recycling fractions. Recycling centres are open three hours per day during which time they are staffed, or some are open 24/7 through a phone app without staff.

There are not yet sufficient data on how much waste is produced by public institutions because on Bornholm waste is collected in the same truck, and collection route could include public institution's, household's, and small business's waste. However, an extensive study by BOFA on sorting of waste fractions will be starting in September/October 2019, and unfortunately this thesis does not have possibilities to include the findings of that study due to timing. In Bornholm, the waste collection is outsourced to three collection companies: the Marius Pedersen, the Lennart Ipsen and the Fugato (Hjul-Nielsen, 2018). In January 2020, two more recycling containers will be added to separate two different plastics (Gerdes, 2019). BOFA monitors and records all the incoming waste.

By 2032, Bornholm's incineration plant will need to be upgraded. However, BOFA and Bornholm politicians have taken a unique and ambitious vision that instead, they will close down the incineration plant. The vision 'Bornholm showing the way – without waste 2032' aim to 100 % recycle and reuse the island's waste (Hjul-Nielsen, 2018). The vision addressed that one of the approaches to reach the vision is for the "regional municipality [to] prevent waste generation through sustainable and waste reducing procurement combined with new resource-saving technologies and waste solutions" (BOFA, 2018). The whole vision can be found in Appendix 1. Since the vision is reasonably new, BOFA and Bornholm are currently looking more into different options on how to reach the vision (Johansen, 2019).

3 Methodology

This chapter describes, in detail, the different processes taken to complete the thesis. The thesis design is qualitative, and the research strategy is based upon the case study. The first two sub-chapters elaborated on why the design and research strategies were chosen and how they are beneficial to the study. Additionally, the inherent limitations of these strategies were discussed.

The data collection section described the step-by-step process of collection of primary and secondary data. This section described how the interview guide was constructed, the manner in which interviews were conducted, including the number of interviewees and how the literature review was constructed and how the literature was collected. At the end of the data collection sub-chapter, limitations of the data collection processes are presented and discussed. The final section of this chapter focused on the steps taken to analyse the data.

It is important to highlight what has been throughout the thesis the ontological consideration, meaning that “the assumption about the nature of social phenomena influence the research process” (Bryman, 2012, p. 6). The author views through the *constructionist* position, meaning that: “social phenomena and categories are not only produced through social interaction but that they are in a constant state of revision” (Bryman, 2012, p. 33). It is important to state the consideration because author’s views had implications on how the research was conducted and analysed.

3.1 Qualitative design

Given the ambitious nature of Bornholm’s vision to become a waste free island by 2032, through a strategy that ensures all materials are recycled and reused, but also prevented, this case study seeks to examine at close quarters, the steps necessary in reaching this target. The thesis methodology was based on qualitative design, with the primary data collection of the study being in the actual location where the research problem or phenomenon was occurring (Flick, 2006). The primary data were gathered via interviews with the informants, through observations, gathering local documents and by desktop research, including exploring academic literature. One of the characteristics in qualitative design is to self-reflect and aim to clarify potential biases (Creswell, 2014).

The nature of the relationship between the theoretical framework and research has been mixed with deductive and inductive approach (Bryman, 2012). This thesis process was started deductively by acquiring different literature based on the thesis topic. While narrowing down the thesis topic, the literature selected for the study got more specific, and from there, similar themes and patterns started to emerge. The author is aware that the themes and patterns from the literature were extracted due to possible bias towards the objective of the thesis; the Bornholm case and their vision. Additional themes and nuances were drawn from first hand interviews and observations in the field and corroborated by a literature review. Thus the process started deductively, but inductive reasoning also played an important role in data collection and in the analysis processes (Creswell, 2014).

3.2 Research strategy: a case study

This thesis is a *case study*, aimed at looking deeper and contextualising a real-world scenario, specific to Bornholm, Denmark and the regional municipality’s waste reduction ambitions.

The author closely examined public institutions in the regional municipality and their procurement processes. This author sought to draw parallels between Bornholm's ambitious 2032 without a waste strategy, and whether public procurement can aid in waste prevention. Other characteristics of a case study are that the case guides data collection prior to development of a theoretical proposition (Yin, 2014). Additionally, a case study is based on multiple sources, such as literature and observations (Yin, 2014).

Verschuren, Doorewaard, & Mellion (2010) highlighted that there are disadvantages and limitations in using a case study strategy, as it becomes difficult to draw generalisations from a single case observation. However, study by Flyvbjerg (2006) argued against the common misconception of non-generalisability, pointing out that if the case is carefully chosen and researchers are skilful in many areas then the case "can often generalise on the basis of a single case, and the case study may be central to scientific development via generalisation as supplement or alternative to other methods" (Flyvbjerg, 2006, p. 228). Furthermore, Yin (2014) emphasised that it is possible in the context of theory to make a generalisation from a case study. Another concern towards a case study strategy is that it does not provide comparative information. It is not possible to do randomised controlled trials and get comparative results because cases are individual (Yin, 2014).

3.3 Data collection

In line with the qualitative design and literature design of this thesis, and to gain as much insight as possible in the case, data was collected through interviews and a literature review (Seidman, 2006). The data were primarily based on in-depth interviews with subject matter experts and peer-reviewed literature and publications on the topic (Bryman, 2012; Walliman, 2015; Verschuren, Doorewaard, & Mellion, 2010).

The author, had an advantage to kick-start the thesis data collection process smoothly and had access to data and documents more easily because prior to the thesis study, the author worked jointly with Bornholm's municipal solid waste management company (BOFA) in the project which is called, Integrated Sustainable Waste Management Systems with the objective of decreasing pollution discharges in the South Baltic area (hereafter, WASTEMAN). During the WASTEMAN project, the author had the privilege to become acquainted with Bornholm's waste management system, BOFA and visiting their operational centre in Rønne, Bornholm. The author was part of the WASTEMAN project from December 2018 to April 2019. After completing a research paper, which was part of the university course work, the author continued her collaboration with BOFA and Bornholm. This thesis' co-supervisor, Stig Hirsbak, is also one of the WASTEMAN project' advisors from Aalborg University. Another pivotal stakeholder and also part of the WASTEMAN project and BOFA is David Christensen. He is a facilitator in this thesis and assisted in kick-starting the data collection process.

Despite the many advantages of having previous contact with the main stakeholder of the thesis, there are disadvantages too. Interpretations during data collection and writing were shaped by previous experiences and knowledge (Creswell, 2014). For example, the experiences caused the author to lean towards certain themes or to actively look for evidence which can support Bornholm to attain its 2032 vision. Additionally, the author was subjected to biases from the documentation she received from BOFA and from the suggestions of people for the thesis interviews. Such documentations and suggestions of interviewees can naturally lean to support finding foreshadowed solutions for BOFA and Bornholm. Biases can have resulted in

distortions of the thesis data collection process or/and during the thesis writing process (Creswell, 2014).

Primary data were collected in Bornholm and at a distance by way of desktop research. The author travelled to the island of Bornholm to develop a better contextual understanding of the case. During these visits, face-to-face interviews were conducted with key research stakeholders. Additionally, observation tours allowed for a better understanding of the islands waste management system. The author did not use observation technique as a research strategy nor as a “goal to gaining an insider’s knowledge of the field” (Flick, 2006, p. 215). The observation was not methodologically systematised, instead the aim was to additional context to complement the insights from interviews. One of the observation sites was BOFA’s waste weighing station. During this two-hour tour, the author had the opportunity to observe the different waste types received at the facility. Naturally, two hours is a short time, and the author is biased to make unconscious assumptions about waste compositions and quantity as a result of such a short visit (Flick, 2006).

The author visited Bornholm twice during the thesis data collection process. Spending three days near the end of June 2019 and three days at the beginning of July 2019. The time on the island was limited due to researchers other obligations in Lund. More time would have been beneficial to better understand the processes, however the time on Bornholm gave the author new perspectives and contacts for the further interviews, later conducted through teleconferencing.

3.3.1 Interview guide

The interview guide was formulated based on the thesis research questions, which are:

RQ1: What barriers do decision-makers in public institutions on Bornholm face in applying waste prevention measures as part of public procurement?

RQ2: How can decision-makers in public institutions on Bornholm prevent waste during the procurement processes?

Nearly every interview guide was tailored to specific interviewee because most were from different departments or organisations. Following table, 3-1, shows example themes of the process behind interview guide formulation. Section one: is about introductory questions. Section two: Specific to topic and depended on whom the author was interviewing. Section three: Follow-up question themes which usually which arose during the section two.

Table 3-1. Interview guide formulation

Section 1	Section 2	Section 3
Introduction to the thesis	Asking about how their organisation approaches waste prevention	What the interviewer did not anticipate and had follow up questions
Question about their work and role	How they understand waste prevention	Following the snowball technique, asking who should be approached for an interview

Questions about the elaboration of what company or organisation does	What are barriers to prevent waste or to dematerialise	In some interviews, references were given to reports and documents, which were requested by the interviewer.
Double-checking if it is ok to record and reference interviewee in the paper	What tools are available to be used while procuring	Interview always ended on the 'thank you' note
	What conditions public procurement have	
	Do they use GPP, if yes, what advantages and disadvantage	
	What are the barriers to applying GPP	
	Who can influence public procurement criteria making	

Source: M.Jäppinen

3.3.2 Interviews

15 semi-constructed interviews were conducted. These interviews had a combination of pre-set interview questions and open-ended questions, allowing for a holistic and in-depth interview with various stakeholders (See Table 3-2). The interview process was in-person, one-on-one or with two interviewees in the same interview. Interviews were also conducted through telephone, video conferencing and e-mail. After the interviews, all the recordings were transcribed. Interviews are a crucial means of research and allow the researcher to have a chance to encounter and get glimpse of someone's reality when observation of the phenomenon is not possible (Creswell, 2014). Also, the interviewee has a possibility to provide historical or other relevant information to provide additional context. Creswell (2014) also points out another advantage, in that, the interviewer has a possibility to control the line of questioning which helps to steer the interviewee within the research topic.

Considering that various methodology literature pointed out the importance of the ethical consideration, for example Bryman (2012), highlighted to request in advance from all interviewees recording and referencing permission. In this thesis, permission was requested in advance from each interviewee, and they all gave the permission to record and to use the interview as a reference.

Interview sampling utilised, to a large extent, the snowball technique. That technique uses established contacts with other contacts, and it is unlikely that it would be representative of the whole population or of the target group (Bryman, 2012). Only three interviews did not utilise the snowball technique, instead the aim was to talk with people from the Danish Environmental Protection Agency (EPA), the KomUdbud (which is a procurement association of 15 municipalities) and the SKI (Danish state and municipal procurement service) to elicit a better understanding of how waste prevention, dematerialisation and Green Public Procurement are applied. The interview process started in June 2019 by approaching BOFA's project manager David Christensen who recommended a number of contacts in BOFA, Bornholm and in mainland Denmark. In the following table (Table 3-2) is possible to see every person the author has interviewed, the organisation they represent and their professional title. Despite utilising the snowball technique, the author was careful to choose interviewees that would provide insights specific to waste prevention in Bornholm and greater Denmark.

Interviewees were chosen based on the thesis’s target group: decision-makers, such as regional municipality administrators, the CEO of BOFA and politicians. Other interviewees included NGO Administrators, project coordinators, waste experts and procurement contract administrators. This provided a holistic picture on waste prevention and particularly dematerialisation, in its present state in Bornholm. In addition to the interviews, the author had e-mail correspondence with different stakeholders relevant to the thesis topic. One such correspondence was with Bornholm’s regional municipality economic department, specifically the head of the economics department, Stine Hansen who provided Bornholm’s budget information. In the process of contacting stakeholders for the interview, only one person refused for the interview, and three people redirected to contact their colleagues, and they were able to have an interview.

Nearly all (except one due to maternity leave) quotes which, were used in the thesis were double verified with the interviewee. The reason why such a double-check system was used was to avoid misunderstanding. But it also allowed the interviewee to reflect more deeply upon her/his answer. Also, the triangulation method was used to ensure validity and reliability of the data. Triangulation means that more than one data source is used to verify accuracy of the data (Bryman, 2012). For example, same interview questions were asked from different interviewees coming from different organisational bodies, as well as interview-based information was cross-checked with content of relevant reports and literature to evaluate emergent data patterns.

Table 3-2. Interviewees

Name	Organisation	Job title
Laila Stougaard	BOFA	Environmental Specialist
Jens Hjul-Nielsen	BOFA	The CEO
Brian Johansen	BOFA	BOFA’s communicator
Lena Schenk	“Green Bright Island” –initiative on Bornholm	‘Green Bright Island’ initiative’s coordinator
Birgitte Kjær	PlanMiljø	The waste management expert/ Chief Consultant
Nina Kragsskov	The Regional Municipality of Bornholm’s catering company DeViKa	The head of the DeViKa
Kim Eilif Pedersen and Steen Pedersen	The Regional Municipality of Bornholm	Managers of the municipal building’s maintenance department
Leif Olsen	Socialistisk Folkeparti (Socialist People’s Party) and Natur- og Miljøudvalget (the Nature and Environment Committee) on Bornholm	Politician and the chairman of the Nature and Environment Committee
Steffen Gerdes	BOFA	Waste consultant and the weight station responsible
Jeppe Nothlev Nørtoft	The Danish Environmental Protection Agency	GPP partnership coordinator
Jens Peter Mortensen	Danmarks Naturfredningsforening (The Danish Nature Association’s)	Environmental policy advisor
Anders Damgaard Madsen	The Regional Municipality of Bornholm	Public Procurement Analyst

Rikke Dreyer	Miljømærkning Danmark (Ecolabelling Denmark) and Ministry of Environment and Food	Chief Consultant for Ecolabelling Denmark and Chairman of the Ministry of the Environment's Sustainable Procurement Forum
Jakob Bonde Lauritsen	KomUdbud (procurement association) and Silkeborg Municipality	The chairman of the executive committee in KomUdbud and Accounting manager of Silkeborg Municipality
Michael Terkelsen	SKI - a state and municipal procurement service	Procurement lawyer and CSR manger

Source: M.Jäppinen

3.3.3 Literature review

The author started by identifying keywords for the literature search, based on the key concepts of the thesis (Verschuren et al., 2010). The author used to a large extent the LUBsearch (Lund University's academic literature search tool) and the Google Scholar search tools to look for literature. In the search tools, signs such as: “” or + and + [], were utilised to have more specific to the topic search. Further readings were identified from the bibliographies of peer-reviewed journals identified through the search process and from different national documentation which had bibliographies. Table 3-3 shows an example of keywords which were used to search for the literature.

Table 3-3. Keywords utilised in the research tools

Theme	Keywords
Waste prevention	dematerialisation, waste prevention, preventing waste, waste reduction, the Waste Directives 2008 and 2018, the EU waste prevention plan, the waste hierarchy the Nordic Council and waste
Public procurement	Public procurement, green public procurement, funding, the EU Public Procurement Directive, Denmark
Bornholm	waste, island, insular, waste management, the EU islands
Denmark	waste management, national waste prevention strategy, waste statistics, the EU and waste

Source: M.Jäppinen

Literature that covers waste prevention was sourced, to give context to state of the art on an EU level as well as on a domestic level in Denmark and Bornholm. To grasp the legislative framework that Member States in the EU operate under, specific to Waste Prevention, the EU Waste Framework Directive was utilised for guidance, in understanding Denmark's obligations. Further, the literature was categorised into documents covering Public Procurement Framework Directive, academic literature on public procurement and public institutions, to get a fuller picture of how waste prevention is currently approached in public institutions. The focus on Green Public Procurement (GPP) was informed by the Danish Waste Prevention document and the EU Waste Framework Directive, both of which emphasised the importance of GPP. Further literature considerations were identified after

interviews with stakeholders. Literature specific to the waste hierarchy and waste prevention, essential and core of this thesis, was sourced from government and municipal documents as well as from academic sources.

3.3.4 Limitations of data collection

The interviewing process has its advantages and disadvantages. A clear limitation of the interview process is rooting out biases held by interviewees. Also, the researcher's presence may create biases in their responses (Creswell, 2014). Upon introducing the scope of the research at the onset of the interview, the interviewees often could have limited their responses to what they perceived to be relevant to the topic, often times at the cost of giving a fuller picture in their responses.

During the data collection, the author experienced barriers which affected the data collection process. Since the thesis writing period was during the summertime (end of May to September), most limitations were due to the timing. The author started requesting the interviews starting in June 2019 and continued through to July 2019. During this time, the majority of public employees, waste management experts and public procurement experts were on summer vacation. For example, the author was not able to reach respondents from the Finance Ministry of Denmark. These interviewees would have provided more insights on government budgeting for municipalities, especially as it pertains to financing waste prevention, especially dematerialisation initiatives, Green Public Procurement or other activities which focus on waste prevention. The accounting department on Bornholm was also busy and not available for an interview. Furthermore, two major interviewees, the head of procurement department in Bornholm and the head of the economics department in Bornholm, did not have time for an interview. Nonetheless, the author was able to interview Bornholm's Public Procurement Analyst and have an email exchange with the head of the economics department. Though most of the data collection limitations occurred while requesting interviews, a variety of different stakeholders were reached and allowing for a fuller understanding of barriers and enablers to waste prevention during municipal public procurement.

Another challenge was the language barrier. A lot of national documents are written in Danish. As a non-speaker, there was a dependence on the Google Translator tool and limited Swedish proficiency to understand the content. It is worth noting that these translations are not entirely accurate. Additionally, some of interviewees had limited English language proficiency, and occasionally, questions were not fully understood despite utilising Google Translator tool. Hence, it is possible that some of author's questions were misinterpreted and responses potentially misunderstood.

3.4 Data analysis

For the analytical framework, due to deductive and inductive approach, literature and findings served as a framework to answer the research questions. The major themes were politics, economics and organisational dimension. The first major theme, politics, emerged from interviews, however, were also reflected through literature in the form of, for example, the EU Directives. The second theme, economics, were cut through topic, for example, through public procurement, in the literature but also emerged as an essential factor in the interviews. The

final, organisational dimension theme emerged firstly from the literature but later also during interviews as a major factor to prevent waste in the public procurement process.

For the interview data analysis, the author used the Nvivo 12 analysing tool, which assisted in analysing, organise and cluster interviews by the themes. Before using the tool, the author identified themes and words based on emerging topics. The topics emerged from what interviewees were talking about and what came out of the literature. The author analysed the interviews by coding the relevant themes (Verschuren et al., 2010).

The coding process was essential in the analysis processes because the author was able to cluster similar topics which were included within the major themes (Creswell, 2014), which were politics, economics and organisational dimensions. Limitations by using such analysis tools, such as Nvivo, that it requires some time to get accustomed with the tool. Also, coding process, regardless of what program is used, remains as a subjective process where.

4 Literature review

The literature review is based on the synthesis of secondary sources including various peer-reviewed journal articles, white papers and policy documents on waste prevention and public procurement. The sub-chapters are divided into two distinct themes specifically; the waste hierarchy - specifically waste prevention, and economic instruments - specifically public procurement and green public procurement.

4.1 The Waste Hierarchy: Waste Prevention

Over the decades, waste management has shifted from addressing landfilling problems to the importance of waste recycling and reuse. In the 1980s, challenges with toxins from products in landfills and incinerators resulted in an increased interest in waste prevention measures (Van Ewijk & Stegemann, 2016). The Waste Framework Directive policy roots come from the landfill, incineration, and integrated pollution prevention and control directives (Hultman & Corvellec, 2012). In the Waste Framework Directive 2008/98/EC, the ‘waste hierarchy’ was introduced to guide the Member States on waste management measures that are economically and environmentally sound.

Despite the waste hierarchy’s objective to increase clarity on the preferred order of waste treatment for the Member States, the hierarchy has been critiqued for being vague and hard to understand (Gharfalkar, Court, Campbell, Ali, & Hillier, 2015; Hultman & Corvellec, 2012; Van Ewijk & Stegemann, 2016). One major critique highlighted that the waste hierarchy does not separate and distinguish between economic growth and environmental benefits, instead, it has intertwined them (Corvellec et al., 2018). Such a situation creates an environment which is more accepting of other options on the waste hierarchy ladder, such as recycling and recovery, rather than upon prevention. Gharfalkar et al. (2015) pointed out that if the hierarchy were more explicit and codified, then valuable virgin materials would be more cautiously exploited and utilised more efficiently during the production processes. Though, Van Ewijk & Stegemann (2016) added that the waste hierarchy does not always indicate the environmentally best option. Hence, it is up to each Member State to identify the best available waste management, waste prevention or waste minimisation processes, techniques, technologies and policies.

Waste prevention is the preferred measure in the hierarchy, as it aims to reduce or prevent waste flows (Pires, Martinho, Rodrigues, & Gomes, 2019a). The European Waste Framework Directive (2008) defines waste prevention as:

“measures taken before a substance, material or product has become waste, that reduce:

- (a) the quantity of waste, including through the re-use of products or the extension of the life span of products;
- (b) the adverse impacts of the generated waste on the environment and human health; or
- (c) the content of harmful substances in materials and products.”

Source: The EU Waste Framework Directive, 2008, p. 10

There is divergence on the understanding and operationalisation of ‘waste prevention’ as a waste management strategy. The EU Waste Framework Directive is critiqued for ill defining waste prevention (Gharfalkar et al., 2015; Pires et al., 2019a). The study by Gharfalkar et al. pointed out a stark inconsistency in how the term ‘prevention’ is defined in the 2008 Waste Framework Directive. The directive’s authors, rather than tightly defining the term, instead focussed on the term ‘reduction’, hence compromising the structure of the hierarchy (Gharfalkar et al., 2015). Also, the definition of the term ‘prevention’ is not clearly stated and leads the reader to debate whether the meaning of the term is about “the consumption of scarce natural resources; the resultant waste that is generated; the environmental impact; or the impact on human health or the effect on society” (Gharfalkar et al., 2015, p. 306). Moreover, waste prevention is hard or impossible to measure (Hultman & Corvellec, 2012). Specifically, the study emphasised out that monitoring and evaluation are very challenging in waste prevention because technically, waste should not exist in the first place in waste prevention (Zorpas & Lasaridi, 2013). As a repercussion, it is hard to understand what waste prevention is, as defined by the Waste Directive in 2008 and how it should be ‘managed’.

Such confusion creates hiccups for legislators and policymakers on the national and municipal level to incorporate waste prevention as part of their strategy (Zorpas & Lasaridi, 2013). The study by Hutner et al. (2017) pointed out that the overall implementation status of waste prevention is low due to an apparent lack of guidance for practitioners. Furthermore, other research emphasised on an unwillingness or inability of governments to use more stringent and harder tools, such as economic instruments, often opting for softer tools, such as informative tools, because they are easier to plan, implement and monitor (Johansson & Corvellec, 2018). In contrast, a different study points out that harder tools are not necessary to be in place to create a change and reduction of waste (Puig-Ventosa, Jofra-Sora, & Freire-González, 2015). Even when waste is reduced or prevented, another study by Van Ewijk & Stegemann argued that it does not guarantee that the implementation of a waste prevention strategy will lower environmental impacts (Van Ewijk & Stegemann, 2016).

Conversations about different changes and reasoning why these changes are needed can lead to changes in policies. As an example, in 2018 the Waste Framework Directive had updated parts in the directive which were criticised earlier by scholars, practitioners and consultants. In response to critique, the 2018 Waste Framework Directive included, for example, more definition about waste prevention and what is entailed in waste prevention, as presented in the Article 9 (the full article is included in Appendix 2). The Directive states that in order to prevent waste, Member States should “promote and support sustainable production and consumption models” (EU Waste Directive, 2018, p. 126). This part of the Directive is important since procurement is the central element in this thesis. The Directive states that waste prevention can be reached while “the design, manufacturing and use of products that are resource-efficient” are encouraged. Further on, the Directive highlights to be knowledgeable about preventing waste by “target products containing critical raw materials to prevent that those materials become waste” (EU Waste Directive, 2018, pp. 126-127).

In theory, ‘waste prevention’ has been set as a goal for the Member States to attain. However, in reality, waste prevention refers to a broad range of precursor activities, before such a goal can be said to be attained (Corvellec, 2016). A large waste prevention study conducted by Lund and Gothenburg Universities, over an extended period of time, concluded that there are seven main elements which hinder the realisation of waste prevention (Corvellec et al., 2018). The

study underscored the complexity of waste prevention in the real-world decision-making processes that included:

1. The first finding pointed out that waste prevention happens through interconnected actions, meaning that if different stakeholders, for example, waste producers and waste managers, do not co-operate with each other, then there is no waste prevention nor environmental impact reductions realised. The lockstep collaboration between various stakeholders in attaining a set waste prevention goal achieves better outcomes through collective abilities.
2. Further, the study emphasised that the most engaged stakeholder such as activists, accelerate and lead the way forward towards waste prevention and if they to stop, the waste prevention initiative might be discontinued.
3. The third finding emphasised that even when there are great and well-functioning waste prevention initiatives, it is difficult to disseminate and scale-up waste prevention initiatives on a large scale or even in other regions, due to the difficulty in funding waste prevention projects.
4. The fourth finding stated that the structural rigidity complicates waste prevention, which means that waste management, in reality, is locked-in within different systems. Such systems are incineration which provides district heating and electricity (in the Nordic countries), or biogas, which, provides fuel for public transport, and further waste management locked-ins. There is a whole infrastructure built to utilise and manage waste in the most resourceful way. Considering that the infrastructure comes at a substantial financial investment cost with decades long pay-back period, it is not surprising that there are difficulties in getting agreement on prevention or minimisation approaches and goals. Therefore, to completely shift to without waste at all, would create complications for the whole waste infrastructure systems.
5. A further finding suggested that the location where waste is stored and collected should be much closer to residents because waste prevention takes place through distance work and that creates a spatial and mental distance from waste creation (Corvellec et al., 2018).
6. The final two findings by Corvellec et al. (2018) were connected to further critiques by other scholars about waste prevention policy being unclear,
7. Finally, in the end, waste prevention is not about waste *per sé*, but about behavioural and mental changes that are needed.

Despite the debate and critiques surrounding the definition of waste prevention and its outcomes, as a strategy, it is utilised in various policies and legislations because on paper and at first glance, the concept may seem clear (Corvellec, 2016) but as discussed in this sub-chapter, the reality is not as straightforward. Waste prevention, as a topic, is essential to examine because it creates an understanding of the complexities involved in defining it, and the precursors that necessitate its actualisation (Corvellec, 2016) The focus of this thesis is to examine dematerialisation as a precursor to waste prevention. This is with a formative understanding that “waste cannot be prevented once it has been generated” (Zacho & Mosgaard, 2016, p. 980).

4.2 Role of economic instruments to prevent waste

Market-based instruments, commonly also referred to as economic instruments, are hard policy tools compared to softer tools, such as informative/public communication measures

(Wilts & Bakas, 2019). Economic instruments are used widely in waste management practices, from landfilling taxes, pay-as-you-throw schemes and refund schemes (European Environment Agency, 2018; Ferrara, 2008; Scharff, 2014). Economic instruments are seen to be effective as they are believed to trigger people's attitudes and behaviour (Johansson & Corvellec, 2018) and have an indirect impact on waste prevention rates. Regardless of instrument's effectiveness, past decades waste prevention, particularly dematerialisation, has been rarely addressed and steered through economic instruments (Corvellec & Czarniawska, 2015; Hutner, Thorenz, & Tuma, 2017). Waste prevention has been approached by softer tools, such as information campaigning to prevent food waste, which is an important factor, but solely not enough to strengthen focus and results when compared to harder policy tools (Corvellec et al., 2018). A focus on waste prevention with harder policy tools, such as economic instruments, could have a more significant impact on the waste prevention rate in municipalities, regions and eventually at the national level.

The EU Waste Framework Directive 2008 has taken a stand and states that “economic instruments can play a crucial role in the achievement of waste prevention and management objectives (EU Waste Directive, 2008, p. 312)”. The directive further states, “waste often has value as a resource, and the further application of economic instruments may maximise environmental benefits” (EU Waste Directive, 2008, p. 312). However, the Directive's guidance is focused on already produced ‘waste’ and not dematerialisation of waste, which could have more economic and environmental benefits.

The Danish National Waste Prevention Strategy incorporates economic instruments as part of the strategy but falls short on emphasising the need for dematerialisation as a steering measure away from unnecessary waste. The Prevention Strategy is primarily focused on green funds and green subsidies directed at the private sector (The Danish Government, 2015). Such funds can undoubtedly have a positive impact, but municipalities do not have access to them. In 2009, the Danish Environmental Ministry published a catalogue for different waste prevention ideas. The idea to use economic instruments to prevent waste in public institutions was introduced (Kjær & Fischer, 2009). For example, since municipalities do not have access to government subsidies, such as green funds, they are able to interact with private companies who have possibilities to access these funds. The public procurement process is a partnership between municipalities and private companies. If, as part of a GPP strategy, the public institutions would like to purchase greener products, for example, those efficiently produced with minimum waste, it is likely that the private industries that make those goods today might need to retool their manufacturing process. As such, access to funding and/or cost of compliance reductions by way of these economic incentives, could help companies to be compliant and therefore, eligible partners in the GPP (Kjær & Fischer, 2009).

Kirakoian, (2016) presented a valuable point by demonstrating that the effectiveness of economic instruments has not been yet challenged, but, concluding that even though economic instruments have not been challenged, there are no studies showing whether the withdrawal of using different economic instruments results in detrimental changes.

A study in Sweden by the Swedish Waste Management and Recycling association identified that the market is one of the four factors (knowledge, time, and organisation) which affect waste prevention practices (Svensson Myrin et al., 2018). The market, in other words, economic instrument, showed that the market has the inability to respond to the waste prevention requirements (Svensson Myrin et al., 2018). Thus, early market engagement prior the procurement is at least one way of trying to prepare the market for more suppliers to compete (Dreyer, 2019). However, not every municipality can have early market engagement

because it is resource consuming, (Dreyer, 2019; Morton et al., 2011) and especially smaller municipalities do not have financial resources nor the human resources for such a procedure.

4.2.1 Public Procurement and waste prevention

Public procurement is a powerful economic tool which has been utilised strategically to reach different goals (Alhola & Kaljonen, 2017). Traditionally, the goal of public procurement is to provide the taxpayer, by way of government agencies and public institutions, competitively sourced goods and services secured at the lowest possible cost (Thai, 2001).

Public procurement in the EU is regulated, and all the Member States have to apply the EU's and national procurement rules (Adamsen et al., 2016; Dreyer, 2019; Lloyd & McCue, 2004). In the latest Public Procurement Directive 2014/24/EU, various aspects of procurement processes are outlined compared to the previous iteration, Directive 2004/18/EC (Adamsen et al., 2016). This more detailed directive is not surprising because Public Procurement is an important and complex topic with an enormous budget. In the EU alone, approximately 1.8 trillion Euros are spent annually by public institutions on public procurement (European Commission Environment, 2019b). This accounts for around 14 % of the EU's gross domestic product (European Commission Environment, 2019b).

The complexity of Public Procurement has been recognised by various scholars (Igarashi, Boer, & Pfuhl, 2017; Preuss, 2009; Thai, 2001). Public Procurement is continuously under pressure by various stakeholders, each with a different agenda and interest in the procurement process (Schapper, Malta, & Gilbert, 2006). Public Procurement requires striking a delicate balance of interests between different stakeholders, such as politicians, municipalities, businesses, and communities (Schapper et al., 2006). In particular politics, plays a pivotal role in public procurement because of the significant amounts of public money involved in the procurement processes (Schapper et al., 2006).

Thai (2001) pointed out that a government can have two distinct goals: procurement goals and non-procurement goals. Essential to the procurement goals is an emphasis on quality, maximising competition, and maintaining integrity. Non-procurement goals can include economic vibrancy, environmental protection, green public procurement, social, and international relations features. However, such goals may not be in harmony, and there will always be trade-offs between each goal (Thai, 2001). Trade-offs are an inevitability when procuring. Another challenge, and particularly in Denmark, is that waste prevention in procurement is not considered a current topic of interest; instead, discussions are heavily focused on the circularity of materials (Kjær, 2019).

The United Nations (UN) has also recognised the importance of Public Procurement for a sustainable future. The role of Public Procurement is highlighted in sustainable development goal (SDG) number 12, which pursues to “Ensure sustainable consumption and production patterns” (United Nations, 2015). To be more precise, the UN stresses to “promote public procurement practices that are sustainable, in accordance with national policies and priorities”, stated in the Target 12.7 (United Nations, 2015, p. 27)

The Public Procurement Directive 2014/24/EU does not mention waste prevention nor circular economy, however the Directive does introduce Eco-labelling, allowing public procurers to actually demand labels (Dreyer, 2019). Another environmental feature which was brought in the PP Directive 2014/24/EU, Article 68, is about the characteristic of a product's

life-cycle costing (LCC). The LCC is an economic tool to calculate the full costs, including externalities, of product and service purchases (Pires, Martinho, Rodrigues, & Gomes, 2019b; PwC, 2015). Article 68 emphasises that the cost-effectiveness approach, life-cycle costing:

“shall to the extent relevant cover parts or all of the following costs over the life cycle of a product, service or works: (a) costs, borne by the contracting authority or other users... [and] ... (b) costs imputed to environmental externalities linked to the product, service or works during its life cycle, provided their monetary value can be determined and verified; such costs may include the cost of emissions of greenhouse gases and of other pollutant emissions and other climate change mitigation costs.”

Source: (Public Procurement Directive, 2014, p. 94)

Despite introducing the environmental aspect in Article 68, Article 67 clearly states that “The most economically advantageous tender from the point of view of the contracting authority shall be identified on the basis of the price or cost” (Public Procurement Directive, 2014, p. 94), meaning that economics are prioritised above the environmental aspects. Such standards make it harder for practitioners/procurers to choose other options even when there is a will to choose “greener” products (Damgaard Madsen, 2019).

4.2.2 Green Public Procurement and waste prevention

Despite the fact that the Public Procurement Directive 2014/24/EU does not explicitly focus upon Green Public Procurement (GPP), it has been widely used at the EU, at the national, regional and municipal levels (European Commission Environment, 2019b). Governments are increasingly using procurement as a means to pursue strategic policy goals beyond what is only economically profitable (PwC, 2015). The European Commission states that GPP is a public procurement tool which factors in environmental goals, ambitions and constraints, into the procurement process. The main characteristic of GPP is to ensure reduced environmental impacts throughout the life cycle of the goods, services and works, and yet to have, at the same time, the primary function that would be otherwise procured (European Commission Environment, 2019b; PwC, 2015). Even though GPP is a voluntary tool and the Member States can decide if and to what extent they want to utilise it, by 2015, 22 out of 28 Member States introduced Green Public Procurement National Action Plans (PwC, 2015). Furthermore, some Member States applied the GPP criteria as compulsory for certain central governments (PwC, 2015).

Thus the European Commission has developed a blueprint (The GPP handbook) to guide the Member States towards environmentally conscious approaches while procuring (GPP Handbook, 2016). In the GPP handbook, the guidance is targeted, especially in high-impact sectors such as buildings, food and catering, vehicles and energy-using products (GPP Handbook, 2016). The European Commission chose the four sectors based on their “environmental impact, their budgetary importance, the potential to influence the market, as well as the availability of green alternatives” (GPP Handbook, 2016, p. 68).

Green Public Procurement is not the only concept proposed in the literature and in the policy documents, to include environmental considerations while procuring. Sustainable Public

Procurement (SPP) also includes environmental criteria. SPP “seek[s] to achieve the appropriate balance between the three pillars of sustainable development - economic, social and environmental” (European Commission Environment, 2019a). The European Commission does point out that GPP does not exclude social and economic factors (European Commission Environment, 2019a). Other, concepts which are similar to GPP and SPP are the Circular Public Procurement and Public Procurement for Innovation. All of these concepts have a similar idea behind, to change procurement from ‘procurement as usual’ to have a more sustainable approach to procurement (Cattolica, 2018).

Whether guidance is applied from Green Public Procurement or Sustainable Public Procurement, the most important properties are that the procurement process lowers the environmental impacts, holds budgetary importance and has the potential to influence the market. There is not a big difference between GPP and SPP (Cattolica, 2018). Both emphasise that it is crucial for decision-makers/procurers to identify the requirements that tenders should include (GPP Handbook, 2016; Morton et al., 2011). The criteria are, for example, Eco-labelling, labour rights and waste minimisation. Another example is when tenders are made by public institutions, evaluation criteria for waste prevention can be formulated to encourage suppliers to work in the direction of waste prevention (Svensson Myrin et al., 2018) and particularly dematerialising while suppliers are producing products. This thesis author chose to use GPP, based on that the concept that frequently emerged during the interviews.

A study from Finland documented that procurement criteria of Eco-labelling, ecological and fair trade products was much stronger in bigger municipalities (around 200 000 residents) compared to smaller municipalities (Alhola & Kaljonen, 2017). Such a pattern can be seen in the Northern and Central part of Denmark by the KomUdbud association (which is a procurement association of 15 municipalities) (Lauritsen, 2019). This situation can be explained that the budgeting or/and human resources are relatively small compared to bigger municipalities to work on the environmental subject (Alhola & Kaljonen, 2017).

Despite smaller budgets, smaller municipalities have possibilities to work within the GPP criteria and apply different tools, such as total cost of ownership to make a greener choice (Damgaard Madsen, 2019). Therefore, the professional qualifications of staff and their experience of GPP is relevant (GPP Handbook, 2016). For example in the Bornholm, some decision-makers have made a choice to have greener products instead of conventional ones because they were more aware and qualified about environmental issues (Kragsskov, 2019). It is important to highlight that “greener” product does not automatically mean that it is or was produced from “waste preventing” criteria. The Danish Environmental Protection Agency conducted a study by looking into 15 different product types and compared between conventional and greener products. Results showed that the common misconception that greener criteria make products more expensive than conventional, to be false (Miljøstyrelsen, 2018). Only four out of 15 products cost more, and the other products were the same price or even cheaper than conventional products (Miljøstyrelsen, 2018).

Despite financial and environmental benefits to applying GPP, to design and implement GPP on municipal or national level can be a complicated process in practice (McKinnon et al., 2018). While applying GPP, there can be a significant administrative burden for public authorities, especially in smaller municipalities where human and budget resources are limited (McKinnon et al., 2018). Regardless of some challenges to apply GPP, it is a widely utilised tool because it is a strategic economic instrument for working towards meeting the goals regarding sustainability policies (Alhola & Kaljonen, 2017).

5 Findings

Interview findings were grouped according to major themes that emerged. The themes are Politics, Economics and Organisational dimension. Economics and Organisational dimension themes display multiple perspectives on the theme from the interviewees (Creswell, 2014).

5.1 Politics

The topic of politics and politicians emerged nearly in all interviews. Specifically, 14/15 of the interviewees referred to politics connecting to procurement and the waste prevention agenda. The interviewees represented different organisations and municipalities, yet all agreed on the importance of politics and emphasised that political will is essential in order to prevent waste through procurement or to have other greener procurement processes. Political will can be experienced as having the right people in place, such as front runners, within municipalities, but also, when politicians across party lines and affiliations partner on the same agenda.

One of the local politicians and the chairman of the Nature and Environment Committee, Leif Olsen, saw first-hand how the political climate negatively affected the environmental agenda in Bornholm in the early 2000s. Once the political atmosphere started slowly to change towards more environmental consciousness, an environmental agenda was easier to highlight and gather support for: "...politically it was rather difficult ...the people's understanding has changed a lot during these past five, eight years, luckily. Because it was, let's say, upward when we started." Mr. Olsen expressed.

Though awareness has increased in the past decades, sometimes in the beginning, awareness does not necessarily increase political will; instead, it is a matter of having the right people being reached. The Chief Consultant for Ecolabelling Denmark and Chairman of the Ministry of the Environment's Sustainable Procurement Forum, Rikke Dreyer, stressed that since procurement and different "green" factors are dependent on political will, it is important to pay attention to whom to approach when aiming to work further on "green" solutions: "it's just because they didn't ask the right politicians because they asked those who deal with budgets, those who are in the field of procurement. So, they need to involve environmental folks to put the pressure."

Once the "right" people are on board spreading the message about environmental impacts and what government and municipalities can do, for example, to support a greener procurement process, it is vital to get more stakeholders involved. A waste management expert and Chief Consultant for the PlanMiljø, Birgitte Kjær explained that "the mayor, all the political members of the municipal council need to think, this is a good idea and that's the way forward we would like to go... you need some political will". Further on Ms. Kjær emphasised the importance of "some front runners who want to go and to be in front and have decisions about it". Also Ms. Kjær stated that municipalities could have an impact on "stimulat[ing] the demand on new and innovative solutions, which also includes waste prevention if that's what you are going for".

For the past years, Bornholm has witnessed increased political will and support towards greener initiatives. Coordinator Lena Schenk from the 'Green Bright Island' of Bornholm initiative pointed out "...that the politicians have asked the administration to come up with an analysis on how we can push forward the Green [Public] Procurement". Such political support was also experienced by the 'Bornholm without waste' vision developer and BOFA's

communicator Brian Johansen. Mr. Johansen witnessed that Bornholm's politicians were able to come together despite party differences and set a joint environmental decision:

“The idea of a waste-free society in 2032 was pretty crazy. In fact, we were unsure if our politicians would even agree to the idea. But all politicians in the municipal council, from the right to the left, said yes and then we were ready to go”

Mr. Johansen's colleague from BOFA, an environmental specialist, Laila Stougaard agreed that political will is crucial, especially if the municipality aims to work with waste prevention:

“I think in some ways [waste prevention] is a political question because you have a lot of barriers to do the right things, so you also need political will behind this so you can actually execute things that is good on board”

Mr. Olsen brought political view which did not deviate from Ms. Stougaard's point: “Politically, of course, we also want to minimise at least the amount of waste actually coming [into the island]”.

5.2 Economics

The theme of economics emerged in nearly all interviews. In the interviews, 14/15 of the interviewees referred to economics as connecting to the procurement and agenda on waste prevention. The economics theme was experienced through limitations in the budgeting, misunderstanding of the actual pricing while procuring, and benefits as well as barriers to use of the life cycle costing tool, such as the total cost of ownership tool. Economics was discussed in the form of looking for greener goods and to have co-operation between other municipalities.

Economics and politics are interconnected as Mr. Olsen, pointed out. Further on, recalling why, for example GPP, was a challenge to accept within local government: “the reason why [GPP] was never a possibility that we could join was that they [other political parties] believed it to be, some people or the political majority believed it to be too expensive”.

Bornholm's Public Procurement Analyst, Anders Damgaard Madsen, agrees that it can be expensive to utilise GPP criteria, hence more resources are needed, and political will cannot alone assist in the situation. Mr. Damgaard Madsen highlighted a point that even when there is outspoken political support, there sometimes is a disconnect in subsequent budgets:

“Because of course, we have political visions that say well we have to procure as sustainabl[y] as possible. However, that's difficult when budgets don't follow. And that's the thing we've been trying to tell the politicians; ‘if you want sustainable products, you are going to have to increase budgets because sustainable products are generally more expensive.’”

Because the budget has not been possible to increase, public procurers, such as the head of the DeViKa municipal catering company, Nina Kragstov, has found it challenging to have greener products. The challenge has not been mainly about the cost of the product but rather to have time to find “greener” products. It takes time to research for greener products (for

example, products which have been dematerialised during production) because the existing contract with Bornholm does not necessarily have the greenest product contracts:

“Of course, something is very cheap, or something is very expensive and then the expensive things, we have to think about what is the price for this product, is it too expensive? And of course, we have to find this place we can buy the things and some of the things you can't buy, you have to buy it private and something is for the municipality... ..because it takes some time to find this but I want to and I take the time but many times you have to do so many other things”

Bornholm's politician, Leif Olsen recognised the challenge of the time factor to rethink the way to procure in order to prevent waste: “you need time to think, you need time and the engagement or the will to do things differently”. Further Mr. Olsen continues:

“in public management time is money. And when we cut budget in order to save money what we are actually cutting is our employee's time. And that also the possibilities of being innovative. Maybe, this is changing a bit with the new council this new period. We have already passed three... strategic initiatives.”

Bornholm's Public Procurement Analyst, Anders Damgaard Madsen, pointed out that the cost of the product is still the dominant factor and mentioned that it should not be the only factor but rather looking into other indicators, such as total cost of ownership or dematerialising while procuring:

“But as long as economy and cost are the main drivers of the contract, of course you are going to choose the rigid contract-model because it reduces cost the best by giving contractors a more predictable procurement. That's something we have to tell the politicians, to change this focus on only cost, that we have to talk to them about having to say well maybe cost isn't the only key performance indicator that we have to measure on in order to engage in a contract.”

One possibility to overcome financial constraints and yet to have other indicators, such as greener products or waste prevention, is to collaborate with other municipalities explains procurement lawyer, Michael Terkelsen, from the SKI (Danish state and municipal procurement service). Purchasing power becomes bigger, “so we put it all into one bigger power” when municipalities come together, said Mr. Terkelsen. Mr. Damgaard Madsen continued with the same trace of thought: “So, in our procurement-cooperation with other Northern-Zealand municipalities, we pool our spending in order to have more leverage in the negotiations with the contractors when we make demands and when we want to drive down costs and that's beneficial for all of us. We get lower prices, and contractors get a higher turnover.”

It is a win-win situation for the procurers as well as the producers because larger orders give signals for product producers that they can cover the cost and yet simultaneously potentially to invest for a better, “greener” products, explained Mr. Terkelsen. Furthermore, “the supplier has covered up their investment if they have to invest even more to make sure that the products ... That they achieve their demands. And they are more intrigued to bid in on our [SKI]

agreements [because more municipalities are using SKI contract and are able to drive the cost down]” said Mr. Terkelsen.

Such an advantage has been experienced by the 15 municipalities from the Northern and Central part of Denmark. The chairman of the executive committee in the KomUdbud and accounting manager of Silkeborg Municipality, Jakob Bonde Lauritsen, revealed that because of the joint co-operation with other municipalities while procuring, these municipalities were able to have a lot of savings over the years. Also, Mr. Lauritsen pointed out that because some municipalities have been front runners and demanded “greener” products, other municipalities started to catch up, slowly, but they have taken steps towards GPP. As a result, Mr. Lauritsen said that they have bigger purchasing power and demand for environmentally conscious products.

More substantial demand creates competition, and that also drives prices down as conveyed by the Chief Consultant for Ecolabelling Denmark and Chairman of the Ministry of the Environment's Sustainable Procurement Forum, Rikke Dreyer. Furthermore, Ms. Dreyer pointed out that it is crucial to debunk the common misconception that greener products have to be more expensive:

“But if you have competition, it’s not more expensive, and it might even be cheaper to choose the most environmentally friendly products. ...it’s like there’s confusion but [product] doesn’t have to be more expensive, and it’s only depending on the market situation.”

Such misconception was highlighted also by the Danish Environmental Protection Agency GPP coordinator Jeppe Nothlev Nørtoft, who also expressed that to buy greener and more sustainable products, municipalities should talk to the market: “because there are a lot of actors out there who actually have really great ideas on what to do and they also have a really great sense of what’s actually within an economical reasonable frame”. Mr. Nothlev Nørtoft added that:

“a lot of sustainable products actually has a really good economy if you look at it from a total cost of ownership perspective because they usually last longer and they have a lower use of resources during the use phase. So even though they are a bit more expensive to buy up front, they are cheaper in the long run.”

The aspect of the total cost of ownership was brought up in the interview by Anders Damgaard Madsen, the Bornholm’s Public Procurement Analyst. Mr. Damgaard Madsen utilises the total cost of ownership tool when possible and uses the results to communicate with the Bornholm public procurers:

“[I communicate] over and over again to our shoppers that they might pay a higher price now but if you buy the furniture in IKEA, it’s not going to last you 20 years, it’s going to last you five or six years, and then you have to buy another one and then that’s going to last you five or six years and then you have to buy another one and already then you just spent more than you would have if you just bought the product on the contract and because of a lot of people don’t know about the total cost of ownership calculation”

In contrast, the chairman of the executive committee in the KomUdbud (procurement association of 15 municipalities) and accounting manager of Silkeborg Municipality, Jakob Bonde Lauritsen, voiced that it is not easy to use the total cost of ownership tool and explained that rather bigger municipalities have the capacity or knowledge to use the tool. However, Mr. Bonde Lauritsen said that more municipalities are using the tool.

Michael Terkelsen, from the SKI also stressed that the “total cost of ownership can be a bit difficult to use and that’s only some of our agreements that where it suits and for those categories, it might be more suitable to make a set of sustainable minimum requirements”. The SKI have tried to visualise and communicate the possibility to choose a greener product despite it is not in their mandate to let buyer know that the greener solution is cheaper:

“what we do is we try to make it clear, missions for the buyers where, for example, there is an Eco-label. So, if they use our site, the catalogue where you can find the products, you can sort the products by choosing only, for example, Eco labelled products. So, hereby you can only find those ecolabels that you want to, which actually makes it efficient for them to see, to take the greener choice”

Mr. Terklesen added that the Danish national study, where the SKI “have supplied data and... analysed those products which are not more expensive to buy than others”. Such a study shows that the GPP is possible to apply even in the smaller, economically restricted municipalities and hence can prevent waste while procuring.

5.3 Organisational dimension

Politics and economics are known factors which can affect waste prevention specifically in public procurement. However, those factors are intertwined with the organisational dimension. In the thesis findings chapter, organisational dimension is not defined by organisational structure instead of focusing on what interviewees were sharing about the different barriers that exist within organisations, as it relates to waste prevention during the procurement process. Enablers to prevent waste while procuring and focusing on greener products was possible through “thinking outside of box” approaches, while barriers occurred due to lack of knowledge or miscommunication.

Even when local/municipal politics and budgeting are in place, at the end of the day, the rules higher governing bodies impose, do matter and municipalities have to comply. The CEO of the BOFA, Jens Hjul-Nielsen, explained it does matter what the government stance is on environmental issues on municipalities. Even though the government can cause legislative barriers to implementing waste prevention while procuring, municipalities can have “a huge impact, because they have big budgets as they are buying a lot of different kinds of things,” clarified a waste management expert and Chief Consultant for the PlanMiljø, Birgitte Kjær. For example, the Regional Municipality of Bornholm itself decided to have high percentage of organic food in the public institution’s catering, explained coordinator, Lena Schenk, from the ‘Green Bright Island’ initiative from Bornholm.

However, to have such a commitment and change in the procurement, there is a need to “think outside of the box” on an organisational level because usually the budget does not change and political climate may not be in favour of environmental prioritisation, elaborated the head of the municipal catering company DeViKa, Nina Kragkov. The Danish Environmental

Protection Agency GPP coordinator Jeppe Nothlev Nørtoft explained further that sometimes it is a fine balance for administrators to approach GPP on an organisational level:

“And you can do that in a lot of different ways. Say you have a municipality with a city council who has decided on a more sustainable political direction, then it’s usually not very specific how they intend to bring this about. Most of the time they simply want to be greener or more sustainable. Then the administration has to comply with the new political direction and they have to figure out ‘oh but how do we do that the best way when we also need to continuously manage our other areas of responsibility?’. Furthermore, the administration has to handle budget cuts because of demands of efficiency from the state.”

The challenge in such situations when administrators have to go and look for “greener” options, such as preventing waste is challenged by a lack of human resources. Another challenge is that some products do not have an Ecolabel to indicate that they are more sustainable than conventional products, elaborated the Bornholm’s Public Procurement Analyst, Anders Damgaard Madsen:

“The only barrier in that sort of approach to sustainable procurement is that it’s labour intensive because you have to manually go into the catalogue and then pick out every conventional product or whatever conventional product you want out, but we do not have the time to do that. The only problem is that it’s labour intensive and it falls back to me, I am the one who has to do it and I just think we don’t have the time to sit and filter through because we have about 300,000 products. The thing is, that on SKI contract 50.20 about half the products meet the requirements of the label “Svanemærket” [the Nordic Swan], however the products does not have the actual label. Therefore, these products doesn’t look sustainable, despite the facts that they indeed are. So instead of picking out the conventional products, we find it is better to engage in a dialogue with the shoppers about the products available.”

Likewise, Ms. Kragkov head of DeViKa explained that it is possible to go “greener” way. DeViKa has managed on an organisational level to prevent waste during procurement and in the use phase but “it is a huge work” and “it took us a lot of time” to look for better goods. Such an approach was possible because Ms. Kragkov believed that DeViKa’s operation can be “greener”, less polluting and resource conscious. Hence, Ms. Kragkov, as Mr. Damgaard Madsen, made sure to engage in a dialogue with the team to ensure that the DeViKa team carries the same operation value: to prevent waste and increase recycling within the DeViKa operation.

Even at the national level, procurement criteria “...is really a fight of values” explained the Chief Consultant for Ecolabelling Denmark and Chairman of the Ministry of the Environment's Sustainable Procurement Forum, Rikke Dreyer. Further on, Ms. Dreyer continued to explain where the challenge could lie on the higher organisational body level, and the effect of it can be experienced all the way in Bornholm and what could Bornholm do to overcome such a barrier:

“...often the environment doesn’t have a voice in the procurement process from drawing up the national and local procurement strategies to doing the

actual call for tenders e.g. It's the financial people, those who of course are interested in procurement who work with procurement and therefore is drawing the strategy and taking decisions regarding requirements, including environmental requirements. So, I mean, one way we could maybe do to try is to involve more environmentally [engaged] people in the work - "Hey, let's get some other people in this association of the municipalities. Let's try to make them interested in procurement and see actually the power [of using GPP as a tool to steer procurement towards environmentally sound options]".

But sometimes for the decision-makers, it is hard to see if a greener product or criteria of waste prevention is relevant because of lack of knowledge about what goes into finding and procuring greener goods, reflected Bornholm's politician, Leif Olsen. "And like you can say the politically interesting is of course what quality standard is set right. But going out and finding the products which actually meet those standards, that's not for politicians because we don't [procure]" explained Mr. Olsen.

Despite the fact that decision-makers might not know the details about procurement, but they do know about cost, explained Bornholm's municipal building's manager Kim Eilif Pedersen. "There is the thing in right now that we have to be more aware of the environment, so they [decision-makers] know that things will get more expensive... So, this is our chance and time to tell them that we need more money if we have to make some greener purchases" elaborated Mr. Pedersen.

Coordinator from the "Bright Green Island" initiative in Bornholm, Lena Schenk, highlighted that decision-makers are "aware that public procurement will be a tool, or is a tool in this green transition". However, Jeppe Nothlev Nørtoft from the Danish EPA pointed out that it is not always as straightforward on an organisational level as it is planned to be:

"one of the big barriers is actually learning to do something in a new way. There is a certain culture in the procurement departments where they are very used to doing it a certain way which is the buying as low as the price as possible. Another thing is this concern of having a dialogue with the market in order to figure out what the market actually can deliver. This concern is rooted in risks of being accused of favouritism and obscuring the competition which is not necessarily going to be the case if the dialogue is conducted properly."

But sometimes it is challenging to find a fine balance because, for example, a waste prevention criteria need to be carefully crafted: "we can put demands like that without much issue, but we also have care that we don't put up too many demands because if we are too demanding, no contractor will bid or prices will be too high, and we won't have a contract, and that's an issue too because we have to balance our budget" explained Bornholm's Public Procurement Analyst, Anders Damgaard Madsen.

Knowledge about finding the right balance or knowledge about other barriers on the organisational level when focusing on applying waste prevention strategies while procuring are all important. Another barrier is potential miscommunication between organisations on Bornholm. Steen Pedersen from the Regional Municipality of Bornholm pointed out that the procurement department in Bornholm is the one which takes the environment into consideration "we have departments who do that. We can call them, and then they go to fill

[in environmental criteria]”. Miscommunication can unintentionally happen also within organisations when knowledge can be based on an assumption: “it’s not like we every morning [we] tell our staff to be aware of what you buy and how it’s wrapped or what you produce of waste. That’s not how we do it, but I think it’s a general awareness that we maintain all the time, I think” said Kim Eilif Pedersen from the Regional Municipality of Bornholm.

Awareness to prevent waste and demanding for decision-makers to work on waste issues has grown amongst consumers described Lena Schenk: “the other part is the consumption part, which I think it’s really rising on the agenda now. And everyone has a part to do. But one way you can change the whole waste [the problem is to] move closer to our everyday life, and to every day in life also in businesses and the municipality”. Mr. Damgaard Madsen, agreed that “waste is definitely a thing that we are going to have to discuss [more]” on different organisational level within the Regional Municipality of Bornholm.

Throughout the interviews on Bornholm, knowledge and definition about waste prevention varied on an organisational level. ‘Waste prevention’ was explained by Ms. Kragstov as a way to request less plastic packaging while procuring and also reusing some food ingredients in the municipal catering kitchens in order to prevent food waste. Kim Eilif Pedersen also referred about less plastic wrapping, but also to increase recycling process on the island as a waste prevention option. According to Mr. Olsen, waste prevention can be realised by minimising waste coming to the island, for example, through supporting local agriculture and that way using less packing. Mr. Johansen elaborated waste prevention as something where more education is need and need to pay attention to procure products with the Ecolabel sign.

6 Analysis and Discussion

“A broad objective, waste prevention affects and depends on a very wide range of stakeholders. It benefits from national targets and local authority engagement, but it depends fundamentally on changes in the attitudes and behaviour of households and businesses and on new paradigms in industrial processes and product design.” (European Commission, 2012, p. 6)

6.1 Barriers to preventing waste

In Denmark, a country with high GDP and insatiable consumption habits, it is not surprising that they face various barriers to dematerialising while procuring for public institutions. To answer the first research question, ‘*What barriers do decision-makers in public institutions on Bornholm face in applying waste prevention measures as part of public procurement?*’, there is a need to go back to what Bornholm’s decision-makers expressed during the interviews and also what previous literature has found out about existing barriers.

6.1.1 Political:

Waste prevention is a highly political topic (Corvellec et al., 2018). Various stakeholders with various interests are involved in decision-making about waste prevention, and the tools to utilise, including harder tools in the form of the public procurement (GPP Handbook, 2016; Schapper et al., 2006). Findings show that without front runners who lead the way, there are more barriers to overcome (discussed further in 6.2.1). On Bornholm, in previous years, a distinct lack of political will was a barrier for the island in applying hard “greener” tools, such as green public procurement. Without the political support across different parties, the vision of ‘*Bornholm showing the way – without waste 2032*’ would not have been possible to introduce.

Politics is also about garnering votes and honouring pledges to the electorate once in office. As such, politicians are attentive to listen to voters and their concerns, and especially so in small communities like Bornholm. Environmental awareness amongst the public has grown, especially on matters regarding environmental degradation, Climate Change and plastic pollution in the Oceans, to name few. Findings show that voter awareness in Bornholm has had an impact on the politicians, and in so doing, influences the political agenda towards greener goals and visions. In Bornholm, the softer tools, such as information campaigning, should not be ignored and instead used in combination with harder tools, such as GPP.

Eventually, the challenge and potential barrier in the future are the changing political tides, reflective of whatever is the pressing topic amongst the electorate. If consistent public interest prevails on a specific environmental initiative amongst the public, and more so in a close community as Bornholm, political impetus is likely to follow. Conversely, should voter interests sway because of other pressing political matters, likely politicians will fail to follow through. As such, work on “greener” goals, such as waste prevention and especially dematerialisation, tend to fall back in the political agenda and do not get political support. Such a situation is not constrained only to the municipal level, but also national and the EU level.

6.1.2 Economic:

A significant economic barrier limiting green initiatives and activities in Bornholm are budget allocations to municipalities in Denmark. A significant juxtaposition is the National Government's requirement that municipality expenditure is reduced one per cent year on year, while concurrently expecting municipalities to engage more in capital intensive environmental activities, such as, waste prevention and focusing on green public procurement. Findings showed that the one per cent cost-cutting measure in Bornholm had created more barriers and more restrictions by further limiting already limited human resources, required to drive environmental initiatives such as waste prevention. Findings showed that public procurement is a balancing act between budgetary constraints and purchasing power. Crafting and following through on an effective waste prevention initiative is directly limited by the lack of economic or/and human resources to have early engagement with a market (Svensson Myrin et al., 2018).

Cost is another significant barrier to waste prevention. Findings point to market constraints as limitations to attaining waste prevention. As markets have been deemed to move slower than the ambition of environmental policies such as Green Procurement. Other finding, however, shows that the fault lies with the administrators and decision-makers of public institutions who have a limited grasp of market pricing and green public procurement (Miljøstyrelsen, 2018). Findings showed that greener products can actually be cheaper or at par with conventional products while providing the same utility. This lack of understanding has meant that politicians have been unwilling to allocate budgets towards GPP due to limited or incorrect information.

Findings revealed another barrier what Bornholm is facing due to its' small size and relatively small purchasing power compared to larger municipalities in Denmark. If Bornholm is not able to co-operate with other municipalities, their purchasing power is too small, and they are not able to influence procurement criteria the same way as bigger municipalities can. Hence, Bornholm is dependent on co-operating with other municipalities in order to get good pricing and have a possibility to influence product to be greener. At the same time, since not all the municipalities are front runners, Bornholm may need to lower green criteria when they are procuring together with other municipalities, and as a consequence that, for example, dematerialisation criteria might not be on the procurement agenda.

6.1.3 Organisational dimension:

From the organisational dimension point of view, the findings, as well as literature, have shown that there are a number of barriers that limit the implementation of waste prevention. These barriers include misunderstanding and miscommunication among vital stakeholders and an unwillingness to step outside of comfort zones and to attempt new strategies. Strategies such as waste prevention are as much about dematerialisation as they are about mental and behavioural change (Corvellec et al., 2018).

As literature has pointed out, the definition of waste prevention is not as straightforward and has a lot of room for misinterpretation (Gharfalkar et al., 2015; Pires et al., 2019a). Such misinterpretation creates a barrier to *how* waste prevention can be reached through procurement. Understanding can vary from “the consumption of scarce natural resources; the resultant waste that is generated; the environmental impact; or the impact on human health or the effect on society” (Gharfalkar et al., 2015, p. 306). Findings also from Bornholm showed that interviewees had a different understanding of what waste prevention is and also how it

can be achieved. Such a broad misunderstanding can lead to challenges in finding solutions both at the local and national level.

Confusion can create hiccups for legislators and policymakers in incorporating waste prevention at a national level (Zorpas & Lasaridi, 2013). Such hiccups have also surfaced on the local decision-making level in Bornholm. The misunderstanding of waste prevention (especially dematerialisation) on the national level has trickled-down to municipal level, further creating legislative barriers in implementing waste prevention at municipal level.

In Denmark, as in Bornholm, the focus on the waste prevention at an organisational level is not as prominent when compared to other strategies such as waste recycling, reuse and “closing the loops” (The Danish Government, 2015). As a consequence, ‘Bornholm showing the way – without waste 2032’ vision is inconsistent with waste prevention, in the form of dematerialisation and instead focuses mostly on waste recycling and reuse (the vision in Appendix 1). Since dematerialisation is not included in the Bornholm 2032 vision, that creates a lot of barriers for people at organisational and council level in focusing particularly on dematerialisation while public procuring. For an island like Bornholm which has geographical constraints and tourism-dependent, it remains vulnerable by relying only on recycling and energy recovery loops. Such loops are polluting, and the carbon footprint can remain high (Camilleri-Fenech, Oliver-Solà, Farreny, & Gabarrell, 2018) and transition towards greener behaviour would remain relatively low.

Another barrier from an organisational point of view are the drivers behind the waste prevention and dematerialisation agenda. In Bornholm, only one or two municipality administrators responsible for procurement are knowledgeable about dematerialisation as a means to achieving waste prevention. Literature points that there is a very high risk that should the person or persons discontinue their engagement with waste prevention, then likely as a whole, the focus on waste prevention will be eroded and discontinued (Corvellec et al., 2018) and will have an effect on entire island and what is procured in the public institutions.

6.2 How to prevent waste

With the barriers which were elaborated in the 6.1, there are solutions which were highlighted in the findings chapter and in the literature review chapter. This sub-section will give insights into the second research question: ‘How can decision-makers in public institutions on Bornholm prevent waste during the procurement process?’

6.2.1 Politics:

As findings have shown, the political will in Bornholm has been an enabler in strategically moving towards environmentally sound goals. However, there is a need to have more front runners who are environmentally aware and to engage them, especially in decision-making positions. Hence, it is essential for decision-makers to apply both soft and hard tools in order to drive waste prevention. Carefully crafting these tools can ensure effectiveness and longevity. Soft tools can be designed to work without an over reliance on political dependence as hard tools such as economic instruments, in the same right, can be driven by the market. Bornholm has set itself apart as regional municipality, wherein despite political differences and affiliations,

politicians have been able to partner with environmental practitioners to effect and realise the implementation of ambitious environmental visions.

Findings in the literature and during the interviews showed that waste management and waste prevention is continuously changing and becoming more stringent and clearer (EU Waste Directive, 2018). Hence, Bornholm pays attention to what is happening on the national and the EU level because they are dependent on what regulatory bodies will implement. Bornholm has an ambitious vision because municipalities in Denmark have the possibilities to develop further their environmental ambitions agendas than the minimums expected by the national government (The Danish Government, 2015). Bornholm aims to be innovative and set a benchmark that can be emulated by the rest of the EU, by showing how effectively utilising both soft and hard tools alongside innovative thinking, can realise substantial environmental gains. By positioning itself as a leader in green thinking, Bornholm can draw to itself crucial partnerships with other municipalities, as well as private industry, which would want to partner on the waste prevention and dematerialisation initiatives, in public procurement.

6.2.2 Economic:

Economics is a significant driver in the manner in which decision-makers in public institutions approach waste prevention. Especially so during the public procurement process. Findings showed that awareness and knowledge in applying economic instruments such as GPP could be an important contribution to prevent waste (EU Waste Directive, 2018). Findings further showed that in addition to awareness on how to apply GPP, effective communication about sustainable products and their durability could have an impact what public institutions procure.

Findings showed that applying the total cost of ownership principle is not always easy for municipalities. However, doing so is both financially and environmentally beneficial. By co-operating and collaborating with other municipalities and utilising knowledge sharing, innovative avenues on waste prevention through green public procurement can be realised, including joint procurement and budgeting between municipalities. A joint procurement process creates bigger purchasing pools and a greater purchasing power. This not only realises economies of scale but in addition, a stronger purchasing position allows for municipalities to set stringent product criteria including waste reduction practices during the manufacturing process. “By asking suppliers about their waste prevention activities, the municipality can get information about the maturity of the industry and be guided in work on finding suitable waste prevention requirements” (Svensson Myrin et al., 2018, p. 8). Co-operation can also serve as a supportive factor for better product development by having early market engagement with the largest procurers.

6.2.3 Organisational dimension:

Findings and literature showed that at an organisational level, there should be front runners that drive different green agendas. For example, front runner working to prevent waste in the procurement process. Organisational commitment should not be underestimated and should be strategically considered. “A successful example of how to meet these challenges is to appoint a person with an operative role with a designated responsibility for long-term sustainability aspects of procurements (Svensson Myrin et al., 2018, p. 9), as well as, to ensure

that dematerialisation is applied as a key criteria when procuring, even in the absence of the current office holder in the procurement department.

6.3 Further discussion and future research

In Bornholm, the focus has been on the vision of *Bornholm showing the way – without waste 2032*. However, it is not clear whether contingencies are in place and whether a plan b to this vision exists. In a scenario where the recycling rates remain low, and the waste prevention ambitions are not met, it is unclear how the strategy will evolve to address this possibility. Indeed, the question given this scenario are numerous. How will waste be managed? Will all the waste be shipped outside of the island for recycling and treatment? If this becomes a possibility, what would be the added environmental footprint? These questions are not simple, and the answers need to be carefully considered. Therefore, further study on calculating the environmental footprint of this scenario would be useful to look at. Another option is to study what minimum recycling levels need to be attained if a full transition to waste-free cannot be attained.

Currently, Bornholm has not categorically defined which waste fractions should be prioritised as part of its waste prevention strategy as well as the recycle and re-use strategy. Hence, it would be beneficial to have a further study that clearly identifies a hierarchy of focus on waste. This will have the added benefit of informing the regional municipality the types of products to focus their procurement on as well as open up co-creation opportunities with suppliers of these products.

The thesis will be publicly available a few months before the new Danish waste prevention strategy is set to be published (est. January 2020). It is possible that some barriers identified in this thesis will not be barriers as they could be addressed by the National Waste Prevention Strategy. Hence, based on the upcoming new national strategy, it would be beneficial for Bornholm or other municipalities to do further research on how public institutions could prevent waste and use public procurement as a tool in the context of the new legislation.

7 Conclusion

This thesis examined the barriers and opportunities to dematerialisation (the absolute reduction of raw material used in the production process), as a means of waste prevention, through the lens of public procurement within the island of Bornholm regional municipality, Denmark. Findings revealed three major themes: politics, economics and organisational dimension, which all presented barriers and opportunities for decision-makers in realising waste prevention in public institutions through public procurement. Findings showed that key success factors to green public procurement include strong political will, the presence of front runners in public procurement that can champion the cause, and for the strong propagation of the vision, independent of the tenure of the front runners in public office. Another important finding that emerged was the misconception that “greener” products are more expensive than conventional ones. However, what is necessary is the allocation of resources and particularly knowledgeable human resources, with the necessary sourcing expertise to seek these products out. Bornholm has not allocated resources to look into green public procurement (GPP), creating a disconnect in procurement budgeting when compared to waste prevention ambition. Findings also showed that applying economic instruments, such as GPP, can assist in steering strategically waste prevention while procuring.

Further, the finding showed that collaboration and co-operation with other municipalities on joint procurement can strengthen Bornholm’s ability to strategically apply waste prevention during procurement by leveraging its larger purchasing power. But before co-operation it is crucial for Bornholm to define clearly waste prevention in an objective manner. Interviews revealed that there wasn’t a cohesive and uniform understanding of the ‘what’ and ‘how’ of waste prevention among key decision-makers. With these findings, this thesis aims to contribute to expanding the knowledge and understanding of waste prevention through public procurement as well as aid Bornholm’s vision, *‘Bornholm showing the way – without waste 2032’*.

7.1 Recommendations

The author aims that the following recommendations can serve as a starting point to a conversation on Bornholm about waste prevention (particularly, dematerialisation aspect) while publicly procuring on Bornholm.

Recommendations to BOFA:

- Define what waste prevention means
- Co-operate with the public procurement department
 - It is good to specify at the beginning who is the responsible individual or the team who will take in charge of keeping up on how co-operation is progressing
- Assist public institutions in identifying which waste fraction is the largest in public institutions; the information helps to target correctly to prevent waste flow before such products or materials are procured to the island
 - Such identification could help procurement department set new procurement criteria
- Have a plan B how to work towards waste prevention, if the vision 2032 fails
- Help to develop Bornholm’s green public procurement criteria, which includes dematerialisation

Recommendations to Bornholm's procurement department:

- Co-operate with BOFA because they know what waste is easy to recycle or reuse
- Utilise already existing sources such as the Copenhagen city's GPP calculations
- Utilise already existing format on the Ecolabel website to make tenders with greener features
- Join the POGI (the Danish GPP Partnership); it is free and gives access to support and guidance from other municipalities which are part of POGI
- Debunk the myth that the GPP is more expensive all the time
- Ensure that waste prevention criteria will remain in place while procuring, even if a committed and environmentally-minded procurement officer leaves the position.

Recommendations to Bornholm's public institutions:

- Identify which waste fraction or material is the largest, so public institutions can potentially address it while procuring
- Request from politicians that more budget is allocated to find a way to prevent waste in public institutions
- Have a continues dialogue with public procurement department about how could public institutions reduce/prevent waste while procuring
- Request budgeting from Bornholm regional municipality to use environmental managers who are already located on Bornholm as a consultant to work on the environmental topics, such as waste prevention.

Recommendations to Bornholm's politicians:

- Reach a political consensus on the definition of waste prevention, and
- Clarify how Bornholm will prevent waste, particularly dematerialisation, in the first place.
- Try not to treat GPP as a more expensive option, because mostly it is not
- Utilise knowledge from other municipalities and cities, such as Copenhagen, and the way they have been able to reach their waste prevention approach and procure more environmentally friendly products
- Support dematerialisation criteria while procuring, because your support is crucial to driving GPP beyond its' current criteria

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Appendix 1: Bornholm's the 2032 Vision

The *'Bornholm showing the way – without waste 2032'* is the vision of a cleaner, healthier, and greener Bornholm, boosting growth and development. The following points are taken directly from the vision (BOFA, 2018, pp. 4-5):

- The citizens of Bornholm pave the way. In households and businesses all waste is sorted, making it easy and simple to use it in new resource loops. Existing fractions such as metal, plastics, and cardboard are widely recycled and new waste fractions such as fishing nets, insulation materials, and special plastics are recycled in collaboration with local businesses and partners.
- Organic waste is converted to energy through composting or biogasification. The green part of garden and park waste is also recovered for energy purposes. The nutrient-rich residue from energy recovery is used as a fertiliser on agricultural land, in gardens, and in the green spaces of the island.
- The citizens of Bornholm reuse everything from furniture to children's wear, and they make use of sharing economy services. Socioeconomic businesses repair everything from old bicycles to discarded kitchens.
- Schools, childcare institutions, and secondary education institutions along with all other institutions of the Regional Municipality prevent waste generation through sustainable and waste reducing procurement combined with new resource-saving technologies and waste solutions.
- The elementary school pupils of Bornholm - as the first ones worldwide - are educated as "resource heroes" through practical and direct work regarding waste, resources, environment, and nature.
- Tourists and visitors to Bornholm are active players in one of the world's first waste-free societies and thereby in Bright Green Island. They prevent waste through sustainable consumption, and they sort their waste in the novel waste solutions that hotels, restaurants, the entertainment industry, and cultural venues place at their disposal. And they learn about sustainability and resources at the summer schools, green workshops, and holiday farms of Bornholm.
- Bofa, the municipal waste management company of Bornholm, as the first municipal waste management company in Denmark has phased out incineration as a treatment option. Now all waste is collected and treated as sorted recyclable resources through local public, private, and public-private collaborations and partnerships.
- Bornholm is a technology and systems beacon in the waste and resource field. This position has been achieved thanks to the concrete results that the conversion of the waste management system has produced on Bornholm, and to the associated growth within commerce, agriculture, industry, tourism, and education and training. The island is a national and international showcase for how to realise a true circular economy in practice.
- A waste and resource cluster has been established with new and established businesses on Bornholm through several years of targeted efforts. The resource cluster serves as a knowledge centre and an international showroom for Danish waste solutions, technologies, and knowhow.
- In collaboration with a university Bornholm has established its first education and research centre for green transition and circular economy. The centre is characterised by conducting evidence-based and practice-near education, research, and development activities created in close collaboration with the island's business community, citizens, and public institutions.

Appendix 2: The 2018 Waste Framework Directive

Article 9,

Prevention of waste

1. Member States shall take measures to prevent waste generation. Those measures shall, at least:

- (a) promote and support sustainable production and consumption models;
- (b) encourage the design, manufacturing and use of products that are resource-efficient, durable (including in terms of life span and absence of planned obsolescence), repairable, re-usable and upgradable;
- (c) target products containing critical raw materials to prevent that those materials become waste;
- (d) encourage the re-use of products and the setting up of systems promoting repair and re-use activities, including in particular for electrical and electronic equipment, textiles and furniture, as well as packaging and construction materials and products;
- (e) encourage, as appropriate and without prejudice to intellectual property rights, the availability of spare parts, instruction manuals, technical information, or other instruments, equipment or software enabling the repair and re-use of products without compromising their quality and safety;
- (f) reduce waste generation in processes related to industrial production, extraction of minerals, manufacturing, construction and demolition, taking into account best available techniques;
- (g) reduce the generation of food waste in primary production, in processing and manufacturing, in retail and other distribution of food, in restaurants and food services as well as in households as a contribution to the United Nations Sustainable Development Goal to reduce by 50 % the per capita global food waste at the retail and consumer levels and to reduce food losses along production and supply chains by 2030;
- (h) encourage food donation and other redistribution for human consumption, prioritising human use over animal feed and the reprocessing into non-food products;
- (i) promote the reduction of the content of hazardous substances in materials and products, without prejudice to harmonised legal requirements concerning those materials and products laid down at Union level, and ensure that any supplier of an article as defined in point 33 of Article 3 of Regulation (EC) No 1907/2006 of the European Parliament and of the Council (*) provides the information pursuant to Article 33(1) of that Regulation to the European Chemicals Agency as from 5 January 2021;
- (j) reduce the generation of waste, in particular waste that is not suitable for preparing for re-use or recycling;
- (k) identify products that are the main sources of littering, notably in natural and marine environments, and take appropriate measures to prevent and reduce litter from such products; where Member States decide to implement this obligation through market restrictions, they shall ensure that such restrictions are proportionate and non-discriminatory;
- (l) aim to halt the generation of marine litter as a contribution towards the United Nations Sustainable Development Goal to prevent and significantly reduce marine pollution of all kinds; and
- (m) develop and support information campaigns to raise awareness about waste prevention and littering.