Drivers and Barriers for Reducing Food Waste in School Kitchens

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Master Thesis

2019

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Abstract

Of the food produced for human consumption, one-third is lost or wasted. Food waste has an impact on the environment in several ways and it is thus required to reduce food waste in all parts of the value chain.

The objective of this thesis is to identify drivers and barriers for implementing food waste reducing strategies in school kitchens. The study is conducted within the project *Göteborgsmodellen för mindre matsvinn.* The analytical framework for this thesis is an eight step model for change. Within these steps, drivers and barriers were mapped by collecting data from a qualitative study including interviews with representatives from Göteborgsmodellen, a study visit in a school kitchen and interviews with personnel from four school kitchens in the Swedish municipality Göteborgs Stad.

The overall conclusion from the drivers and barriers identified within this thesis is to start with facilitating recooking of leftovers. This is done by introducing a flexible dish on the menu, installing equipment for example cooling down leftovers and inspiring personnel to be creative with how they recook the food. Reducing overproduction is the ultimate goal, however it is both difficult due to unpredictable amounts of food consumed and it is less connected to the drivers. That said, the change process is not finished until there are routines in place both for recooking leftovers and reducing overproduction.

As for the future, this research should be deepened with studies on initial barriers to reduce food waste and psychological and behavioural patterns in the whole process as well as broaden with the drivers and barriers in other types of large-scale kitchens.

Sammanfattning

Av maten som produceras för mänsklig konsumtion blir ungefär en tredjedel till svinn. Matsvinn påverkar miljön på flera olika sätt och det är därför eftersträvansvärt att minska matsvinnet i alla steg i värdekedjan.

Avsikten med den här uppsatsen är att identifiera drivkrafter och barriärer för implementering av matsvinnsreducerande strategier i skolkök. Studien har gjorts inom projektet *Göteborgsmodellen för mindre matsvinn*. En modell för förändring i åtta steg har använts som analytiskt ramverk. Insamlad data från en kvalitativ studie har legat som grund för kartläggning av drivkrafter och barriärer inom dessa åtta steg. Data har samlats in från representanter från Göteborgsmodellen, ett studiebesök i ett skolkök samt intervjuer med personal i skolköken i Göteborgs Stad.

Slutsatsen från drivkrafterna och barriärerna som identifierades i denna studie är att förändringen mot minskat matsvinn bör börja med att underlätta tillvaratagande av matrester. Det kan göras genom att introducera en flexibel rätt på menyn, att installera utrustning för till exempel nedkylning av rester samt genom att inspirera kökspersonalen till nya sätt att återanvända resterna. Det slutgiltiga målet är att även minska överproduktionen, men det kan vara svårt på grund av varierande och oförutsägbar åtgång av mat samt svagare koppling till de identifierade drivkrafterna. Med det sagt är inte förändringsprocessen klar förrän det finns rutiner både för tillvaratagande av rester och minskning av överproduktionen.

För fortsatt forskning rekommenderas en fördjupning av den här studien genom dels en studie med fokus på initiala barriärer för att minska matsvinnet, dels en studie med fokus på psykologiska och beteendemässiga mönster i hela förändringsprocessen. En breddning av den här studien kan göras genom att studera drivkrafter och barriärer i andra storkök.

Definitions

ENGLISH	SWEDISH	EXPLANATION
Food waste		
Food waste	Matsvinn	Food that is thrown away but that could have been consumed if it was handled differently.
Unavoidable food waste	Oätligt matsvinn	Inedible parts of food that are removed and thrown away, such as coffee grounds and bones.
Plate waste	Tallrikssvinn	Food waste from plates.
Serving waste	Serveringssvinn	Waste from servings, i.e. food left in pots and bowls from serving
Kitchen waste	Kökssvinn	Waste arose in the kitchen, i.e. from preparation and cooking as well as cooked food that is saved but thrown away.
Kitchen types		
Production unit	Produktionskök	Kitchen preparing and cooking food. Divided into onsite production units and central production units.
On-site production unit	Tillagningskök	Kitchen producing food for their own use.
Central production unit	Centralkök	Kitchen producing food for distribution to receiving kitchens.
Receiving kitchen	Mottagningskök/ serveringskök	Kitchen receiving prepared and cooked food from production units for serving.
Titles		
District manager	Områdeschef	Manager for one district in the municipality, including several units.
Unit manager	Enhetschef	Manager for one unit including several kitchens.
Kitchen manager	Köksmästare	Leading the food production in the kitchen. Administrative tasks and cooking.
Meal Assistant	Måltidsbiträde	Kitchen personnel (serving food)
Chef	Kock	Kitchen personnel (cooking food)
Key person	Nyckelperson	Tasked to introduce food reducing routines in the kitchen.
Local interaction support	Samverkansstöd	Collecting and visualising data from the waste measurement and other administrative work.
Other		
AIVO	AIVO	System for monitoring food waste.

Acknowledgement

I want to start with thanking my main supervisor Karin Östergren (RISE & LTH) for two things. First, for giving me the opportunity to write an interdisciplinary thesis on my two fields of study Biotechnology and Management. It meant a lot for me to get this opportunity. Second, for being a great supervisor, always willing to share knowledge, contacts and ideas. It was of great importance for the outcome of this thesis!

I would also like to thank my two other supervisors. Thanks to Misse Wester (LTH) for expert notes on change, behaviours and interview studies and to Jennifer Davis (RISE) for sharing her knowledge on food and environmental issues as well as help with facilitating the interview appointments. Your comments were highly appreciated!

Thanks to everyone within Göteborgsmodellen för mindre matsvinn. To Christina Linnerhag for helping me reach out to the school kitchens and for providing knowledge and insights about the work of reducing food waste in school kitchens with Göteborgsmodellen. Thanks also to the kitchen personnel who took time and engaged in the interviews. The insights from you are the foundation for this thesis, thus invaluable.

Last but not least, a heartful thank you to my office buddy Kristina Broberg. Thanks for sharing joyful and not so joyful moments with me while writing our theses and of course for valuable inputs along the way. I had a blast at the office thanks to you!

Table of Contents

1 Introduction

In this chapter, the aim of this thesis is presented: the purpose, the research questions, the intended outcome and delimitations.

1.1 Objectives

It is commonly agreed that reducing food waste is desirable from both an economical and environmental perspective. Nevertheless, a lot of edible food is still thrown away. Why? It is clear that there is a willingness to reduce food waste, yet there seems to be barriers hindering action. The objective of this thesis is to identify drivers and barriers for implementing food waste reducing strategies in school kitchens. There is a need to find out how to turn strategies into actions and results and to understand how humans interact with technological and organisational structures in school kitchens.

1.2 Purpose

The purpose of this thesis is to map the drivers and barriers for reducing food waste in school kitchens and how those factors can be turned into actions and results. The focus is on technical and organisational structures in the school kitchens and human's interaction with these structures.

1.3 Research Questions

1. What drivers and barriers are there for reducing food waste in school kitchens?
2. How can structures (organisational as well as technical) in the school kitchens be linked to drivers and barriers for reducing food waste?
3. How can the drivers for reducing food waste be implemented? I.e. how can the leaders/managers use the drivers and remove the barriers to get their teams to reduce food waste?

1.4 Intended Outcome

The intended outcome of this thesis is a better understanding of how to succeed in reducing food waste in school kitchens by analysing it as a change process. It targets the whole change process, from introducing the change, via what encourage and discourage actions, to make the change stick within the organisation. Thus, the contribution to existing knowledge will be a broader and better understanding of how school kitchens can change, both on an organisational and technical level, to reduce food waste. By knowing how to organise the kitchens to favour drivers and minimise barriers for reducing food waste, the results from the food waste minimisation projects can be sustained and there will be a long-term behavioural change.

Despite targeting Göteborgsmodellen and the kitchen within Göteborgs Stad, the outcome of this thesis is useful for anyone who want to reduce their food waste in the school kitchen (and similar food services). The result can be used by managers to help their kitchens and personnel to reduce food waste by giving them the right prerequisites to change, and in the end save resources.

1.5 Delimitations

This thesis focus on school kitchens in Göteborgs Stad (municipality in Sweden) as a source of data. Moreover, to be able to serve the purpose of this thesis, the kitchens studied will be actively working with reducing their food waste. The indicators for this are having tangible targets and a strategy for reducing food waste. Further, the focus of this thesis is technical and organisational structures, giving an emphasis on practical issues rather than psychological factors.

The tool Göteborgsmodellen has a focus on kitchen waste and serving waste. However, from a practical point of view the three waste types (kitchen, serving and plate waste) are interrelated. Therefore plate waste is to a certain extent included in this thesis, yet the focus is on kitchen waste and serving waste.

As an analytical tool, Kotter and Cohen's eight steps of change (Kotter & Cohen 2002) have been chosen to be the only theory on change management due time constraints. The model was chosen because of its holistic perspective.

2 Methodology

The aim of this chapter is to describe and discuss the methodology for this thesis. The approach, the data quality, the method of analysis, and suggestions for methodological improvements will be elaborated on.

This thesis is a qualitative study. This means a focus on identifying and specifying unknown or unsatisfying phenomena, which can be variations, structures and processes (Starrin & Svensson 1994). In this case, the identified phenomena is the uncovered drivers and barriers for implementation of food waste reducing actions. The thesis aims to search for the facts, characteristics and meanings within these actions. Since the facts, characteristics and meanings are not yet known (to a satisfying extent), the study will have a qualitative approach. To explore and obtain new knowledge, interviews are suitable (Kvale 2011). In short, the goal is to explore the drivers and barriers for implementing food waste reducing actions.

2.1 Assembling Information

2.1.1 Literature Study and Technical Knowledge

The literature study have been divided into two chapters to make it easier for the reader. The first chapter (Chapter 3 Background) is a general background focusing on the context and theories. The second chapter (Chapter 4 Prerequisites) is more practical and presents the production process in the kitchen as well as the tool Göteborgsmodellen.

Chapter 3 Background is based on a literature study. Research and theory from academia as well as data and information from government agencies are included. The purpose of the theory is to specify the phenomenon studied (Wallén 1996). Conceptual knowledge of the area studied is crucial to make informed choices for methodology and formulation of interview questions (Kvale 2011).

As for this thesis, theory covers relevant research and facts on food waste, school meals in Sweden and lean production. The first part about food waste aims to give a context and a higher purpose to the thesis by explaining the sustainability issue of food waste. In short, it aims to describe why this study is relevant and how it relates to other similar efforts. The second part about public catering services describes the industry at hand. It provides background information about school meals and their organisational context as well as applicable rules and regulations. The third part about lean production explains the seven types of waste within value streams and the lean philosophy. Additionally, a summary on similar projects and best practices is presented. Together, these parts define the background for this thesis.

Moreover, Chapter 4 Prerequisites extends the background theory with more practical information related to food production and food waste. First, the production process in school kitchens is described. Second, Göteborgsmodellen, the tool for reducing food waste used in the municipality studied, is presented. Together, they provide a comprehensive view on the daily work of reducing food waste in the school kitchens at hand.

Search phrases for the literature study have been *food waste, public kitchens, food waste Sweden, reducing food waste driver,* and *reducing food waste barrier.* Some articles and reports were found by looking in the reference list of the articles found via the search phrases, as well as checking relevant

governmental organisations' websites (Livsmedelsverket[1], Jordbruksverket[2], and Göteborgs Stad[3]). The websites of the European Union and United Nations were also accessed. Additionally, some key reports were shared from people experienced in the field, such as the supervisors, during the course of the work. Lastly the written information was complemented with oral information from a dialogue with Charlott Håkansson, lecturer in food production at Lund University, Faculty of Engineering. The text written with information from the dialogue was read and approved by C. Håkansson.

2.1.2 Interviews With Representatives from Göteborgsmodellen

Elin Backlund, former educator in Göteborgsmodellen, and Christina Linnerhag, project manager for Göteborgsmodellen, was interviewed due to their expertise. Their positions have given them unique insights on how the project implementation was conducted both on a technical level and the human plane. The interviews were unformal, more like a conversation. The interviews were not recorded or transcribed, but careful notes were taken. Additionally, the text in Chapter 7.1 Interviews with Representatives from Göteborgsmodellen have been reviewed by both E. Backlund and C. Linnerhag to make sure it is accurate.

2.1.3 Study visit

To get a better understanding of the situation in a school kitchen and how food waste is reduced in practice, a study visit was made. Being familiar with the context not only from a theoretical point of view gives knowledge about the language, routines and power structures (Kvale 2011). Additionally, having a holistic view on the context is the foundation of high-quality interviews (Kvale 2011).

The school kitchen visited was a kitchen where the structures and methods for reducing food waste was well in place. The reason for choosing this type of school was to see usage of the tool Göteborgsmodellen in practice. The visit could also be seen as a pilot study, preparing and testing the theories and methods before the main interviews.

During the study visit, careful notes were taken on when, what and how things happened. Especially the handling of the leftovers and other food waste reducing acts were considered. Moreover, discussions were held with the personnel regarding their routines and actions. The focus of the discussions was food waste as well.

2.1.4 Interviews with Kitchen Personnel

The respondents were selected based on their knowledge and experience in the area. This correlates to the suggestions for qualitative research to get a broad yet accurate picture of the problem (Hedin 1996). Further the sample should have the same composition as the whole population (Frey & Oishi 1995), in this case meaning personnel from both successful and less successful kitchens (in terms of reduced food waste), kitchens of different sizes and type of organisation. To select the kitchens, the project leader for Göteborgsmodellen, Christina Linnerhag, assisted. She contacted relevant kitchens with a short explanation of the project and conveyed the contacts. In the email, where Christina Linnerhag asked the unit managers to reach out to the kitchen personnel, it was written that we were looking for different types of kitchens (central production units, on-site production units and receiving kitchens) and both kitchens which have engaged and succeeded in the project and those who have had a slow and tough start. However, it should be recognised that this step is somewhat self-regulatory in sense of motivation. Only kitchens interested and (at least to a certain extent) committed to the project of reducing food waste will volunteer for the interviews. Even though this was a part of the criteria and delimitation of this thesis – to have respondents working in kitchens with a strategy for reducing food waste – the fully

[1] https://www.livsmedelsverket.se/
[2] http://www.jordbruksverket.se/
[3] https://goteborg.se/

engaged kitchens are more likely to answer than the kitchen's that are struggling. Among the respondents, all kitchens have been successful in reducing food waste. However, they had different experiences on how easy the change was. Thus, they provided different perspectives on the change even though none of them had severe struggles at the moment.

Because of ethical reasons, which is extra important since the group of respondents is small (Hedin 1996), the privacy of the respondents was highly valued. No names or specific titles are included in the data which the respondents were told before the interview started. The respondents were also informed that they could stop the interview, skip answering one or more questions, and take back their sayings at any point. This is in line with what Frey and Oishi (1995) suggest in terms of confidentiality.

Before the interviews the participants got an advance letter about the purpose of the project and the scope of the interviews (Appendix A). The purpose of an advance letter is to increase data quality as well as respondent rate (Frey & Oishi 1995). Further, an introductory statement to be read just before the interview was created (Appendix B). The introductory statement was outlined as recommended by Frey and Oishi (1995). As for one interview the intended respondent turned ill the day of the interview. Therefore, two stand-ins were arranged. The stand-ins worked at the same kitchen, but had not had the chance to read the advance letter before the interview. Therefore, they were given a more comprehensive introduction of this study and the interview than the other respondents. Moreover, an interview guide containing a broad set of questions and areas to discuss was created. The questions were a result of the combined analysis of food reducing work in school kitchens, more specifically Göteborgsmodellen, and the analytical framework about change management. The analysis is presented in Chapter 6 The Analytical Framework Applied to Reduction of Food Waste in School Kitchens.

The interviews were then held face-to-face. In-person interviews allow for a higher variety in questions than over-phone interviews, and is recognised to be one of the best ways to access detailed data (Frey & Oishi 1995). Even though respondents are more likely to give truthful answers to sensitive questions (which some of the questions regarding success and failure are considered to be) during a telephone interview, in-person interviews are suitable for complex and open-ended questions since they allow for visual cues complementing the verbal answers to get the full picture of the situation (Frey & Oishi 1995). Although over-phone interviews are more cost and time efficient, obtaining detailed and elaborated answers were considered key in this thesis thus the choice of in-person interviews. In both settings it is crucial to be aware of the interviewer effect, which is how the interviewers' feedback influence the respondent's answers. Regarding the interviewer effect, there are more negative effects for in-person interviews, namely visual cues such as face expressions or appearance (Frey & Oishi 1995).

In the interviews, the respondents were first informed about the circumstances for the interview, which was shared by reading the introductory statement (Appendix B) out loud. After given permission, various questions on what affects their behaviour in the kitchen in relation to food waste were asked to the respondents. The interviews were semi structured, which according to Hedin (1996) means a set of questions are decided on beforehand (Appendix C), yet there is a possibility to go deeper into any aspect turning out to be more valuable or interesting. Hence, follow-up questions to get the respondent to elaborate was common. Another reason for choosing semi structured interviews is to make sure the respondents get the chance to share their personal experiences and what they found important, yet to keep the answers related to the purpose and the intended outcome. To capture everything said, the interviews were recorded. Afterwards the interviews were transcribed and the respondents were given the possibility to read the transcription and suggest corrections. This was done to minimise the risk of misunderstandings.

Being only one interviewer has its limitations. If the answers are only interpreted by one person, there is a risk of personal perspectives affecting the interpretations of the answers. Therefore, as suggested by Hedin (1996), one of the transcripts were read and analysed by two others (the supervisors Karin

Östergren and Misse Wester). Nevertheless, being more people interviewing would probably have given a better distribution and more nuances to the follow-up questions.

2.2 Analysis

2.2.1 Choosing the Analytical Framework

The analytical framework aims to present theory on how organisations can change. Kotter and Cohen's (2002) model containing eight steps for successful organisational change was chosen since it is a well-known framework on change management and gives a holistic view on the process starting with establishing a sense of urgency to making the changes stick in the organisation. Further, with its eight steps, it gives a clear structure and puts the efforts on a time line.

Other theories on change considered for this thesis include Sunstein's (2014) work on nudging behaviours, i.e how to make it easy for personnel to make the right decisions and behave in a desirable way. Another theory is on cognitive biases, by (Beshears & Gino 2015). Cognitive biases are cognitive barriers for us to change, for example the status quo bias which makes us prefer the current state over an unknown future state. However, both Sunstein's (2014) and Beshears and Gino's (2015) theories were excluded since they target the psychological drivers and barriers, rather than the organisational and technical aspects. Further, Kotter and Schlesinger (2008) presents different strategies for change. Which strategy to choose depends on the urgency of the change versus the need for commitment within the organisation. The reason for excluding this theory is since it suggests strategies and solutions, rather than facilitating mapping of drivers and barriers. These theories all serve as complements to Kotter and Cohen's change model (2002), however time constraints and the purpose of this thesis made Kotter and Cohen's model the best choice.

2.2.2 Analysing The Interviews

The analysis was well structured to make sure important and correct patterns were recognised. Before transcription, a short list on key take-aways from the interview was created. This list was based on rememberable stories and messages. After transcription, the full version of the interview was read to get a comprehensive view of the interview.

The analysis was made in NVivo. NVivo is a software for analysing qualitative data. The quotes can be coded into different themes (nodes). Then, quotes from different interviews on the same theme can easily be compared. After coding all interviews into themes the summaries for each theme were read and if needed the quotes were given a new theme. When coding was done, the themes most commonly talked about were included as a part of the result. Themes could also be interesting for the result in other ways, for example by answering one of the research questions or having a unique perspective. Since the interviews were held in Swedish, relevant quotes were translated when included in the result. This is a potential source of error. It should also be noted that the analysis process was not linear. While going over the interview answers and the themes, new patterns were found and old patterns was dismissed. Going deeper into the meanings of the stories is a natural part of the analysis.

2.3 Data Quality

The data obtained in the study is first hand data from interviews with school kitchen personnel as well as representatives from Göteborgsmodellen and also a study visit in a school kitchen working with Göteborgsmodellen. The sources of data can therefore be considered to have valid and reliable information about the topic. Since this is a qualitative study and the number of respondents is low, the results should be viewed as inspiration and indicative for future (quantitative) research rather than a generalisable truth. The data is foremost applicable to school kitchens aiming to reduce their food waste using Göteborgsmodellen, yet the data can possibly be applied to similar contexts such as elderly care catering services or restaurants.

2.4 Methodological Considerations

Ideally, only one interview is held and then the data from that interview is transcribed and briefly analysed. This makes it easier to remember and capture non-verbal messages, as well as allowing for improvements of questions and techniques for the next interview. However, due to the geographical distance, only doing one interview at a time was not always a viable option thus two of the four interviews were held at the same day. The alternative would have been to do the interviews via phone or video call. This would have made it viable to conduct one interview at a time. On the contrary non-verbal cues would then have been missed for other reasons, such as not seeing (parts of) the person or difficulties in interpreting tone of voice.

Moreover, as already mentioned, the interviews were held in Swedish while this thesis is written in English. Swedish were chosen for the interviews to minimise the barriers, since the interviewer have Swedish as a mother tongue and the respondent had Swedish as a mother tongue or second language. The reason for writing the thesis in English is to make it more broadly available.

As for the selection of respondents, there are room for improvements. Having an interview with a kitchen which have started to work with reducing food waste, but only for a short while or with great struggles, might had provided another perspective. As said, even though the current respondents had different perspectives on the change process, none of them currently experience severe struggles. However, a kitchen like that was not available for an interview during the time period for this thesis. Furthermore, only four kitchens were interviewed for the study. There are two reasons for this: time constraints and saturation of data. After the fourth interview, data was experienced to be saturated (i.e. the same stories and meanings were shared by the respondent as in the earlier interviews). Due to time constraints, it was thus decided to focus on analysis. Yet, if more time would have been available a fifth interview should have been carried through to ensure complete saturation of data.

3 Background

This chapter will present the background theory for this thesis. First, there is a general introduction on food waste and why food waste is problematic. Afterwards, the concept of Swedish school meals and the organisation around them are presented. Moreover, a short introduction on lean production is provided. Last some examples of similar projects and best practices are provided to further give context to this thesis.

3.1 Food Waste

3.1.1 Different Kinds of Food Waste

Food waste, sometimes referred to as edible or avoidable food waste, is in this thesis defined as “food that could have been eaten if handled differently”, which is the same definition as used by Göteborgsmodellen. This implies a part of the food thrown away is not edible, such as coffee grounds, peel, bones, and seeds. That type of waste is referred to as unavoidable food waste (Göteborgs Stad 2016).

In this thesis, three types of food waste are discussed: kitchen waste, serving waste and plate waste. Kitchen waste is all waste that occurs in the kitchen, both ingredients and leftovers saved but later on thrown away. This also means waste from preparation and cooking as well as from storing. Serving waste is waste that occurs from the serving. This includes food left in trays, bowls and pots. Plate waste is all waste from plates, hence caused by the guests in the restaurant. In Göteborgsmodellen, the focus so far is to measure and reduce kitchen waste and serving waste (Göteborgs Stad 2016).

The food waste in school kitchens can be divided into different categories: products that are considered not suitable for consumption and thus thrown away, waste from preparation and cooking, waste from plates, waste from serving, and liquid food waste (Naturvårdsverket 2008, 2009). A report from Livsmedelsverket (2011) shows that half of the waste is generated from preparing and serving and half of the waste is from leftovers (plate waste). In total, almost 20 percent of the purchased food is wasted. This means there are economic losses and unnecessary work done, as well as an avoidable environmental impact (Livsmedelsverket 2011). These factors are all incentives for reducing the food waste in the school kitchens.

Food waste in school kitchens can thus occur at several stages in the internal value chain. Some of the most common sources of food waste are too many portions cooked, insufficient communication regarding absence and presence, lack of adequate routines regarding budgeting and planning, lack of possibilities to store or cook in batches, lack of possibilities to take care of leftovers, difficulties to calculate correct amount of food, and poor ingredients (Livsmedelsverket & Naturvårdsverket 2013).

3.1.2 Why and How Food Waste is Problematic

Around one-third of all food produced is wasted according to the Food and Agriculture Organisation of the United Nations (FAO) (FAO 2011). This is problematic both from an environmental perspective and an economic perspective. Aiking and de Boer (2018) ranked food waste as the third most problematic part in today's food supply chain in Western countries (after over-consumption of protein and over-consumption of calories). Furthermore, the study from FAO (2011) revealed that on a per-capita basis more food is wasted in industrial countries than developing countries.

Food waste is a problem in the whole value chain, from agriculture, via food producers, groceries, restaurants and catering services, to consumer (Naturvårdsverket 2008). A study from FAO (2011) reveals unsatisfactory coordination within the supply chain together with consumer behaviour are the main drivers for food waste in medium- and high income countries. Food waste is problematic since producing food requires natural resources (Naturvårdsverket 2012). Resources needed are raw materials and energy, and it releases hazardous compounds from for example use of pesticides. The production also contributes to climate change, acidification and overfertilization. Moreover, forests are cut down to make more space for farmlands. Wastage of food means that more food than what is consumed needs to be produced, which makes the environmental impact from food production larger than necessary (Naturvårdsverket 2012).

The amount of avoidable food waste from large-scale catering establishments was 35 000 tonnes in 2014 according to Livsmedelsverket (2016). Further, Naturvårdsverket (2018) also presents quantifications of the food waste in Sweden. As of 2016 Sweden wasted 1 255 000 tonnes of food (avoidable and unavoidable food waste) in total. Per person this number was 129 kg. Households caused the main part of the wasted food. Large-scale catering establishments (schools, preschools, elderly care, hospitals, custodies, and prisons) wasted 73 000 tonnes of food (avoidable and unavoidable food waste), which equals 7 kg per person. The main part, up to 50 000 tonnes, originated from preschool and school kitchens. As of 2014 the total wastage of food from large-scale catering establishments were 70 000 tonnes, which equalled 7 kg per person.

As for the school kitchens, there are several aspects of the food waste problem. First, there is the economic perspective. Wasting food costs money in terms of unserved meals and the ingredients used for those meals. It also costs money because of used electricity, personnel's time and other resources needed to purchase, store and cook the food. Second, it is an environmental problem, since wasted ingredients and cooked food have consumed resources during farming, industrial production and transportation, as discussed in the previous paragraph. The food industry is also a major consumer of water. Third, there are the legal aspects. There are legislations in place for how public kitchens must store, cook and cool down the food. This impacts the possibilities to for example serve leftovers or reuse

the food in new dishes. (Göteborgs Stad 2016; FAO 2013; "About the Sustainable Development Goals" 2018; "Matsvinn" 2018)

3.1.3 Global Perspective

On a global level, the purpose of reducing food waste could be linked to the UN Sustainability goals. The relevant goals are number 6 (Clean water and sanitation), 12 (Responsible production and consumption), and 13 (Climate action) ("About the Sustainable Development Goals" 2018). Most relevant is target 12.3 "*By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses*" ("Sustainable Development Goal 12" 2018). The EU Commission has decided, as a part of their Circular Economy Action Plan, to support the achievement of SDG 12.3. To do so, a platform for sharing best practice, defining measures and evaluating progress is established ("The EU Platform on Food Loss and Food Waste" 2018). Likewise, Springmann et.al. (2018) concluded that technologies and management for the food system need to be developed, along with reduction of food loss and waste and dietary changes towards more plant-based diets, in order to keep the environmental impact of the food system within the planetary boundaries.

The Food Waste Pyramid, which can be seen in Figure 1 (FAO 2013), shows that reducing the food waste is the best action from an environmental point of view, followed by reusing the waste, recycle or recover the waste, and lastly to let the waste go to landfill. For every other production step, more resources are required. Hence, reducing the waste is the best option. However, for the same reasons, the second best option is to reuse the food waste. Reusing could be done by finding other areas of use, such as selling to secondary markets, giving it to charity organisations or for animal feed. Preferably, the food should be kept in the human food chain. Recycle or recovering is the third option, making use of the nutrients and the energy in the food by for example composting the waste. The last option is landfilling, since it causes emissions of methane and pollutes soil and water. (FAO 2013)

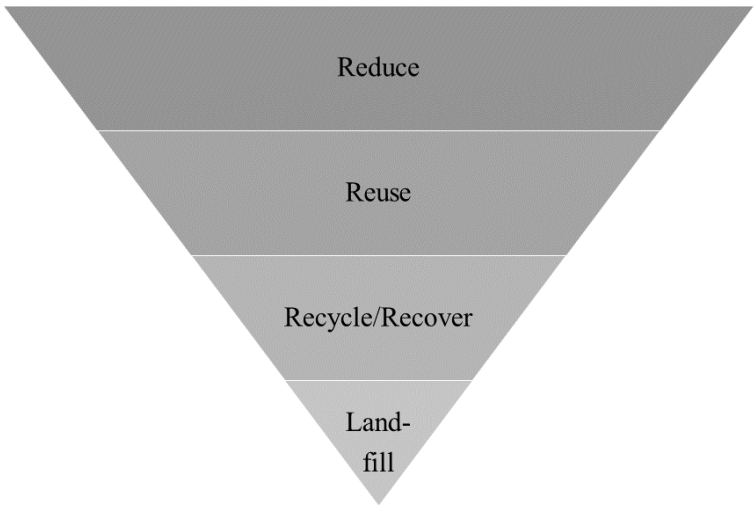

Figure 1 Food Waste Pyramid (inversed) (FAO 2011)

Another model is the Food Recovery Hierarchy, shown in Figure 2. The Food Recovery Hierarchy describes the prioritisations for prevention and diversion of wasted food in terms of action that can be taken by organisations. Reducing the source of food waste is the highest priority. This is followed by feeding hungry people. Third preference is to feed animals, fourth to have it for industrial uses, fifth to compost it, and sixth to let it go to landfill. ("Food Recovery Hierarchy" 2018) Hence, this thesis targets the highest priority (source reduction).

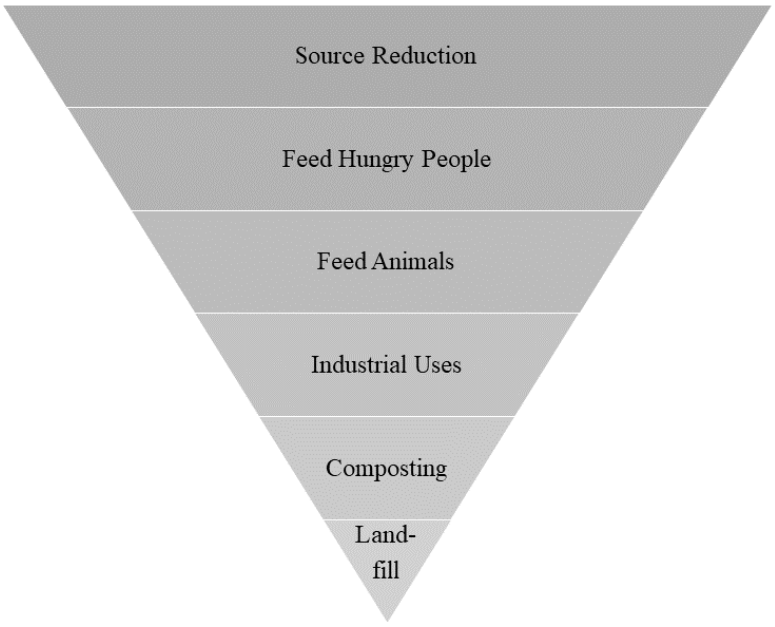

Figure 2 1 Food Recovery Hierarchy ***("Food Recovery Hierarchy" 2018)***

It is suggested that to prevent food waste organisations can conduct a waste audit and implement reduction habits. A waste audit maps the flows through the kitchens to find out where, what and how much food is wasted. From this, strategies for food waste prevention can be formulated. Further, reduction habits that could be implemented covers everything from purchasing to storing to serving. By for example adapting the menus to the consumers, both in terms of portion size and dishes served, to store food properly, or to use leftovers and excesses creatively, food waste can be reduced. ("Food Recovery Hierarchy" 2018)

3.1.4 Local Perspective

Countries, municipalities and cities can have their own sustainability goals. Between the years 2013 and 2015 Livsmedelsverket (the National Food Administration in Sweden), Naturvårdsverket (Swedish Environmental Protection Agency) and Jordbruksverket (the Swedish Board of Agriculture) worked with projects on reducing food waste as a commission from the Swedish government. The project was called "Minska Matsvinnet" (in English: Reduce the Food Waste). The conclusion was that Sweden needed a long-term strategy for reducing food waste, that the commitments within SDG 12.3 needed to be communicated better, and that a holistic view on food waste and interaction between industries should give positive synergies (Livsmedelsverket 2016).

From year 2017 to 2019, the Swedish government again commissioned, Naturvårdsverket and Jordbruksverket to work for reduced food waste in Sweden. As a part of this, the agencies have developed an action plan to aid the work within Sustainable Development Goal 12.3. The actions involves primary production, producers, commerce, restaurants, consumers, authorities, research and innovation as well as meals in schools, elderly care, and health care ("Handlingsplan för minskat matsvinn i Sverige" 2018). The action plan is divided into nine different areas: Goals and measurements, Cooperation and dialogue, Increasing knowledge, changing behaviours and attitudes, Rules and applications for reducing food waste, Date indications, shelf life and cooling chain, Prognosis, logistics and handling, Agreement and procurement, Increasing of motivation, and Investigation, research and innovation (Livsmedelsverket, Jordbruksverket & Naturvårdsverket 2018). In December 2018 Livsmedelsverket released a national method for measuring food waste. The aim of having a national

method is to get comparable results and thus have the basis for developing food reducing strategies further ("Det som mäts är det som syns – ny nationell metod för matsvinssmätning i storkök" 2018).

Västra Götalandsregionen has set up a strategic agenda to achieve a society not dependent on fossil fuels by 2030. To get there, four focus areas were identified: Sustainable transport, Climate-smart and healthy food, Renewable and resource-efficient products and services, and Healthy and climate-smart homes and buildings. Within the focus area of climate-smart and healthy food, reducing food waste is one of the topics. To get there, all actors in the region need to act within their organisation as well as together with other organisations. Within this, the need for a long-term focus and continuous improvements is highlighted. To ensure a safe handling of left-overs to enable safe storing and reuse is another key aspect. Moreover, tools for controlling and stimulating climate initiatives coupled to food waste should be developed and improved. (Länsstyrelsen Västra Götalands län & Västra Götalandsregionen 2017)

In the City of Gothenburg, one of the goals is to reduce the waste per citizen in the municipality by 30 percent from 2010 to 2030 and reducing the food waste in the public kitchens will help achieving the goal (Göteborgs Stad 2016). Further, Naturvårdsverket ("Matsvinn" 2018) states the major cause of food waste is too many meals produced each day. The reason behind is economical, since the budgeting routines favour overproduction ("Matsvinn" 2018). Despite this, calculations have shown that Göteborgs Stad (schools, preschools and elderly care) throws away edible food to a value of 36 MSEK each year (Göteborgs Stad 2016). If other related costs are taken into account, such as costs for electricity and facilities, the cost is even higher.

3.2 School Meals in Sweden

3.2.1 Organisation

How Swedish municipalities have organised the school kitchens varies. The difference lies in budget responsibilities, ways of working and organisational affiliation. The principal is often responsible for the budget, whilst the Education Committee or similar is the responsible committee in the municipality. However, in some municipalities the responsibility is shared between several committees, such as the Educational Committee and the Technical Committee, which makes it difficult to have a holistic view on the value chain of the public catering services. (Naturvårdsverket 2009)

There are three different kinds of kitchens: production units, divided into central production units and onsite production units, and receiving kitchens (Eriksson, Persson Osowski, Malefors, Björkman & Eriksson 2017). According to Naturvårdsverket (2009) common organisational approach is a few production units, delivering the hot, prepared meals to the receiving kitchens for serving. An organisation with central production units and receiving kitchens normally causes more food waste compared to organisations with onsite production units. This is since the receiving kitchens often order more food than needed to make sure they have enough food to all students and since they also often lack possibilities to properly cool down and store the food **(**Naturvårdsverket 2009). Likewise, Eriksson, Malefors, Björkman and Eriksson (2016) found that long-term, municipalities should convert receiving kitchens to production units to minimise food waste.

3.2.2 Rules, Regulations and Recommendations for School Meals

In 1946 Sweden introduced economical contributions from the state to the municipalities that offered free meals in school. Despite this, the right for all students to get free meals in school was not implemented until 1997. In 2011 it became mandatory to serve nutritionally balanced meals (Livsmedelsverket 2013) and in 2017 the Swedish government decided that by 2030 at least 60 percent of the food purchased for the public catering services should be organic ("Upphandling av Mat och Måltider" 2018).

School meals were introduced to give the students the right foundation for learning and development in school. Moreover, the curriculum says the school is responsible for that all students after elementary school have knowledge about and understand the connection between their lifestyle and their own health, the environment and the society. (Livsmedelsverket 2013)

Today, about 1.3 million meals are served in schools in Sweden. The cost for the food ingredients in one meal costs about 13 to 14 SEK. A majority of the schools measure the food waste at least once every semester. ("Fakta om Offentliga Måltider" 2018)

Livsmedelsverket (the National Food Administration in Sweden) have created a model for a holistic view on the school meals ("Måltidsmodellen" 2018). The meal model consists of six pieces explaining the important parts of the meal: Tasty, Integrated, Pleasant, Sustainable, Nutritious, and Safe. The pieces are illustrated in Figure 3. Being nutritional and safe are important from a health perspective. However, if the food is not tasty and pleasant it will not be eaten (to the same extent as wanted and needed). As for the sustainability of the food, the focus is on environmental and social sustainability. Integrated refers to the meal being a resource for education.

Figure 3 The Meal Model from Livsmedelsverket ("Måltidsmodellen" 2018)

3.2.3 General Regulations Regarding Food and Municipal Kitchens

Besides the regulations for the Swedish school meals described in Chapter 3.2.2 , a majority of the rules and regulations applying to school kitchens are based on mandatory EC-regulations implemented in the Swedish regulatory system. An important one is the General Food Law (Regulation no 178/2002) ("General Food Law" 2019).

There are also regulations from Livsmedelsverket regarding hygiene, food safety, traceability, facilities and equipment, and education of personnel. The purpose of the Swedish food legislation is to protect human health and the interests of the consumers. Almost all packaged food needs to be marked with dates regarding either when the food is expected to lose quality (referred to as "best before") or when the food could possibly be unsafe to consume (referred to as "use by" date). The first type of marking, "best before", often comes with directions on how to store the food and the original quality could actually be kept for longer if the food for example is stored at a lower temperature than suggested. For this type of marking, it is okay to serve the food even if the date is passed. The one serving the food is responsible to make sure the food is still okay by for example smell or taste it. The other marking, "use by", is more strict and food that have passed this date must not be sold or donated, since it is potentially a health hazard. (Livsmedelsverket & Naturvårdsverket 2013) To have knowledge regarding the different types of markings as well as keeping track of the dates on the food in the storage room are thus an important step to reduce food waste in school kitchens.

All actors within the food industry need to adhere to a certain set of rules and regulations, and in the case of school kitchens the municipality is the responsible organisation. Besides ensuring adequate controls and measures are in place, the premises need to be suited for safe food production and suited for the organisation and purpose. For example, cleaning and maintenance of the facilities should be easy. The facilities should be protected from pests and handling of clean and dirty steps should be separated (i.e. raw and cooked food should be separated in time and/or space). Moreover, the facilities must have enough hand cleaning stations, ventilation, drains, and lights, all suitable for the task of preparing and cooking food. Rooms should have different purposes, such as different kinds of storage rooms, cleaning rooms, dishing room, waste room and space for a desk and computer. (Sveriges Kommuner och Landsting 2009)

There are industry guidelines regarding heating, keeping the food warm, and cooling. All food should be heated to an inner temperature of at least 70 °C (cooked fish could sometimes be heated to a lower temperature due to sensorics). The food should then not be kept warm at a lower temperature than 60 °C and not for longer than two hours due to the risk of losing nutrients and change in taste, smell, appearance, and texture. As soon as possible, food aimed for saving, should be cooled down to a temperature lower than 8 °C and the cooling process should not take more than four hours. Cold food should be kept at a temperature between 4 °C and 8 °C and must not get warmer at any point. As for freezing, temperature should go well below -18 °C. If the food is to be transported, such as in the case of production units and receiving kitchens, the same industry guidelines apply and the food should be protected to hinder contaminants to enter the storage boxes. The temperatures can be seen in Table 1 Food temperatures and time. (Sveriges Kommuner och Landsting 2009) From a food waste perspective and to be able to save leftovers, it is important for the personnel to have knowledge regarding these regulations.

Table 1 Food temperatures and time (Sveriges Kommuner och Landsting 2009)

Type	**Temperature**	**Time**
Heating	>70 °C	-
Keeping warm	>60 °C	<2 h
Cooling down	<8 °C	<4 h
Freezing	>-18 °C	Depending on type and quality
Cold food	4-8 °C	Depending on type and quality

Lastly, the procurement of ingredients is limited by the Law of Government procurement, which regulates procurement made by governmental organisations or organisations funded by governmental means, such as school **kitchens ("Lag (2016:1145) om offentlig upphandling" 2018).**

According to Charlott Håkansson, University lecturer in food technology at the Faculty of Engineering Lund University, there are few strict rules regarding public catering services and similar kitchens. There are recommendations, such as the industry guidelines explained above, yet the kitchens are allowed to serve the food as long as it is safe. This requires knowledge about food and cooking and how it is affected by time, temperature and on a microbiological plane. If possible, the food should be heated up in batches, and not all at once, to avoid long lasting warm keeping. This prevents both microbiological growth (thus preventing unsafe food) and quality deterioration. As for the cooling down process, there are special equipments for this purpose ("Blast Chiller") which cools down the food fast and safe. However, the food could be cooled down in a normal fridge. Nevertheless, it should be noted that cooling down in the fridge might shortens the shelf life for other products in the fridge due to a temperature rise in the fridge from the hot food. Additionally, this method is slow. Storing food in small containers decreases the time for heat transfer and thus speeds up the process. However, this requires a lot of space in the fridge. Moreover, knowledge is critical especially regarding handling food and saving leftovers for special diets and allergies. (C. Håkansson, personal communication 5 December 2018)

3.3 Lean Production

There are seven types of waste within value streams: overproduction, defects, unnecessary storage, unnecessary processes, unnecessary transports between facilities, waiting-time, and unnecessary movements at the workplace (Ohno cited in Jones & Womack 2006). In a school kitchen setting waste could thus occur at several stages. Overproduction can occur due to failure in absence reporting systems. Defects could for example be burned or overcooked food. Unnecessary storage can occur either before cooking the food (ingredients) or after, as an effect from overproduction. Unnecessary processes could be warm keeping of the food, since this does not add any value for the customer (pupils) compared to eating the food freshly cooked. In fact, warm-keeping even lowers the value of the product since nutrients are lost and texture and flavours impair. Unnecessary transports between facilities could be derived to the transports occurring in an organisation with central production units and receiving kitchens. Waiting occurs for example when the heated food waits to be served or when the oven is already heated up but the ingredients are not prepared to get cooked yet. Lastly, unnecessary movements at the workplace can be derived to placement of serving stations, dish station and scales for weighing the food waste. According to Ohno (cited in Jones & Womack 2006), overproduction is the worst kind of waste. It is central to be attentive to communication patterns and flow of information as well as requirements from management (Jones & Womack 2006).

3.4 Similar Projects and Best Practice

Around Europe, there are several food waste related projects going on. The reason for presenting them here is to give a broader context to this thesis as well as mapping related research. As seen by the European Commission (2010), there are and have been several initiatives for reducing food waste. Targeting source reduction have been initiatives such as awareness campaigns, informational tools, training programmes, logistical improvements, waste measurement activities, research programme, and regulatory measures. Other initiatives have targeted at food redistribution initiatives and industrial uses. Here, a selection of the initiatives is presented.

WRAP (Waste and Resource Action Programme) is a project in the United Kingdom, started year 2000. Since then the project have run several campaigns for preventing food waste for the whole food supply chain, from producer to consumer ("WRAP – Our History" 2018). The vision of the charity organisation is "*a world in which resources are used sustainably*" ("WRAP – About" 2018). WRAP suggests hospitality and food services to reduce food waste by for example take action within measuring and monitoring, purchasing, storage, and preparation ("WRAP – Supporting Resources for the Hospitality and Food Service Sector" 2018). By this, WRAP is a forefront actor with targets in common with Göteborgsmodellen. In 2008 WRAP launched an initiative called "Love Food Hate Waste", aiming to raise awareness regarding the need to reduce food waste (European Commission 2010). The target was households in the United Kingdom.

Another initiative in the United Kingdom is Approved Food and Drink Company, which is a food redistribution programme. They sell dry food products near or past the "best before" date. Again, households are the target stakeholders. Another food redistribution programme is "Buon Samaritano" in Italy, a local multi-stakeholder project which collects uneaten meals from school canteens and still edible products from super markets for redistribution to charity organisations. (European Commission 2010) These projects are interesting since they suggest a mitigation strategy for the overproduction in school kitchens.

As for waste monitoring, The Green Hospitality Award Scheme, initiated by a national authority, helps the hospitality industry of Ireland to reduce their food waste by involving targets and offering an award to top-performers (European Commission 2010). There is also a possibility to get certified on different levels and the organisation claims to have helped business reduce costs related to waste management with up to €100,000 annually ("GreenHospitality.ie – About us" 2018).

A research made by van Geffen, van Herpen, and van Trijp (2017) showed that food waste in households could be prevented via motivation, abilities and opportunities. Before going into detail on what this entails, it should be highlighted that these findings apply to people in private life, i.e. in their households. People have different power to influence the origin of food waste in the home compared to at the work place. Therefore these findings cannot be directly translated to the situation in the school kitchens. Instead, the theories need to be tested and adapted to find the barriers and drivers to prevent food waste in school kitchens. However, the results serve as an inspiration for what may or may not drive work for reducing food waste.

As for the motivation, van Geffen, van Herpen, and van Trijp (2017) concluded that the awareness of the impacts of food waste did not affect the amount of food wasted, whilst the actual behaviour of others mattered. Thus, a strategy for minimising food waste, at least in households, is to stress the fact that others (e.g. friends and family) aim to prevent food waste. Further, prevention via abilities, is achieved when consumers have the knowledge and skills for planning, cooking and prolonging shelf life to minimise food waste on all levels. Here, education matters. Lastly, as for the opportunities, they seem to be crucial for reducing food waste. One opportunity comes when the supply of groceries that matches the need and preference of the consumer. Another opportunity is the opportunity to plan, since unforeseen events influences to which extent food is wasted. (van Geffen, van Herpen, and van Trijp 2017)

More focused in public catering services, a Danish hospital managed to reduce their food waste by 40 tonnes per year by offering an a la carte menu. It was a logistical improvement making it possible to reduce food waste and increase food quality, still within budget limitations. (European Commission 2010)

In Sweden, there have been projects focused on reducing food waste in hospitality sector, public catering services (including school kitchens). Many of them focus on plate waste, but there are some projects targeting kitchen waste and serving waste (Livsmedelsverket & Naturvårdsverket 2013). One project for example focused on overproduction and aimed to reach lasting improvements when it comes to resource utilisation. By combining Lean manufacturing concepts, knowledge from consuming patterns and behaviours, and a deep engagement, new working methods can be developed and implemented. The keys were found to be communication as in communicating between all productions steps and with the school regarding absences, planning as in planning preparation of food and use of resources, and parrying as in how to adapt if too much or too little food is produced (Barr 2015).

In Timbro municipality for example, a decision was made to decentralise the food service organisation, meaning that all school kitchens should become onsite production units instead of having central production units and receiving kitchens. This enabled continuous production of more food during the opening hours of the school restaurant as well as store and reuse leftovers. (Livsmedelsverket & Naturvårdsverket 2013)

Skolmatsakademin, a knowledge network within Västra Götaland aiming to promote the school meals and sound eating habits within schools (“Om Skolmatsakademin” 2018), have some projects going on. It could be educations and seminars, for example they organised a workshop on how to take care of left-overs by baking bread (“Alla kan baka” 2018). Another initiative is the launch of a mobile app where students get to pick which dish they want the week before, which makes it easier for the kitchen personnel to plan and cook the right amount of food (“Mobilapp gav minskat matsvinn och mättare skolelever” 2018).

In a quantitative study in Sala municipality the effect of six different food waste reducing actions were evaluated. It was found that having more optional dishes on the menu along with an organisation with receiving kitchens was major sources for food waste. Having a flexible alternative on the menu (allowing the personnel to create a dish out of leftovers) and informing students about food waste measurements

had an effect, though not as noteworthy as the first two options mentioned. On the contrary, popular dishes seemed to generate less food waste than unpopular ones and neither did bigger kitchens generate more food waste than small ones. (Eriksson, Malefors, Björkman & Eriksson 2016)

Nevertheless, different kitchens have different prerequisites and different hinders for reducing food waste. This can be seen in varying results between kitchens and within kitchens over time, implying that waste reduction measurements need to be focused on individual hot-spots for waste generation and actual problems in the kitchen at hand. (Eriksson, Persson Osowski, Malefors, Björkman & Eriksson 2017)

In an interview study with eight Danish foodservice professionals Ofei, Werther, Thomsen, Holst, Rasmussen, and Mikkelsen (2015) aimed to map barriers for implementing food waste preventing strategies in large-scale institutions. They found nine themes, namely: forecasting and portion flexibility, routine monitoring, current strategies in use, enhancing internal awareness, collaboration through communication, taking on responsibility, attitude and habits, regulatory constraints and competing priorities. Current strategies were often to reuse the food in new dishes, whilst difficulties in forecasting the number of eating guests made it hard to order the right amount of food in the first place and thus prevent the excess food to occur in the first place. Personnel had some concerns with the monitoring and visualisation of the food waste, mainly due to insufficient communication regarding the initiatives and adaption to existing routines. (Ofei, Werther, Thomsen, Holst, Rasmussen & Mikkelsen 2015)

4 Prerequisites

This chapter aims to describe the prerequisites for the school kitchens: the production process and Göteborgsmodellen (the tool for reducing food waste in Göteborgs Stad). To understand the production process is important to later on understand what might drive and hinder action for reducing food waste. Similarly Göteborgsmodellen is the tool given to the kitchen personnel, hence also an important prerequisite for the kitchen personnel to reduce food waste.

4.1 The Production Process and Sources for Food Waste

The production process in school kitchens can be schematically described as in Figure 4. The procurement of ingredients is regulated by the law for Government procurement (“Lag (2016:1145) om offentlig upphandling” 2018).

Further, budgets and political decisions sets limits and directions for the school kitchens. The menu is planned and ingredients are procured according to the menu and the related recipes. The amount of ingredients is related to the number of students at the school and if there are any planned absences, such as field trips for a class. When the goods is received, it is unpacked and stored in either a freezer, a fridge or a dry storage room. If frozen, the ingredients are thawed before preparation. In the preparation step, to give one example, vegetables are peeled and chopped. Afterwards the food is heat treated. Heat treatment could be baked or cooked in oven, cooked on a stove or fried. How much food is prepared and cooked depends on the presence and absence of students that day, and is affected by for example sick leaves. The food is kept warm until serving. When the serving is finished, or if the personnel at an earlier point sees that there is more food than needed for the upcoming guests, the food is cooled down. Then it can be reheated or recooked to be served again. However, food is sometimes thrown away, either before ending up at serving or if cooled down and saved but the kitchen failed to serve the leftovers. The waste handling is not covered in the schematic picture. (Sveriges Kommuner och Landsting 2009; C. Håkansson, personal communication 5 December 2018)

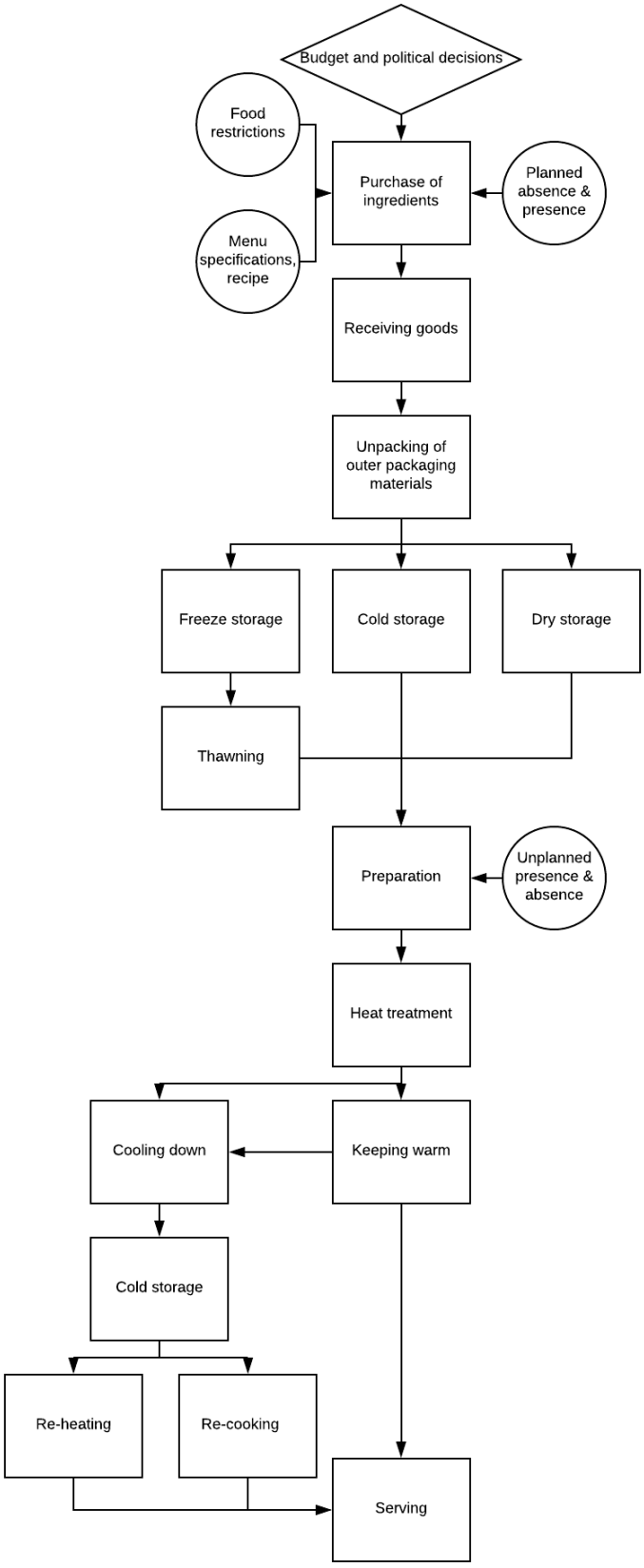

Figure 4 Process scheme for kitchen cooking warm food

Within this value chain, the school kitchen personnel have the power to make an impact at several steps. For example, they can plan the purchases, cook the food in batches and make sure there are possibilities

to take care of leftovers as well as adapting the food and portion sizes to the eating guests. Other personnel at the school can make sure to adapt the schedule and to have an absence system adapted to the situation in the kitchen. On a manager level, the person in charge of the menu and the kitchens, can make sure the personnel is educated and the routines in the kitchens and the serving are well working. It is also important to establish a prevailing understanding of the impact of food waste, as well as keeping the motivation up. (Livsmedelsverket & Naturvårdsverket 2013)

According to the theory on Lean production it is problematic when the customer in the end sets the pace for the production flow (Jones & Womack 2006). This is the case in school kitchens, were the flow of customers (guests) coming to eat is high and variating, and within a short time period. Furthermore, the ability to plan is affected by the physical circumstances in the kitchen, the competence of the personnel, time and interest (Naturvårdsverket 2009).

By combining the Lean methodology, knowledge about consumption patterns and thorough engagement, Barr (2015) aimed to find keys for durable change to resist overproduction in school kitchens. The report discusses how improved value streams and better use of resources can help to increase sustainability and says that the work and processes of others could be a source of inspiration, yet the improvements and changes need to be adapted to the kitchen at hand. The keys were concluded to be communication, planning and parrying. Communication makes is easier to produce the right amount of food with respect to for example sick leaves and other unforeseen or foreseen absences, planning for example the menu and personnel schedules makes it possible to utilise the resources given, and parrying means handling deviations and having a backup plan in case there is an overproduction after all. (Barr 2015)

A report from Avfall Sverige (2017) have shown that it is important to take the entire value chain into consideration in food waste matters. In the case of school kitchens it means from planning and ordering the food, to storage of the groceries, to preparation and cooking, to handling of the finished food, to serving the food, to handling the (potential) plate waste **(**Eriksson, Persson Osowski, Malefors, Björkman & Eriksson 2017). Another aspect is outside the internal value chain. For example, serving chicken filets will give less (unavoidable) food waste than serving chicken drumsticks. Yet the bones of the wings will be waste somewhere else, making the total amount of food waste the same (Eriksson, Persson Osowski, Malefors, Björkman & Eriksson 2017).

According to Naturvårdsverket (2009), the municipalities perceive the plate waste to be the biggest problem. The amounts are large and the experience of the personnel is that it is hard to change the behaviour of the children. Another problem, according to the municipalities, is food that is served on the buffet but then brought back to the kitchen because it was not consumed. The experience is that as much as 20 percent of the served food is later on wasted. This especially applies to stews and gratins. Moreover, not all kitchens can impact the kitchen waste to a large extent, since they receive already cooked food from production units. Thus, the kitchen waste of those kitchens, referred to as receiving kitchens, are lower. On the other hand, the receiving kitchens struggle with serving waste since they have less control over how much food to produce (they receive a fixed amount from the production unit) and often no possibilities to properly cool down or store leftovers. Nevertheless, the food they serve may have caused food waste at an earlier stage. The same applies to pre-peeled vegetables or in other ways prepared food. For example some kitchens receive peeled potatoes or chopped onions and in this case most of the waste from preparing the food, thus a part of the kitchen waste, occurs in a previous step in the value chain. (Naturvårdsverket 2009)

A short-term solution is to add a flexible alternative in the menu to be able to use leftovers as well as informing the students about the food waste measurements. It is also suggest to limit the number of alternative dishes served. (Eriksson, Malefors, Björkman and Eriksson 2016)

4.2 Göteborgsmodellen – a Model for Reducing Food Waste in Municipal Kitchens

4.2.1 The Purpose and Background of the Model

Göteborgsmodellen för mindre matsvinn is a project in Göteborgs Stad (Swedish municipality) to reduce food waste in municipal kitchens (Göteborgs Stad 2016). Göteborgs Stad has action strategies which are concretised in the municipality's action plan for the environment 2018-2020 (Göteborgs Stad 2018). The initiatives for reducing food waste in the municipality kitchens are presented in the category "Göteborgs Stad as a forerunner" (Swedish: Göteborgs Stad som föregångare) and refers to reducing environmental impact from food procurements and to increase the selection of organic and vegetarian food as well as reducing the food waste within restaurants, cafés and events within the municipality (Göteborgs Stad 2018).

The initiatives are further anchored in the Climate Programme for Gothenburg from 2014, which among others presents Climate-conscious consumption as a focus district. Within this district, one strategy is to "Reduce the climate impact of food in our organisation". Within this, schools should be involved in reducing food waste and producing climate-smart food. (Göteborgs Stad 2014)

The model for reducing food waste in municipal kitchens is called "Göteborgsmodellen". The model, presented in a folder and referred to as a 'tool', is available for the municipal kitchens. The tool presents practical and simple actions to reduce food waste together with check-lists and success stories. The nine categories of action steps are: Measure and follow-up, Menu planning, Calculating portions, Reporting of presence and absence, To plan purchases, Storage of food, Cooking, Serving, and Take care of the leftovers. Each category have practical suggestions for how the food waste can be reduced. Those are derived from the underlying reasons for food waste. (Göteborgs Stad 2016)

The project focuses on kitchen waste and serving waste. Ultimately, the project aims to reduce the environmental impact and reduce waste in terms of time and economic resources. The tool presents three reasons for reducing food waste: the environment, to get money and time for other things, and to achieve the goals of the city and obey the law. As for the environment, the impact from food production is presented and it is communicated that less food waste means less environmental impact since less food needs to be produced. Regarding time and money, the focus is on achieving a better working environment where less time is needed to purchase ingredients, cook food and handling of waste which will lead to a less stressful workday. Additionally, money saved can be used for purchasing organic ingredients and increasing the quality of the food. Lastly, the goals of the city is to reduce food waste and thus obey the laws about waste and the environment. (Göteborgs Stad 2016)

4.2.2 The Action Steps in the Model

The first step in the model is about measuring the food waste and making the amounts visible. The food waste weights should be recorded and reported every day. The results and changes over time should preferably be visualised in illustrations or graphs. It is also important to follow up the results on meetings with involved personnel and to have goals for reducing the food waste. To find out where the majority of the waste occurs, spot measurement can be made. (Göteborgs Stad 2016)

Next step, a good menu planning, starts with a flexible menu. In this way, leftovers can be included and the food could be adapted to the guests. Choosing popular and varied food by retrieving feedback from producers and consumers as well as noting what type of food that generates more food waste helps. Likewise, it is important to use names of dishes that describes the content. Thus, the guests knows what to expect. Planning to use the same component in several dishes within a short time span and to choose fruit and vegetables in season, also helps in reducing food waste since the risk of the food turning bad before use is lowered. (Göteborgs Stad 2016)

The third step, calculating portions, is about actively adapting to expected consumption. Hence, keeping track of variations between dishes and days are key actions. Adapting the portion sizes for individual needs are also important. If the portion sizes are off, it should be reported to meal planners. (Göteborgs Stad 2016)

Next step regards keeping track of presence and absence and adapt the amount of cooked food accordingly. Different routines for planned absence (i.e. excursions) and unplanned absence (i.e. sick leaves) should be implemented and clearly communicated in the organisation. Special action is needed regarding the alternatives for special diets. (Göteborgs Stad 2016)

To plan purchases is central to make sure the food is used in time and the storages kept low, since this otherwise is a source for food waste. By purchasing different package sizes and smaller portion pieces it is easier both for the kitchen personnel to adapt the served amounts and the consumer to put the desired amount on the plate. Again, buying seasonal food of good quality makes the food more durable and thus lowers the waste. Additionally, making sure to purchase fresh food close in time to planned consumption is appropriate. (Göteborgs Stad 2016)

Moreover on storage, keeping the storage room structured benefits waste reduction. By organising the shelves with products of shortest expiration dates outermost and marking the packages with dates and content it is easy to keep track of the inventory. Someone should be made responsible for keeping track of each section. Taking care of leftovers by freezing them and using the expertise to judge if the food is edible despite passed expiration date prevents waste. By keeping the temperature in the fridge at 4 °C, expiration dates are pushed. Additionally, it is important to make sure fruit and vegetables are stored at appropriate temperature since not all of them benefit from low temperatures. (Göteborgs Stad 2016)

Furthermore, the important preparation step accounts for how food waste can be reduced in the kitchen. First recommendation is to not cook more than needed and instead have a backup plan in case the food is finished too early. Adapting the amount is easier if the food is cooked in batches. Central production units and receiving kitchens should adapt the size of the boxes to send the exact required amounts. The amount of food should be measured and no extra food should be added to be on the safe side. Continuous performance can be achieved by giving and receiving feedback to meal and recipe planners. By peeling responsibly and use all parts of the vegetables food waste is prevented. Lastly, prevent water losses by cooking at recommended temperatures and defrost food slowly in the fridge. (Göteborgs Stad 2016)

As for serving, it is all about using the right sizes on portions and serving cutlery and trays. To not get serving waste, only as much as is expected to be consumed, based on portion calculations, should be served and it should be calculated how many people that have eaten during the serving. By using the right size on the cutlery it is easier for consumers to help themselves with the right amounts of food. Accordingly, by only having one pot available at a time and using smaller pots by the end of the serving food waste can be prevented. Continuous communication and feedback to production units and schedule planners also makes it easier to plan the serving. (Göteborgs Stad 2016)

Last but not least, if there are leftovers, they should be taken care of. This could be facilitated by collecting recipes and tips in how to use the food. Additionally, it is vital to make quick decisions on how to use the leftovers. Cold leftovers could be used in hot dishes, for example vegetables in a bouillon. All this requires that the leftovers are taken care of in a safe and hygienic way. (Göteborgs Stad 2016)

4.2.3 Status of the Project

The results as of January 2018 are 1150 employees trained in using the tool and 455 of total 530 kitchens (86 percent) in the municipality logging their food waste in the chosen system. Consequently, the food waste has decreased by 21 percent in the public sector kitchens in Gothenburg. The most successful kitchens have decreased their food waste by as much as 75 percent. Other positive side effects of the

projects is mutual commitment to food and environment issues and discussion regarding whether the equipment is sufficient for reducing food waste in all kitchens. (Backlund & Östergren 2019)

Despite the results, the project's objective of reducing the food waste by 50 percent is not yet achieved (as of January 2018) and further actions are needed. The contribution of this thesis is therefore to map what drives necessary actions. Important aspect to get there, according to Backlund and Östergren (2019), are measuring and logging the food waste, making the numbers visible, systematic work, and education of employees within the food organisation.

Further, it has been noticed that different kitchens have different circumstances, and there is a need to adapt the model and the actions to the local prerequisites. Having a clear checklist that is easy to use and understand is helping all types of kitchens though. Lastly, food waste prevention and hygiene rules are perceived to be in conflict with each other. These conclusions are said to be general, not specific for public kitchens, and can hence be applied to hotels and restaurants as well. (Backlund & Östergren 2019)

5 Analytical Framework

Reducing food waste in school kitchens requires change. The change can be implemented on individual, team or organisational level, and it can consider change for technology, processes and competences. In this chapter, Kotter and Cohen's framework for change (Kotter & Cohen 2002) is described. The framework was chosen for its holistic and comprehensive view on change. The eight steps make it suitable to analyse a change process from start to end. The approach of the framework is that change happens when people feel the need for change, rather than understand the need for change. Hence, focusing on touching stories is more effective than logical reasoning. It is a see-feel-change process rather than analysis-think-change. Organisations who manage to change target the challenge of changing people's behaviour, rather than finding the perfect strategy or systems. Lastly, big wins require big leaps. It is about taking the opportunities and overcoming barriers. Kotter and Cohen (2002) says change is more about leadership than management, even though both are needed. Leadership is in his meaning motivating, inspiring, aligning and setting a direction, while management concerns planning, budgeting, organising, and problem solving. In essences, this is what is described in the eight steps below. (Kotter & Cohen 2002)

Kotter and Cohen (2002) suggests these eight steps for successful change:

1. Increase urgency
2. Build the guiding team
3. Get the vision right
4. Communicate for buy-in
5. Empower action
6. Create short-term wins
7. Don't let up
8. Make change stick.

The first step is about getting the employees to understand that the change needs to happen now, either because of major threats or a unique opportunity. The ques should be visible and touch upon feelings. Thus, rationality is the wrong path here. The more extreme evidence, the better. Nevertheless, keep in mind that fear and anger exist which will counteract the change efforts. (Kotter & Cohen 2002)

Second, building a guiding team expresses the need of leaders who encourage team work to implement the change. The leaders should show enthusiasm for the task and the vision and increase trust in the guiding team and minimise frustration. Make sure to get the key players on board in this step. (Kotter & Cohen 2002)

Further, the change effort needs to have a direction, which is set by a vision and having a strategy to achieve that vision. The vision should be clear and concise. Make sure the vision is visible and the personnel can see the future when you speak about the vision. A vision that is moving and connected to an inner drive is more effective. (Kotter & Cohen 2002)

The vision also needs to be communicated in as many ways as possible. Listen to people's feeling about the vision and the change, rather than communicating in a technical way. It should be heartful and target anxieties, confusions, anger, and distrust. (Kotter & Cohen 2002)

Fifth, barriers and drivers need to be identified as well as removed and empowered respectively. People who have successfully undergone the change can serve as story-tellers and confidence-builders. Non-traditional actions, activities and ideas should be encouraged. For this, feedback is a good tool. Give feedback on how well actions are aligned with strategy and when increasing the ownership and accountability of the personnel make sure to give them guidelines and tools as well. Further, make change easy by focusing at one thing at a time. (Kotter & Cohen 2002)

To sustain the efforts, it is important to plan for and create short-term wins. Short-term wins will keep energy up and scepticism down. This can be done by rewards and recognition, as well as implementing improvements. The wins should come fast and be clearly visible. Also make sure the wins are meaningful. An advantage is if the wins are cheap and easy to achieve, despite though they seem small compared to the vision. Make sure the wins touches important people in your organisation so they can help implementing the vision. (Kotter & Cohen 2002)

Next, keep on creating change by keeping urgency up and eliminating unnecessary work to make room for new tasks. Use the new situations in an opportunistic way, rather than planning years ahead. For example if a change effort free up time, use the time to produce still more change. It is crucial not to continue until the vision is achieved. (Kotter & Cohen 2002)

Lastly, to make change stick concerns the new behaviour needed to reach success in the new organisation. It is not enough for one person to believe in the new vision. The ideas and beliefs needs to be the norms of behaviour as well as the shared values of the organisation. However, change of operations and showing the new way of workings is successful comes first and change of culture last. Operations start the change and culture make the change stick even after the driving manager have left or personnel has changed. (Kotter & Cohen 2002)

6 The Analytical Framework Applied to Reduction of Food Waste in School Kitchens

This chapter aims to analyse what may affect the change process of introducing Göteborgsmodellen in school kitchens and is the basis for the interview questions. As previously said, Göteborgsmodellen is divided into nine steps: Measure and follow-up, Menu planning, Calculating portions, Reporting of presence and absence, To plan purchases, Storage of food, Cooking, Serving, and Take care of the leftovers (Göteborgs Stad 2016). All steps requires change in the way of working. Therefore the research questions, Göteborgsmodellen and Kotter and Cohen's (2002) model on change make up the basis from which the interview questions are created.

6.1 What the Change is About

The ultimate goal of the change effort with Göteborgsmodellen is to reduce food waste. The reason for doing it is essentially about saving resources. Resources in this case is money, time, personnel, and ingredients. Especially the last one, ingredients, affects the environment and an important objective of

the project is to reduce environmental impact and contribute to sustainable consumption. (Göterborgs Stad 2016)

Reaching the goals require different changes. First, it is about changing the work procedure. For example, monitoring the food waste is an additional activity during the day. Likewise, the food is handled in new ways to make it last longer (for example by lowering the temperature in the fridge) and to make it possible to reuse it (e.g. by making a new dish out of leftovers). Working in a new way requires new skills and knowledges. On a technical plane, it also requires new equipment. Thus, the aim of the interviews was to find out what the change was about from the kitchen personnel's perspective. On an abstract level this meant asking about what they found important, on a more concrete level about asking for example on changes they have made and how they felt about them. Further, there stories about a normal workday provides a comprehensive view of their situation.

6.2 Before the Change Implementation

In the tool box report "Göteborgsmodellen för mindre matsvinn" (Göteborgs Stad 2016), the message is clear. It is communicated what the current state is, "every fifth portion is wasted" and "the yearly food waste in the kitchens in the districts is 1200 tonnes". There are also numbers on costs and environmental impact. Likewise, the desired future state is, "reducing food waste with 30 percent from year 2010 to year 2030". The report also communicates reasons why the future state is suitable and desirable for the kitchens: to reduce environmental impact, to save money and time and instead use resource in a better way, and to reach the goals of the municipality and to follow laws and regulations.

The first four steps in Kotter and Cohen's (2002) focus on making the organisation ready for the change. Even though all steps to a certain extent happen in parallel, those four steps should more or less be finished when implementing the change in the school kitchens start. There should be a sense of urgency, a guiding coalition and a vision for the change existing already and the need is to communicate and transfer the understanding of the situation downwards the organisation. Kotter and Cohen's (2002) research on change suggests that the leader (kitchen manager or similar in this context) can be a crucial part for succeeding in the food reduction project. Having a leader with a vision who is able to communicate the urgency and the vision helps in the transformation process. What the respondents say about if it is important for them to reduce food waste and why connects to their perception of the vision.

Yet, as Kotter and Cohen (2002) says, people change when their feelings are affected rather than their thoughts. Thus logical reasoning is not as effective as touching stories. To get a sense of this in the interviews, questions about feelings such as anger and dissatisfaction as well as happiness and pride were asked. Moreover, how people talk about the change reveals there level of enthusiasm in the change (the question about a food waste related dialogue). The folder which presents all steps to the kitchens contains success stories to communicate the vision could be achieved and how ("if they could make it, so can we").

6.3 Making Change Happen and Last

By making it easy for the kitchen personnel to act on the vision of Göteborgs Stad, to reduce climate impact by reducing food waste, the vision can be achieved. This is described in the fifth step in Kotter and Cohen's (2002) model. Consequently, questions about perceived drivers and barriers were asked in the interviews (for example what has been easy and hard regarding the change). Empowered to act could range from knowledge and understanding of what regulations applies to school kitchens to technical implementation of new machines and processes for creating opportunities to save and reuse leftovers. Göteborgsmodellen presents simple ways to reduce food waste, such as lowering the temperature in the fridge, as well as more time consuming efforts such as examples on how leftovers could be reused in a new dish (Göteborg Stad 2016).

Besides empowering action, short-term wins should be created (Kotter & Cohen 2002). This could be the first positive results in the food waste monitoring or introducing a new dish made of leftovers that is apricated by the students (consumers of the food). Hence the question about a normal workday and how they monitor the food waste, but also how the food waste reduction project have affected this workday. Again, the questions regarding feelings might reveal what was perceived as short-term wins. In the tool box, the kitchens are for example encouraged to celebrate when they succeed in introducing a new routine (Göteborg Stad 2016), which is a clear way of visualising short-term wins. A problem here might be the amount of actions suggested, making it hard to know where to start and increasing the risk of changing on too many planes at the same time and succeed at none of them.

Moreover, it is important that these short-term wins and other progresses are enhanced and institutionalised (Kotter & Cohen 2002). They need to be turned into long-term wins. Stories about new things they have or want together with advices to others are used to discover how more change can be produced and how to make the new work procedures change. Göteborgsmodellen (Göteborg Stad 2016) contains several action steps to reduce the food waste and it is often said these should become routines, yet few suggestions on how to go from one time action to routine.

6.4 Interview Questions

The interview questions were created as a result of the analysis in Chapter 6. The questions were divided into topics: An average day, Change, Context, Positive aspects (drivers), Negative aspects (barriers), and Expert advices. To conclude the reasoning earlier in this chapter, some questions have the see-feel-change approach of Kotter and Cohen (2002). Other questions have technical and organisational perspectives as well as a focus on practical implementation, which is in line with the research questions. To get a holistic view on the work and the steps in the tool Göteborgsmodellen, more general questions on an average day and the change were asked.

The original set of questions can be found in Appendix C. Below, the English translation of the interview questions are presented.

Introduction

- What is your role in the kitchen?
- How long have you been working in this kitchen? In the public catering service in the municipality of Gothenburg?
- What is important for you when working?
- Do you recognize the Meal Model (Livsmedelsverket) from before?
    - Which of the pieces are most important to you? Why?
    - Which pieces do you feel that you can impact?

An average day

- Tell me what an average day looks like, from arriving to work until you leave and go home?
    - Arrival
    - Preparations
    - Serving
    - After work
    - Food waste measurement
- Tell me how work with reducing food waste have affected your workday?

Change

- Which are the three main differences between before and after you started working with reducing food waste?

- What have been easiest and hardest respectively when it comes to change your way of working to reduce food waste?
- In which way do you feel that you have been able to impact the amount of food waste?
- Which parts are not something you can impact?

Context

- Can you tell me how ordering food works for you?
    - From wholesalers?
    - From production units/to receiving kitchens?
- How do you do to utilise the knowledge between the kitchens in the area?
    - Best practices?

Positive aspects (drivers)

- Tell me what you are most proud of when it comes to your work of reducing food waste?
- Tell me about something new that you have introduced in the kitchen, which have helped you to reduce the food waste?
    - New equipment, new routine?
- Tell me about one time when you felt really happy and satisfied about how you contributed to reducing the food waste?
    - Is it common? What do you need to make it more often?

Negative aspects (barriers)

- Tell me about one time you felt really discouraged or angry because you had to throw away food?
- Which part of your work do you think is unnecessary or difficult?
    - Why?
    - How can it be facilitated?
- Tell me about the last time you waste a large amount of food?
    - What happened?
    - Why?
    - What could you have done differently?

Expert advices

- Describe a typical dialogue you have regarding the food waste work (during breaks, work or other occasion)?
- Which advice would you give to others who would like to reduce the food waste in their school kitchen?
- Which advice would you give to your boss/other person with responsibility regarding your work with food waste?
- If you could change anything in how you work in the kitchen, what would that be?
    - Why?

At last

- Do you think it is important to reduce food waste?
    - Why?
- Is there anything else you would like to share? Some important aspect missing out?

7 Results

In this chapter the results are presented. The results consist of the information gathered from meeting the project leader and an educator of Göteborgsmodellen, observations and information from the study visit and from the four interviews with kitchen personnel.

7.1 Interviews with Representatives from Göteborgsmodellen

E. Backlund (personal communication 23 November 2018), experienced during her time as an educator for Göteborgsmodellen there was a strong engagement in the municipality and among the kitchen personnel for environmental matters. Yet, the initiative of reducing food waste encountered resistance from some kitchens. (E. Backlund, personal communication 23 November 2018)

The project started by a decision from the district managers, saying the municipality should reduce food waste. Before implementing Göteborgsmodellen, the unit managers were assembled, one meeting in each district. At these meetings Göteborgsmodellen was introduced. Following this, an education programme started the autumn of 2016. The aim of the programme was to make the kitchen personnel aware of that food waste is a problem, yet to make it a fun and rewarding project to put effort into. First, there was a series of three education sessions communicating "why, what and how" the project should be implemented. There was an introduction on the view on sustainability objectives in the municipality along with general information on climate change, the waste hierarchy and food waste to give context to the problem. Further the tool with its action steps was presented. Each of the education sessions had around 400 attendants. Second, there was an education performed locally. All kitchen personnel attended one of the education session. The education was a workshop focused on practical solutions for all steps in Göteborgsmodellen. Later on, if needed, the kitchen personnel was invited to an education for repetition of the tool and practical solutions. (C. Linnerhag, personal communication 19 December 2018)

The education programme targeted all kitchen personnel within the municipality's meal services, meaning over 1000 people have been educated in total (E. Backlund, personal communication 19 December 2018). The main part of the education programme was held the fall of 2016, with additional efforts in 2017 to onboard newly employed personnel. Beforehand, the attending kitchen personnel had different knowledge, skills and experiences from previous work with food waste reduction; some kitchen had actively worked with food waste reduction for many years whilst for other this was a completely new way of working (E. Backlund, personal communication 23 November 2018). Therefore, the idea of the meetings was to refresh previous knowledge and share examples and success stories from the kitchens, in order to find improvement points regardless of the status of the kitchen. To be able to learn from each other and to share success stories from their own kitchens were concluded an important part of the education (E. Backlund, personal communication 23 November 2018).

The impression from the education programme was that there is a high level of engagement, yet some kitchens expressed resistance to the change (E. Backlund, personal communication 23 November 2018). To get the resistant kitchens onboard, it was communicated measuring is mandatory due to the decision by the district managers (C. Linnerhag, personal communication 5 December 2018). Further, to increase motivation, it was communicated that the less food waste the kitchens produced the less time the food waste measuring will take. Additionally, if less food is wasted the kitchen can produce less food and they will need to carry less to the garbage cans (C. Linnerhag, personal communication 19 December 2018).

In the beginning of the project, all communication with the kitchens occurred via the district managers. However, communicating through several stages in a line organisation takes time and sometimes information is lost on the way. The organisation was discovered to be vulnerable due to few people communicating information. It took time to get the information out to the kitchen personnel and

sometimes the information was lost on the way. Now, communication occurs through unit managers and key persons since they work closer to the operations (the kitchens). Looking back, the key persons should have been there from the start, helping the kitchens to implement the project. (C. Linnerhag, personal communication 19 December 2018)

If possible, communication would preferably be directly with the kitchen personnel but due to a high turnover on personnel this is not possible from a practical point of view. Therefore the key persons were educated and introduced in 2017. The purpose of having key persons was to come closer to the practical reality of the kitchens. They can be either a local interaction support or a kitchen manager. The local interaction support focus is on collecting and visualising data from the waste measurements and other administrative work, while the kitchen managers focus more on practical issues. (C. Linnerhag, personal communication 5 December 2018)

The food waste measurements within the project started in January 2017. Back then, 69 percent registered their numbers in the database and until the spring of 2018 this number have steadily increased. Today 100 percent of the school kitchens measure their food waste, yet only about 96 to 98 percent (fluctuating) register their numbers. The group of kitchens missing to register their numbers has a high turnover on personnel (due to a long commute). Therefore, there is a lack of routine in handling the food waste issue and just managing to make the food ready to serve is priority. (C. Linnerhag, personal communication 5 December 2018)

7.2 Study visit

During the study visit a day in a school kitchen was explored. The kitchen visited was a receiving kitchen, meaning the cooked potatoes/pasta/rice/etcetera themselves but received the main component from a central production unit. The day of the study visit was a day when several leftovers were served as well. The original dish, mushroom soup, was complemented with carrot soup, Thai stew with rice and halloumi sauce with pasta. Additionally, the kitchen personnel baked bread. In the dough and on the top they used leftovers, such as herb sauce and Indian lentil soup. The kitchen personnel said this way of reusing leftovers was common in their kitchen, yet this week they were even more careful with the leftovers since the kitchen will be closed next week due to a school holiday. The normal procedure is to choose one of the leftover dishes a day to serve.

The personnel started their day at 7 am, however the study visit began at 7:30 am. At 11:00 am the serving started and it lasted until 1:00 pm. The serving hours differs a bit, but are approximately the same from day to day. During the lunch hours the personnel had different responsibilities such as serving or doing dishes. Afterwards the personnel had their lunch, they did the last cleaning and the food waste was weighed and reported. Three persons worked at the kitchen every day and from Monday to Wednesday (starting at 8 am though) a trainee also worked in the school kitchen.

Several actions and routines related to food waste reduction was noted. First, the leftovers saved was marked with the date when they were cooked as well as the name of the dish. Second, the personnel was creative, using the leftovers in new ways such as in bread or in a salad. Third, the food for special diets were treated in two different ways. If possible, as with the mushroom soup, the regular dish and the special diet dish (this time without milk protein) were mixed. Thus it was feasible to save even though the amount of leftovers were small. The second option was to throw it away, hence resulting in a serving waste. At the study visit, the reason for this serving waste was that the children did not show up to collect their lunch and since saving it for the next day would have required the personnel to call the dietary kitchen to cancel tomorrows food and then freeze it separately. It seemed like saving the food required too much of an effort. Additionally, the waste arose due to two specific persons (the ones who have asked for this specific diet) not showing up. Third, it was clear that miscommunications regarding changes in the schedule were common. The day before the study visit, two classes had arrived late due to having sports class at another location. Further, the day of the study visit, it became clear that no one

told the kitchen personnel about the theme week some classes had this week, which changed their lunch time.

As for the food waste reporting the personnel first weighed the food waste (one pot for serving waste and one for kitchen waste) and noted it manually on a paper by the scale. When cleaning of the serving area was done, the result was also reported in the digital system (called AIVO). The weight of the food waste, both serving waste and kitchen waste), was reported and complemented with the number of portion made out of leftovers. They did not count the number of students that ate the food, but estimations were made (for example regarding the number of portions served from leftovers). The personnel did random checks with the children regarding their experience of the food. The purpose was to be able to report back to the central kitchen for further development of the menu and the recipe.

7.3 Interviews with Kitchen Personnel

The information gathered from the interviews are presented below. First, the characteristics of the kitchens are listed. The results presented in Chapter 7.3.2-10 are the stories and meanings from the interviews, organised into themes. The themes are a result of the initial analysis of the answers (i.e. the raw data) and performed as described in Chapter 2.2.2 Analysing The Interviews. Since the interviews were held in Swedish, all quotes are freely translated by the author.

7.3.1 Characteristics of the Kitchens

In Table 2, the kitchen type, portions per day and the age of the students are presented.

Table 2 Characteristics of the kitchens

	Type of kitchen	**Portions per day**	**Students' age**	**Respondent's role**
1	On-site production kitchen	950	10-16 years (year 4-9)	Kitchen manager
2	Receiving kitchen	440	1-12 years (kindergarten – year 6)	Kitchen manager
3	Receiving kitchen	200	1-11 years (kindergarten – year 5)	Meal assistant
4	On-site production kitchen and central production unit	450+240+20	6-16 years (year 0-9), sending to a school (240) and a kindergarten (20)	Chef/Meal assistant

Besides the technical characteristics, the interviewed personnel had different experiences from working in the school kitchens in Göteborgs Stad. While some had worked there for almost 20 years (Interview 1 and one person in Interview 4), some had worked for about five years (Interview 2 and 3) and other just half-a-year (one person in Interview 4) but had experience as a chef in a restaurant.

7.3.2 Motivational Factors for Reducing Food Waste

When talking about why reducing food waste is important, the **economic and environmental causes** are mentioned. **Nutrients** was also mentioned.

Question: "Do you think it is important to reduce food waste? Why?"
Answer: "Yes absolutely! Well, it's money. Money and nutrients. Food that is wasted is no nutrients."
Quote 1 : 1

"That you affect the environment to a great extent. And then it's the economy, that shall not be toned down. But I think especially making an impact on the environment is important."
Quote 2 : 1

"The main thing is that we throw away a bit less and that is important for both our resources here in the kitchen, that is our food and our money, so it is better we use it for better ingredients."
Quote 4 : 1

The respondents also thought about **other people**, both their own children and people in need of the food. Both quotes links the issue to the family of the respondent.

Question: "Do you think it is important to reduce food waste? Why?"
Answer: "Yes!! 100, 110 percent!! You can make an impact for the climate. And at the same time you see, what is it called, how many countries there are where they don't have food. Because I come from a poor family, before, in my home country. […] My father said: 'Do you know the amount of work put into this?' […] So I think I got it from my father. It still affects me."
Quote 3 : 1

Question: "Do you think it is important to reduce food waste? Why?"
Answer: "Yes. For the environment. I have children and I think they also want to live on this"
Quote 4 : 2

"There are so many people who don't have food […] and yet we make a conscious decision to throw away fully edible, tasty, good food in the bin."
Quote 4 : 3

Further, one of the kitchens realised **politicians** only listens to requests and suggestions if they were fortified with numbers.

"I mean, it is like this that our politicians, the ones we are talking to, they don't listen if we say 'yes but we throw away a lot of food'. […] They want numbers. […] Then we get support for our requests."
Quote 1 : 2

How the kitchens started working with food waste was not obvious. The first respondent had been actively working with food waste for ten years and along the way developed a way of following up the food waste. However, it is not clear why and how this kitchen started with reducing food waste. The second respondent did not talk about the project start at all, besides comparing how the project have affected their work. The third respondent was terrified with the amounts of food wasted when starting in the kitchen and called the boss to try to change it. The respondents did not mention when and why they started with the food waste reduction project either but also mentioned differences, both within the school and between former work places.

"I called the boss and said 'Are you kidding with me, we throw away so much'. I almost started crying every day. I said 'No, this doesn't work. I can't see the food being wasted like this.' So we started to talk about what we can do and how to do it and then we started to cool it down instead."
Quote 3 : 2

7.3.3 Monitoring Food Waste

When asking about their workday, none of the respondents mentioned food waste monitoring spontaneously. Despite this, the day was retold in detail, containing both changing clothes, washing their hands, breaks, cleaning, and more. Yet, to get to know when and how they measured their food waste a specific follow-up question was asked. The kitchen had similar approaches, measuring kitchen waste and serving waste. Some of the kitchens measured plate waste as well. Measuring food waste was done after the serving hours.

For some of the respondents, monitoring food waste was an easy task and a routine since long time. Others thought it was a time consuming process and said the **result needs to be saved in a good place**, preferably a computer.

"And when they were about to start with this food waste, or in AIVO, when they started it and you attended meetings and everyone in the municipality thought it was so hard to fill in three things – and then we have had our document for ten years! And developed it, so it's really good. And we thought: 'But what is the problem?!'"
Quote 1 : 3

"But it takes time and work and someone needs to write it down and remember it for next time. And it can't just be placed somewhere. Optimal is if it's place somewhere so everyone can reach it. A computer or something."
Quote 4 : 4

The kitchen personnel mentioned the **insights they got from measuring** their food waste and appreciated seeing the numbers.

"At least our boss usually prints the results for us and how much we have wasted each month and if it went up or down."
Quote 2 : 2

"We have very little waste here. And it's almost like 'Oh is it more than two kilograms today? No no no!!' […] if it is a dash in the protocol, then it's very fun."
Quote 2 : 3

"I think this with the scales are good for work, it's a good tool. It's a true eye-opener."
Quote 4 : 5

"It's more work, but it is possible and when you see results, that you are not wasting, then you are happy. At least we are."
Quote 4 : 6

Being able to see the results not in numbers but in actually less waste in the bins was also appreciated.

"No so, it's such a big difference when you see the two compost bins, was much much less than before. Before it was not enough, we even had to clean the floor. In the waste room."
Quote 3 : 3

"I'm proud, I'm actually proud over, because I can see myself that our kitchen compost often is very empty."
Quote 4 : 7

7.3.4 Work Load

The opinions about whether **reducing food waste increases or decreases the work load** differs. While some thought it increased, due to needing to rethink and change work process, other thought it decreased since less food needed to be carried around.

"Well I have had to rethink a lot and it has been, it has been a lot of extra work."
Quote 2 : 4

"This was another process, you should start thinking even more and you felt it was already quite some work to do already before and now you should start thinking about this as well."
Quote 2 : 5

"When I just looked at the food I became angry. When I move and throw away in the compost bins. That my shoulders should carry it out and then do all the dishes."
Quote 3 : 4

"It takes a lot of time to make use of things, it does. It is easier and more convenient to throw something away than to figure out: what can we use, can we use it at all and when shall we use it, and cool it down and make use of it.[…] The big change from going to the bin to 'how should we do?'"
Quote 4 : 8

"I would say that, because when we started with this the only thing we could think about was "oh lord, it will be so much more work". And it is. But don't worry that, don't get stuck in thinking it will be more work since it will be a part of the routine."
Quote 4 : 9

7.3.5 Difficulties in Estimating Amounts

Three out of four respondents referred to difficulties in estimating how much to cook. The difficulties was related to **estimating the absolute amounts the children are eating**, which varied. Keeping track on how much the children ate when the dish was served last time helps to a certain extent, but is not a water-proof strategy as it seems.

"Well it is when the serving waste breaks even and you really have calculated correctly, or just have had a huge dose of luck that is."
Quote 1 : 4

"You want to reduce as much as possible but if you are doing it wrong, then you need to throw away a lot even though you did all the work. That is what is difficult."
Quote 3 : 5

"The last group came in and the teacher saw the food and said that was not much food. I said: 'Be calm, wait. If it is not enough I have food. I have. You shouldn't be worried.' But then we got leftovers. You see, leftovers. It's a bit hard to work with."
Quote 3 : 6

"We do not have the amount so that when we serve meatballs they always eat ten oven trays. It will, it, well they can eat ten oven trays, they can eat fifteen and they can eat eight. It changes from time to time."
Quote 4 : 10

"Yes when we cook food and then we have a list, how we shall cook and so. Then maybe we realise that 'but this dish we had the same amount of last time and then we got leftovers'. And then we discuss and sometimes we reduce with maybe ten litres since we remembered. But then you need to take some risks."
Quote 4 : 11

Something making it even more difficult to estimate the amounts is if you have more than one dish since the dishes influence each other in terms of how many portions will be taken. **The amounts varied in relation to which dish was served at the same time** (the kitchens served either two or three dishes each day). At one school they asked if they could serve only one dish, at least when it was vegetarian food since all children can eat that food, since their experience was less waste when only having one dish. Further, at buffets when several dishes are served the school have thought of limiting the amounts so if one dish is finished they will waste to heat more of the dish until the other options are finished as well.

"I usually match with the other dish. If they serve meatballs and you cook something which is not that tasty, then the children don't want it. Then you throw away. Even though you did the work. So often when, if it's meatballs, it's tasty. 100 percent of the children run to the meatballs. So then I cook something the children want to taste anyway. Yes. So that is why you need to check all the time, have I matched them wrong or right?"

Quote 3 : 7

"The days when we serve two vegetarian dishes, for a while we changed to serve only one dish. It was much less waste. […] And then they don't want to eat the other dish and you have to heat up more of the first one even though you have a lot… that bothers me, we have been struggling with our bosses and this many times. And we were allowed to do it, if it was approximately one year ago, then we had, I think it was one semester, we change it and had only one vegetarian dish. And I thought it was reduced a lot. But then they realised that 'No it has to be, they need to be able to choose from two dishes.' And that mindset is a bit wrong to me"

Quote 4 : 12

"Or you have the approach of deciding that now we prepare this much and if one or two vegetarian dishes are finished, out of five or so, then we don't heat up more of them until all the other dishes are finished."

Quote 4 : 13

Another uncertainty affecting the kitchen is **the number of children eating varies** from day to day. Also when the children will come to eat and if they will come at all is not certain. The kitchen personnel rely on the absence report when they plan how much to cook and serve. Unplanned absence, which happens if for example some children decide not to eat food from the school kitchen that day, are another problem.

"If I get to know that – well yes now three classes will be absent and I already have ordered the ingredients, well then at least I got to know the day I will cool the food and I don't need to cook all of it. Then I have extra for the next time in the freezer. I usually remind the teachers who often forget, that it's better to say than to say nothing at all."

Quote 1 : 5

"Well that was one time when they forgot to tell us that all the older classes was on an athletics day. A small detail, it's 450 children absent. […] And we don't have unlimited space in fridges and such."

Quote 1 : 6

"Because when I have seen on the schedule that all classes have been here, then it is important that another class is coming which missed their timeslot. That is not possible. Then, then it is rough."

Quote 1 : 7

"And then two classes decide they should go have pizza instead, for example. Then we have heated up two oven trays and we need to throw them away. The you get angry because did not play it cool. We, about playing it cool, we have started with that now. We push each other: 'Come on! Dare! Dare to chance'. But you are worried anyhow. You do not want to run out of food."

Quote 4 : 14

7.3.6 Collaborating With Other Personnel at the School

The collaboration with the rest of the school was a frequent topic. First, one respondent felt they could not affect how pleasant the environment in the canteens is. In this case the **lunch schedule** was set by the headmaster of the school.

"I cannot affect the environment in the canteen actually. Because I do not have a lot of influence over the lunch schedule, and I think that is where a significant deal of the food waste problem lies."
Quote 1 : 8

Moreover, the kitchen personnel think they need to **collaborate with the teachers** to be able to influence the children to reduce plate waste.

"Because I am also kitchen manager at another school, and there they have made it even further. We are collaborating much better with the teachers there."
Quote 1 : 9

"I worked at another school before and there we did much better. During my time there at least, we had a workshop with the teachers where we were divided into three groups and then we did different task, different lectures and cooked together, so we had a bit fun. […] I think it had a noteworthy impact…we need to collaborate!"
Quote 4 : 15

"We just tell the children 'Don't take more than you can eat' or 'Don't throw that much away', things like that… it doesn't help. They are so many one person can't do it, but a teacher might have 25 children and before they go to the canteen they have to talk to them. Preferably every day. […] I feel that is a shortcoming of this school."
Quote 4 : 16

7.3.7 Being Creative, Daring and Trying

All respondents talk about **creativity** in the sense of **making new dishes**. Following, are quotes from all respondents. The respondents expressed both being **proud** of creating new dishes, taking the opportunity to affect the menu and about being inspired to reduce food waste at home as well.

"We have two dishes on the menu, but the third dish is the one where we are free to create out of what is left. Sometimes we might not have any leftovers, but even then we make something up. Because it is always possible. […] And then we have a third dish anyhow. And that is what is fun also because it gives you room for creating new dishes. This is the point when we get creative."
Quote 1 : 10

Question: "Tell me what you are most proud of when it comes to your work with reducing food waste."
Answer: "That we create dishes that did not exist before."
Quote 1 : 11

"I have needed to rethink a lot and it has been quite some extra work. […] There are a lot of positive things as well. Sometimes I get home and say: Now we are going to try something new, you see, something I came up with in school!"
Quote 2 : 6

"It is much more fun to work. Because before we received all food cooked and ready. It is just salad and.. but now we do another dish, the second dish we make here. The you can be involved and influence the dishes."
Quote 3 : 8

"If you manage to make a really tasteful, really good dish, out of stuff you should have thrown away…[…] That is something to be proud of."
Quote 4 : 17

Nevertheless, being creative and knowing what to make of the leftovers was not obvious from the start for some while others thought it was the easiest part. In other words, **opinions are divided on whether being creative was the easiest or the hardest part**.

"Yes well the easiest part is to come up with what to make out of the third dish."
Quote 1 : 12

"The hardest part was to come up with new things, before you knew, before you understood what you could make out of everything."
Quote 2 : 7

"The easiest part, for me, is using the ingredients the way I like! […] And usually I change the dishes. That, that is what I think is easy to work with."
Quote 3 : 9

To get there, **trying and daring** appear to be crucial. The respondents talks about trying new dishes as an opportunity for being creative or as something they did after being inspired by others.

"If everyone are at work and such, and no one is ill or so, then it shall be the ultimate working environment and then we can be creative and make up some new things."
Quote 1 : 13

"Dare to try! Try a lot, dare. It cannot, I mean, if it is not good then you would have thrown it away anyhow. So it cannot, it is just about daring! It.. it will turn out good."
Quote 2 : 8

"You should just dare to. Luckily I dare. Many people thought I was a bit crazy."
Quote 3 : 10

"And I am proud that I dare do new, dare to chance and recook the food the children do not like."
Quote 3 : 11

Question: "If you would give a practical advice to someone who wants to reduce the food waste in there school kitchen, what would it be?"
Answer: "To dare trying. Play with the food a bit, give it some love. Then it is a success."
Quote 3 : 12

"Time and that you dare doing it. […] I mean, mix something together. 'Let's see how it turns out, I think it will be tasty'. It maybe, sometimes you need to fail also."
Quote 4 : 18

The problem of **estimating how much to cook and the importance of being brave** can also be seen in the interview answers. The respondent said they reminded each other to look back on the last time they served the dish and adapt the amount they cooked to their notes, even though it requires some risks.

7.3.8 Cooking Appreciated Food

Moreover, a common topic is to create dishes that are **appreciated by the children**. Some of the respondents expressed it clearly, as the answer to the question about what is important for them in their work. Others talked about it related to reusing leftovers, saying the leftovers from a not so popular dish can be turned into a new appreciated dish.

Question: "What advice would you like to give others who are trying to reduce the food waste in there school kitchen?"
Answer: "That you can make a tastier dish, which was not so popular the first time can be very popular the second time, in a whole new shape then."
Quote 1 : 14

Question: "What is important for you when working?"
Answer: "Ooh! That I come up with new things. That the children thinks that, that they like the food."
Quote 2 : 9

"And then that the children thinks it is fun when there are new things! When there are new salads and things which we have not served before."
Quote 2 : 10

"But dishes, all of them would not have been made otherwise. Which still is appreciated by the children. As long as they appreciate it and then it is fun. Then it is fun to experiment."
Quote 4 : 19

Another point of view on cooking tasty food is targeted in the following quote, in essence saying it does not matter if you cook sustainable food if the food does not end up in the stomach.

"If you cook sustainable food, but no one eats it, because it is not tasty, that's not very good… If you cook tasty food, then people will eat it and that's good for the environment."
Quote 1 : 15

7.3.9 Suggested Mitigations

However, one of the respondents presented a solution: to **have a Plan B**. Plan B should be a more popular dish than the original dish and should be easy to keep in the freezer and quick to heat up if the original dish is about to be finished.

"It feels like this happens every day, even though that is not the situation. Then you can think: 'Okay, I always need to have a Plan B.' and Plan B must always be something that makes the customer more pleased if this dish is served and the original dish is finished. […] You always need to know, what is more popular than that – then you can slow down the consumption of the original dish so the original dish is available for the whole time."
Quote 1 : 16

Another strategy is to **cook in batches**. The reason for cook in batches is the nutrition is kept and the amount is easier to adapt to the flow of children coming to eat. However, it is not always easy.

"We heat up step by step so we always… but then maybe it has happened that they need to wait five minutes, or maximum ten have they waited for the food. But that is not happening often. We are trying to avoid the food being finished but… it is a struggle every day."
Quote 4 : 20

However, this is not possible at all kitchens. One respondent says all food need to be ready to serve already by 11:10 pm (serving is usually open until noon).

"It is like this, that if the time is 11:10 am and already then you need to start checking: do we have enough food? 11:10 am, because after that you have no chance to make more food. And that is how it is, the children are coming all at once."
Quote 1 : 17

The kitchen which cooked in batches had the same experience about a lot of people at the same time being a struggle.

"Yes since sometimes the food goes away really quick and then you get that panic that it is not going to be enough. Because so many classes are coming."
Quote 4 : 21

Collecting and sharing ideas on what to cook and how to take care of leftovers was mentioned as a way to improve the work with reducing food waste. The kitchen personnel exchanged ideas on meetings,

by emailing each other, from visiting other school kitchens and by getting new colleagues who worked in another kitchen before.

"And that we can share – this bread I made last Friday, that was because I stole an idea. It was another school who posted on this 'Matsvinn Göteborg', the website, or on Facebook, how they did with bean stews and such, putting it on a bread and such, so I thought I had to try it. Because I had bean stew leftovers. And it was super popular!"
Quote 1 : 18

"And also when we attend meeting and such with all personnel within the meal services then you get so much more inspiration."
Quote 2 : 11

"I send an email to my colleagues: 'This recipe I did today'. And what the recipe looks like and that the children liked it, so they know. And if something went wrong, we write that as well to each other."
Quote 3 : 13

"Yes but it's like I say, our boards up there now, that thing we got from when we visited another school and saw they had it and wrote things there. 'Why don't we start with that, so it is visible for the children.'"
Quote 4 : 22

"The majority of all who works have worked somewhere else before and with some other colleague. So, in that way we also exchange ideas with each other."
Quote 4 : 23

The respondents also shares examples on **working together and discussing** food and food waste have helped them to reduce their food waste.

"Yes we discuss all the time. Yes partly when we produce, already when we produce today's food we usually discuss what dish this can be tomorrow or similar. Already then the brain starts to work and we begin to contemplate."
Quote 1 : 19

"So we have, collaborate much more in the kitchen now and we talk much more about food than what you, what we used to do."
Quote 2 : 12

"That we don't throw away food but make something else instead. […] But that's probably because, but we dare to nag at each other."
Quote 4 : 24

"And then we need to think all of us. And then maybe someone thinks 'Yes we should have that much because we shouldn't run out on it!'. And the another one says 'But maybe you remember last week, or two weeks ago, we had this soup and it was leftovers'. And then all of us need to think… So we help each other. And everyone are talking to each other."
Quote 4 : 25

7.3.10 Technological and Organisational Improvements

As for **food waste reducing investments**, the school kitchens had different experiences. However, when it comes to influencing the school, the **bosses are being supportive** and driven.

"If we need to buy more small trays for example, that is never a problem. If we have good ideas he/she [note: the boss] will embrace them. And we can only come up with that ourselves and he/she's not familiar with how the serving and such are, we know that best ourselves."
Quote 1 : 20

"He/she [note: the boss] is also involved when we have meetings with the headmaster. With the meal environment and such. He/she is very driving in that matter."
Quote 1 : 21

"They help us with a lot. […] He/she [note: the boss] is passionate about this, attends a lot of meetings and such."
Quote 2 : 13

Question: "Do you feel listened to, when you ask for new tools and such for the kitchen?"
Answer: "No it doesn't work all the time because of money. Unfortunately that's the case. But I got a good boss actually.[…] I'm lucky that we share the same thoughts about work. When I talk about what I want to do and how I can reduce food waste he/she listens."
Quote 3 : 14

As for direct technological improvements the respondents mentioned a number of different ones. It could be as easy as changing to **smaller trays** and another type of **serving cutlery**. To enable taking care of leftovers in the first place a so called "**Blast Chiller**" is useful. The Blast Chiller cools down the food effectively. Even if it is possible to cool down the food in other ways, one respondent says the task was boring and not very motivating. A **stick blender** was used frequently by one of the respondents as a result of the food reducing attempts. Baking bread from leftovers, a process simplified by a **stand mixer**, was a common way of taking care of leftovers. As mentioned previously **(Quote 4 : 5)**, the **scale** is also a valuable tool for reducing food waste.

"Before our trays were really big, but we have bought more of the small trays. We had pretty few of them before, but we almost only use those small trays now."
Quote 1 : 22

"And then we have changed in the salad buffet, so we have kitchen pliers instead of these claws […] and then you can't take as much at a time and then less is wasted."
Quote 1 : 23

"Well it's cooling down I would say – that's the most boring task. But it's, it has to be done otherwise – I don't want to waste the food."
Quote 1 : 24

Question: "Is there any machine you're using more frequently now? Or a tool or so?"
Answer: "Yes, one of those stick blenders. That one I use a lot I can tell."
Quote 2 : 14

"Yes now today I can say the only thing I need is a stand mixer for baking. If I, if we have that one then the food waste can be reduced even more. […] Because I bake so much here, with my hands. But if we have the stand mixer, then we can bake more often. Maybe even every day."
Quote 3 : 15

"We didn't have it before, when I wasn't here, but a Blast Chiller. Then we could take care of the food. Cool it down quickly."
Quote 4 : 26

8 Analysis

In this chapter, the collected data from interviews and study visit are analysed together with theory and prerequisites. The analysis is organised according to the eight steps in the analytical framework (Kotter and Cohen's model) and the research questions are functioning as a frame and focus of the analysis. This means drivers and barriers are presented along with mitigations and practical solutions for each step in the change process.

Before reading the analysis, it should be noted that Göteborgsmodellen is a practical tool presenting several action points for reducing food waste. In line with the research questions, this thesis have not evaluated each and every step in detail. The focus is rather on the complete process in light of change management. Consequently, the analysis is conducted to identified drivers and barriers within the change process which in turn can be applied to the action points of Göteborgsmodellen.

8.1 Increase Urgency

The first step in Kotter and Cohen's (2002) for change is about making personnel sense the urgent need of a change. Therefore, within the frame of Göteborgsmodellen, what personal motivators the personnel have is useful. Further, a way to communicate why the change needs to happen now is important.

By communicating a decision by the district managers saying all kitchens in the municipality should start measuring their food waste (C. Linnerhag, personal communication 19 December 2018), a part of the urgency was created. Another platform for establish a sense of urgency came from the education programme for the kitchen personnel. The programme informed about the food waste problems globally and locally (C. Linnerhag, personal communication 19 December 2018). Besides this, it seems like the urgency came from the individuals themselves. One of the respondents for example said the willingness to reduce food waste came from childhood experiences (Quote 3 : 1) and seeing the huge amounts of food waste in the kitchen (Quote 3 : 2).

Noteworthy, the focus of the project has been that changing will reduce the total amount of work and that it is fun to reduce food waste. Less emphasis was put on why this change needs to happen *now*. The only indicator for this was the decision from district managers, saying all kitchens should start monitoring their food waste. Even though the decision from the district managers somewhat communicated an urgency, it did not follow the see-feel-change approach suggested by Kotter and Cohen (2002), rather the traditional analysis-think-change approach. Thus, even though the vision was communicated in a thorough education programme, parts of the expected effects from the food waste project might have been lost already here in terms of kitchens which did not buy-in on the change.

Measuring food waste gave the respondents important insights about their food waste and was said to be an eye-opener **(**Quote 3 : 3; Quote 4 : 5; Quote 4 : 7). However, even to start measuring could be a barrier since it is one extra task to perform in an already pressured time schedule. This was expressed by for example one respondent (Quote 4 : 4) and by C. Linnerhag (personal communication 5 December 2018) who experienced resistant kitchens to be the ones with a high personnel turnover and thus lack of routines. Therefore, helping a kitchen with measuring for example for a short period of time (for example by having one of the key persons working in the kitchen for that time) could be a way of helping them see the extent of their food waste, thus creating a sense of urgency.

Thus the recommendation for Göteborgsmodellen is to make it clear for the personnel how their personal motivational factors adhere to the work with Göteborgsmodellen. Further, a scale to monitor the food waste in the own kitchen and making the personnel attentive to what their waste room or waste bin looks like are useful approaches for increasing urgency.

8.2 Build the Guiding Team

A powerful guiding team is key to change with their credibility, contacts, skills and reputation (Kotter & Cohen 2002). Within Göteborgsmodellen it is thus important to identify who has formal power to make a difference and who understands the practical reality in the kitchens.

In the work with Göteborgsmodellen the need for a guiding coalition with connection to and trust within the kitchens has been evident. When key persons as a concept was introduced, the communication from the project management to the kitchen personnel went smoother and faster (C. Linnerhag, personal communication 19 December 2018). The key persons worked closely with the kitchens and knew the practical problems and skills as well as having the credibility and the contacts to make an impact.

Besides now having more people in the guiding team, the guiding team consisted of the right people – people with direct power and skills in the targeted area of the change.

Furthermore cooperating and sharing thoughts with the boss are a frequent topic among the respondents with a kitchen manager role (Quote 1 : 20; Quote 1 : 21; Quote 2 : 13; Quote 3 : 2; Quote 3 : 14). They talked about sharing thoughts and ideas about work with their boss and having the same perspective on food waste. Working together as a team to impact school management and making practical improvements respectively seemed worth-while. Also, the importance of having evidence in sense of numbers and not only stories and observation when trying to impact politicians was noticed by one of the respondents (Quote 1 : 2).

Hence, the guiding team in the case of start changing work in school kitchens to reduce food waste needs to be a combination of managers and kitchen personnel. Managers contribute with a holistic perspective, can influence the school in general and have budget responsibility. The kitchen personnel on the other hand, contribute with practical knowledge about the task and the processes while also having the informal influence among the rest of the kitchen personnel. As for the efforts already made, the introduction of key persons seems to be significant for the result.

8.3 Get the Vision Right

This change step must be considered to be out of the scope for the kitchen personnel. It is about creating visions and strategies to encourage action (Kotter & Cohen 2002), hence not a hands-on task performed by the kitchen personnel. Nevertheless their experiences, what motivates them and what is important for them in their work provide clues on if the vision was right. As for Göteborgsmodellen and the practical nature of the tool, an important question to answer with the vision is what a workday will look like when the change to reduce food waste is completed.

In the tool Göteborgsmodellen (Göteborgs Stad 2016) it is communicated what the current state is (amount of food waste) and that the desired future state is ("reducing food waste with 30 percent from year 2010 to year 2030"). Further the tool communicates three reasons to reduce food waste: for the environment, to get time and money for other things, and to achieve the goals of the municipality and obey the law (Göteborgs Stad 2016). As C. Linnerhag (personal communication 19 December 2018) said, the representatives from Göteborgsmodellen aimed to communicate similar reasons. On the other hand, the vision is given little space in the folder and communicated in a rather technical way with a focus on numbers.

As for the kitchen personnel, the environment is important (Quote 2 : 1; Quote 3 : 1; Quote 4 : 2). Further, they mention economic reasons (Quote 1 : 1; Quote 2 : 1; Quote 4 : 1). The respondents also talked about being able to impact their own situation, both in terms of being careful about the resources they are given (Quote 4 : 1) and influence politicians (Quote 1 : 2). Additionally, the respondents talks about the importance of cooking appreciated food, both for environmental reasons and for personal motivation (Quote 1 : 14; Quote 1 : 15; Quote 2 : 9; Quote 2 : 10; Quote 4 : 20). Thus, the kitchens personnel seem to share the vision of Göteborgsmodellen, even though not all of the respondents mentioned all the reasons.

To conclude the third step of the change, the vision should focus on what makes kitchen personnel proud, hence the possibility to have a positive impact on people and the environment. Further to make a direct impact on their own situation, both in terms of resources and stressful work, should be acknowledged.

8.4 Communicate for Buy-In

The fourth step in Kotter and Cohen's (2002) model is about communicating the vision in a distinct and memorable way. To do so, it is required to understand what the kitchen personnel need to understand about the food waste problem in general and what type of communication that they pay attention to.

Following the meeting with the unit managers where Göteborgsmodellen was introduced, an education programme started the autumn of 2016 for all personnel. The aim of the programme was to make the kitchen personnel aware of that food waste is a problem, yet to make it a fun and rewarding project to put effort into (C. Linnerhag, personal communication 19 December 2018). However, the respondents did not talk about how the vision was communicated to them. Some mentioned meetings with other kitchen personnel and within the school, but how the project started in the kitchens at hand was not clear. No direct question on this was asked, yet this might indicate the vision was not communicated in a memorable way. Rather, respondents talk about seeing and feeling the need of change in their own kitchen, which is in line with Kotter and Cohen's (2002) research. Again, measuring the food waste was an eye-opener for one kitchen (Quote 4 : 5) and others talked about seeing less waste in the bin and waste room (Quote 3 : 3; Quote 4 : 7). Even though the environment seemed like an important reason for reducing food waste (Quote 2 : 1; Quote 3 : 1; Quote 4 : 2), throwing away edible food and nutrients, either since it is resources for the kitchens or since there are people in need of it, also seemed significant for the respondents (Quote 1 : 1; Quote 4 : 1; Quote 4 : 3). These are all drivers that should be targeted when communicating the vision.

Given these points, the communication should connect to the motivational factors and values regarding the environment and nutrients. Further, using the situation in the own kitchen, such as showing the waste bin or the numbers on the scale from measuring food waste, makes the problem tangible and up close. As a final note, as suggested by Kotter and Cohen (2002) being creative and utilising digital tools is recommended.

8.5 Empower Action

The fifth step concerns how to turn ideas into actions by removing barriers and empower behaviours in line with the desired change. Since the focus of this thesis is school kitchens which already have a goal of reducing food waste and have started their work, the focus in the questions and the answers have naturally been this step of Kotter and Cohen's (2002) model. This is also in line with the research questions, focusing on organisational and technical structures and implementation of drivers and barriers. In terms of Göteborgsmodellen, it is important to find out how the processes of taking care of leftovers and reducing overproduction could be facilitated.

Comparing with the food waste hierarchy ("Food Recovery Hierarchy" 2018) first priority should be to reduce food waste. This means cooking the right amount of food should be top priority. This could be tricky for several reasons and kitchen personnel struggle with knowing how much to cook since there are no set amounts on how much food will be needed for a certain day or a certain type of dish (Quote 1 : 4; Quote 3 : 5; Quote 3 : 6; Quote 4 : 10). To not cook too much food thus requires risk taking (Quote 4 : 11).

A mitigation strategy is to take careful notes on how much food is consumed each day. However, the amounts varies dependent on which other dish are served at the same time (Quote 3 : 7; Quote 4 : 12; Quote 4 : 13). Being experienced helps and of course experience comes from trying to match different dishes with each other. The respondents mentions routines and experience to be keys, both explicitly (Quote 4 : 9) and indirect (Quote 3 : 7). Also, the respondents saying that there are no absolute amounts consumed every time the dish is served (Quote 4 : 10) or being lucky when reaching break even (Quote 1 : 4) indicates experience to be important. Yet, municipality management could make this easier for the kitchens by allowing them to serve only one dish, or at least make it okay to run out of one dish in the middle of serving, as long as there are always a vegetarian option available. While kitchen 1 (onsite production kitchen) served the two dishes decided by their district and added a third dish to the menu where they used leftovers and ingredients they had at hand (Quote 1 : 10), kitchen 3 (receiving kitchen) took one of the original dishes decided by the district and the second dish was made out of leftovers or ingredients at hand (Quote 3 : 8). Noteworthy, these types of solutions seem to have by-passed kitchen 4. As a manager, empowering action by allowing the kitchens to do it their own way can be a successful

path for food waste reduction. Another solution could be to let the students pick which dish they want the week before, as in the case where a mobile app was tested ("Mobilapp gav minskat matsvinn och mättare skolelever" 2018). This will take away the operation of matching the two dishes served.

Another reason is the number of people eating in the school canteen varies from day to day. Knowing how much to cook is dependent on knowing how many people will eat, thus absence reports are crucial. This requires cooperation with the unit at the school handling the absence of the children. One problem seems to be other personnel at the school forgetting to tell the kitchen personnel a class or even several classes will be gone for activities outside the school (Quote 1 : 5; Quote 1 : 6; Quote 1 : 7; study visit), thus routines for this should be carefully implemented to avoid waste (or unnecessary work) due to this.

However, in the schools with older children, there are the uncertainty of originating from the children deciding to go have lunch at another place (Quote 4 : 14). This type of absence is not covered by the official absence report and are therefore difficult to mitigate. Nevertheless, the respondents presents a number of mitigation strategies which allows for risk taking in terms of cooking and serving a bit less than what is calculated as needed. First, having a Plan B which is a more popular dish that can easily be heated up and served in case the first dish are about to be finished (Quote 1 : 16), makes the children eating happy with the food and their choices and thus makes the risk taking feasible. Second, cooking in batches makes it possible to adapt the amount cooked to the number of children coming to eat (Quote 4 : 20). This might let the children wait according to the respondent, so communication with them is needed. Further, not all kitchens seems to have the possibility to heat up in batches due to a pressured time schedule with an intense flow of children coming to eat over a short period of time (Quote 1 : 17). According to the respondent, this forces decisions on amounts to be taken early. Besides a well-planned lunch schedule, cooking in batches requires the kitchen to be a production unit. In case the kitchen is a receiving kitchen, it needs to have the storage capability, equipment for cooking extra food and enough personnel to do the task.

As mentioned by C. Linnerhag (personal communication 19 December 2018), the kitchen personnel was educated on how they could practically achieve reduced food waste by using the tool Göteborgsmodellen. The educations also utilised the experiences from personnel working in kitchens were food waste was successfully reduced. As Kotter and Cohen (2002) said, people who have successfully undergone the change can serve as story-tellers and confidence-builders. In the same manner, the respondents all talk about recurrently utilising other's ideas. The communication they mention is always clear and visible, either by seeing directly how another kitchen did it (Quote 4 : 22; Quote 4 : 23) or by sharing a recipe or a story in an email, at a meeting or on a digital platform (Quote 1 : 18; Quote 2 : 11; Quote 3 : 13). Those networks should therefore be utilised to empower action and thus drive change.

Another way of empowering action is to provide the kitchen with necessary equipment. It could be small things, such as trays and serving cutlery (Quote 1 : 22; Quote 1 : 23). Smaller trays help reducing food waste since they allow kitchen personnel to put less food at a time out for serving, thus reducing serving waste. New serving cutlery, adapted to the food and the estimated portion sizes, nudges the children to take less food thus reducing plate waste. This type of change is cheap and does not require a new way of thinking since the equipment do the work. Moreover the possibility to cool down, and of course also store the leftovers, so they could be served again later is key when the amount to cook is difficult to estimate. Even though one of the kitchens who mentioned cooling did cool down the food despite not having a Blast Chiller (Quote 1 : 24), an equipment like that would reduce both the amount of work and making the food last longer. Further, installing a machine like a Blast Chiller is communicating in a visible way to the kitchens that they are expected to take care of leftovers. This was noted by one of the respondents, who said the Blast Chiller made it possible for them to take care of their leftovers (Quote 4 : 26). Other useful equipment mentioned by the respondents were a stick blender (Quote 2 : 14) and a stand mixer (Quote 3 : 15). The stand mixer is used to make dough for bread, and even though it was not an equipment mentioned frequently the result, freshly baked bread that is, was mentioned several

times as an easy way to take care of leftovers such as cold sauces or a bean stew (Quote 1 : 18; study visit).

Empowering action by using feedback is a strategy suggested by Kotter and Cohen (2002) as well as a driver the respondents refer to (Quote 2 : 2; Quote 2 : 3; Quote 4 : 6). Both the instant feedback from filling in the protocol and the long-term feedback when going through the numbers with the boss was appreciated. Especially using long-term results is a way for managers to empower actions aligned to the vision. To reconnect to Kotter and Cohen's (2002) idea on change, just numbers and technical analysis are not the best way to achieve change. Instead, communicate changes in creative ways. For example, since the respondents talked about being angry about having to carry around heavy food (Quote 3 : 4), visualise the difference between two time periods with weights corresponding to the two time periods respectively. The way the kitchen in the study visit did it, to ask the children what they thought about today's lunch, is another way on getting direct feedback on an important matter for the kitchens namely cooking appreciated food.

To summarise, reducing overproduction generally seems difficult due to unpredictable meal situations (variating numbers of students eating and variating consumption) in combination with a fear of running out of food. As for taking care of leftovers, the right equipment together with inspiration from other kitchens facilitates the work. Moreover, Kotter and Cohen (2002) says a barrier to act might be too many things changing at once. The tool Göteborgsmodellen contains several comprehensive lists of suggestions on how to reduce food waste. Even though all suggestions are useful, managers could help their personnel by presenting one stage at a time. Thus the change might appears as less overwhelming.

8.6 Create Short-Term Wins

The purpose of creating short-term wins is to recognise positive results, thus keeping energy up and scepticism down. As a leader, it is important to provide manageable challenges and showing the work progress both contemporary and in retrospective . Further, to produce the short-term wins, it is important to focus at one task at the time and to choose the right first step for the change. (Kotter & Cohen 2002) In the frame of Göteborgsmodellen there is a need to find out which activities, in line with the change, that are easiest to carry through respectively which activities that means the most to the kitchen personnel.

In the school kitchens, starting with reducing the kitchen waste could be a good first step since the kitchens personnel can influence the kitchen waste themselves and it is not influenced by the children or the students in the same way as serving waste or plate waste. This is in line with the tool (Göteborgs Stad 2016). Noteworthy, the tool encourages the kitchen personnel to celebrate their success and positive results (Göteborgs Stad 2016), which is a distinct way to acknowledge the short-term wins. Yet, none of the respondents mentioned any celebrations. They mentioned feeling happy and appreciating the feedback from monitoring, but there were no comments regarding celebrations.

Looking back at the analysis of empowering action, minor changes such as introducing new trays or serving cutlery (Quote 1 : 22; Quote 1 : 23) do not require huge efforts, yet gives quick results within the serving waste category. Thus that is a good start for the change effort which together with monitoring the food waste before and after introducing the new trays and cutlery will serve as proof for the personnel that is possible to reduce food waste.

Since the respondents expressed feeling proud when creating a new dish or recooking a not so popular dish to an appreciated one (Quote 1 : 11; Quote 4 : 17), this feeling could be targeted when creating short-term wins. Nevertheless, the respondents stated the importance of daring and being brave (Quote 1 : 13; Quote 2 : 8; Quote 3 : 10; Quote 3 : 11; Quote 3 : 12; Quote 4 : 18). Creating new dishes is not something that will happen automatically in all cases. Two of the respondents talked about daring and trying as something that is possible when the kitchen personnel have enough time (Quote 1 : 13; Quote 4 : 18).

Moreover, for some kitchens creating new dishes seems to be the easiest part about the food waste reduction (Quote 1 : 12; Quote 3 : 9), whilst for others it was a struggle (Quote 2 : 7). When talking about creating new dishes the respondents mention positive feedback from the children as a driver (Quote 1 : 14; Quote 2 : 9; Quote 2 : 10; Quote 4 : 19). Thus it seems important for them to cook food that is appreciated by the children, making fear of failing to cook tasty food a possible barrier. Therefore, recooking leftovers is an action that needs to be empowered and promoted. The respondents talks about sharing ideas with each other in emails, on digital platforms and at meetings (Quote 1 : 18; Quote 2 : 11; Quote 3 : 13). Empowerment could also be training sessions or study visits. In training sessions kitchen personnel can try to recook leftovers into a new dish as a pilot before making it in the school kitchens for the students on a regular day. In study visits, where personnel visit another kitchen and see how they are taking care of leftovers. Any way of showing it is possible to create something even better out of leftovers can empower action, but ensure it is about seeing and feeling it is possible to reuse leftovers.

To conclude, an easy and cheap change to start with is to change to smaller trays and new cutlery, to cut serving waste. However, to make a more touching short-term win, inspiration and facilitation (such as new equipment) to create new dishes from leftovers should be prioritised. Especially the last one is in line with the see-feel-change approach of Kotter and Cohen's (2002), since it targets the importance of creating appreciated food shared by the personnel.

8.7 Don't Let Up

Change is an energy draining process and despite initial success many change processes eventually fail. Thus it is crucial to keep urgency up and to remove unnecessary tasks that no longer add value. (Kotter & Cohen 2002) For Göteborgsmodellen it is important to keep the work load within reasonable limits as well as finding a way to establish the change outside the kitchens, i.e. within other parts of the school.

The idea of Göteborgsmodellen, and a vision that is communicated in the tool as well as orally, is that reducing food waste will mean reduced work load as well in terms of less food to order, less food to cook and less waste management (Göteborgs Stad 2016; C. Linnerhag, personal communication 5 December 2018). Even though the kitchens interviewed agreed it was worth the effort, they still say it has meant more work (Quote 2 : 4; Quote 2 : 5; Quote 4 : 8; Quote 4 : 9). Further the representatives from Göteborgsmodellen have experienced kitchen personnel resisting the change for the same reason; they felt monitoring food waste would be another task on top of an already pressured time schedule. Although cooking the right amount of food from the start is the best option (reducing overproduction), that is difficult as discussed in a previous step (8.5 Empower Action). It takes time for the new way of working to become a routine. As one of the respondents (Quote 4 : 8) allude: it is easier to throw the leftovers away than to cool the food down, put it in a fridge or a freezer, come up with how and when to use it and then heat it up again or create a new dish out of it. This new, extra process is clearly visible in the process scheme as can be seen in Figure 5.

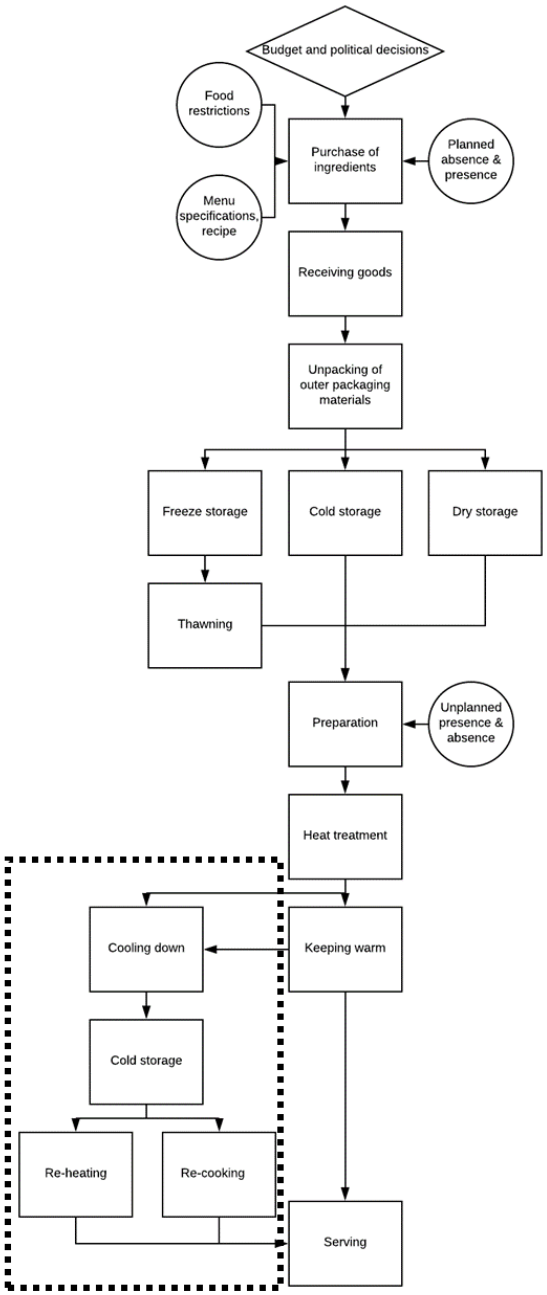

Figure 5 Process scheme over food production process, with the new recooking process marked.

Therefore it needs to be acknowledged that it takes more time to recook leftovers than to throw them away and the long-term gains in line with 'less waste, less work' will take time to achieve. Meanwhile, the time to complete the new process needs to be taken from somewhere. Sometimes it might be as simple as if the kitchen saves the food one day, they can cook less food the day after and thus they have time to take care of leftovers. However, since the kitchens are different in many ways (in terms of type of kitchen, type of school, and how experienced the personnel is to mention some) there are not one solution suitable for all kitchens. The solutions need to be designed for the kitchen at hand. Nevertheless, by helping the kitchens to remove unnecessary tasks, at least until the new working process is routine, change will be ongoing. One of the respondents even mentioned a solution themselves: to allow serving only one dish (Quote 4 : 12), at least for a while until the new task is no longer an additional task but a part of the routine. To continue educations and support even after the tool (Göteborgsmodellen) is

introduced might be needed. Just because the kitchen succeeded once or for a period of time, does not mean the change effort is finished or the new working process has become a routine yet.

So far, the focus of Götebrogsmodellen have been on reducing kitchen waste and serving waste (Göteborgs Stad 2016). While the kitchens participating in the study have managed to reduce their kitchen waste and serving waste, they are concerned about the plate waste. To continue the change efforts, more people need to be on-boarded and the initiatives needs to go beyond the actions in the kitchen itself. First, one respondent felt helpless about the situation in the canteen and needed help from the headmaster of the school to make the situation there sustainable (Quote 1 : 8). As mentioned before, the same respondent felt that the lunch schedule also affected the work in the kitchen since they needed to take decisions on how much to cook early during the day (Quote 1 : 17).

Besides collaborating with the headmaster (or the person responsible for scheduling), collaboration with other personnel at the school seemed to be key to take the next step. While the impact on food waste occurring from personnel missing to report absence is already discussed (Quote 1 : 5; Quote 1 : 6; study visit), the importance of collaborating to get the children onboard is also important according to the respondents (Quote 1 : 9; Quote 4 : 15; Quote 4 : 16). They have experienced schools where all personnel collaborated to reduce food waste in the school kitchen. For example the kitchen personnel meet the children for a short period of time a day, hence it is hard for the kitchen personnel to influence the children's behaviour. Competitions and similar stimuli can work to create short-term wins, yet to make changes in the long-run the rest of the school needs to be involved. Actually, changing the children's behaviour could be as big project as changing the behaviour of the kitchen personnel. The children need the same prerequisites, support and new norms. Additionally, the task of influencing the children might be one of the task that should be delegated to other personnel at the school to make time for the kitchen personnel to focus on kitchen waste and serving waste.

In short, to succeed with the seventh step of the change it is important to remove tasks to make room for new ones. The process of taking care of leftovers is an additional process to the standard process in the kitchen. At least until this process have become routine and somewhat integrated in the standard process it is important to make time for it. Furthermore, to be able to tackle the plate waste, the rest of the school needs to be on-boarded. Teachers are needed to influence the children while the headmaster (or other person responsible) can help by making a better lunch schedule.

8.8 Make Change Stick

The previous steps have focused on operations and practical changes. This last step is about making change stick. According to Kotter and Cohen (2002), change stick when it becomes a part of the organisation's culture. This means the new way of operating is the accepted behaviour and the operations are in line with the personal values existing among employees. However, as Kotter and Cohen (2002) also highlights, operations need to come before culture. For the school kitchens this means the food waste reducing actions must be in place before expecting a new culture. The personnel need to have systems and routines for monitoring food waste, they need to have tools and equipment to save, store and recook leftovers and they need to have the courage and inspiration to do so (see the previous steps).

The tool Göteborgsmodellen is practical, with concrete suggestions for action and check-lists for follow-ups (Göteborgs Stad 2016), which is in line with Kotter and Cohens (2002) philosophy on how to make change stick. Meanwhile the change happening in line with Göteborgsmodellen have provided a new culture at some of the school kitchens as an effect. The new culture includes collaborations within the school kitchen at hand. Collaboration could be discussing what to create out of the leftovers (Quote 2 : 12) or to nag at each other to not cook more than needed (Quote 4 : 24; Quote 4 : 25) and this type of collaboration was not a part of the daily work before. For some, the discussions about food and how to use the ingredients and leftovers starts already in the morning (Quote 1 : 19).

Finally, the respondents talk about the new way of working as a routine (Quote 3 : 7; Quote 4 : 9). For something to become a routine, practice and a common understanding of the procedure are needed. As can be understood, time and patience is needed to achieve that. Noteworthy, when asking the respondents to describe their work day (7.3.3 Monitoring Food Waste) none of them spontaneously mentioned measuring food waste, despite describing the day in a quite detailed manner. This could either be a sign measuring food waste is not part of their routine yet or, the other way around, that it is a part of their cleaning routine and thus not mentioned as a separate activity.

Given these points, a collaborative culture is desirable, yet activities and practical changes should come first and lead to the collaborative culture. Therefore, the format of the tool should be kept as it is with focus on practical actions. When the change effort has reach a certain point, collaboration will be one of the effects. Collaboration means reminding and encourage each other to take on food waste reducing actions, such as daring to cook a bit less or using food before it is no longer suitable for consumption.

8.9 Summary of Analysis – Drivers and Barriers

In this analysis, the stories from the respondents have been organised according to Kotter and Cohen's (2002) model with eight steps of change. All steps are more or less covered by the change effort made with Göteborgsmodellen, giving a good basis for change towards reduced food waste. However, as always, there is room for improvement and the kitchen personnel's experienced drivers and barriers should be taken into consideration when developing the tool further. Based on the analysis, discovered drivers and barriers for each step and there practical implications are presented below. Thus, the list below answers the first and the second research question (What drivers and barriers are there for reducing food waste in school kitchens? and How can structures (organisational as well as technical) in the school kitchens be linked to drivers and barriers for reducing food waste?)

1. **Increase urgency.** Find the individual motivators and show that change needs to happen now. The driver here is kitchen personnel clearly seeing how much they throw away, either by creating awareness on what the waste bin looks like or by showing numbers from their own kitchen. However, numbers mean little unless related to something visual or a feeling. A barrier is not understanding why the change needs to happen now or why this is a unique opportunity to reduce food waste. This might hinder even the first step, measuring the food waste, thus making it hard to communicate urgency.
2. **Build the guiding team**. Onboard the right people to drive the change, in this case both managers and personnel. Managers are able to guide the kitchen personnel, influence the school and make decisions regarding investments. Kitchen personnel are useful for wide-spread and fast communication and for practical knowledge about what is needed in the kitchen to reduce food waste. Barriers within this step include too small teams, failing to communicate required new actions and the vision.
3. **Get the vision right.** A vision is a driver first when it is accepted by the people, so make sure it makes sense to the kitchen personnel and that it is suitable for the organisation. To drive change, show what a workday will look like afterwards, with less heavy lifts and more tasty dishes to feel proud about (if that is what they dislike and like about their work).
4. **Communicate for buy-in.** In an education programme, the vision can be communicated. However, theory and numbers are not enough. Utilise the visual effects of how a waste bin can look like before and after food waste reduction and help the kitchen personnel to measure food waste so that they can see themselves how much they throw away. Make sure to derive the results to things the kitchen personnel care about, such as the environmental effects.
5. **Empower action.** This step contains the most appealing drivers and barriers. Starting with barriers, unpredictable meal situations, a pressured time schedule and a fear of running out of food is common and the barriers make it hard to cook the right amount of food. Further, several dishes takes time to cook and makes it even harder to predict how much to cook. As for the

drivers, the respondents appreciated being able to be creative and wanted to serve appreciated food. Therefore enough time to be creative and knowledge on how to recook the food are drivers. Furthermore the right equipment helps both taking care of the leftovers (Blast Chiller, storage space) and reusing them (stand mixer, stick blender). Utilise other kitchens' success as a driver by making it easy to share stories and achievements - the respondents appreciated the inspiration from others.

6. **Create short-term wins.** Quick and cheap wins could be achieved by investing in smaller trays and new serving cutlery. Thus, it is possible to show results without kitchen personnel having to put in too much effort. Another short-term win is succeeding in recooking a not so popular dish into a more appreciated dish, since the respondent said this made them proud. A barrier for creating new dishes is first not having the possibility to cool down and store the leftovers and second not knowing what to create out of them. Another barrier here is too many focuses – the number of actions suggested by the tool are many and this way of working completely new for the kitchen personnel.
7. **Don't let up.** When managing to reduce kitchen waste and serving waste by changing the routines within the kitchen, the rest of the school needs to be onboarded. This part of the change is driven by cooperation between all school personnel and a common effort to reduce food waste. A barrier is the feeling of not being able to make an impact because of other school personnel not cooperating with the kitchen personnel. Especially onboarding the children needs to be handled by the teachers. Moreover, the change means an increased workload from introducing a new process to cool down, store and recook leftovers. This is a barrier to keep on changing. The kitchens personnel might already be drained on energy from the new process, and thus stops changing or go back to the initial routines before the change project.
8. **Make change stick.** The new culture arising from the change is collaborative. The kitchen personnel talk with each other about food waste and how to take care of leftovers. They also remind each other to dare cooking a bit less, it will be enough anyhow. Thus, the driver making change stick is a collaborative way of working. However, this culture comes first when the practical things are in place – not the other way around.

To following summary of the analysis answers the third research question: How can drivers for reducing food waste be implemented? I.e. how can leaders/managers use the drivers and remove the barriers to get their teams to reduce food waste?. In literature there are several suggestions on how to reduce food waste in school kitchens. Nevertheless, the human-technology interaction as well as how organisational structures act as barriers and drivers for reduction of food waste. Hence managers and leaders need to take the barriers and drivers into consideration for the change of reducing food waste in school kitchen.

The respondents refer to many of the food waste reducing actions suggested in the tool Göteborgsmodellen. Regardless of this, as a general summary of the analysis, the personnel talks about a completely new way of working both on a physical and mental plane. Still they also express being more satisfied with their work, again both on a physical and a mental plane. Work is more challenging, but the challenge is fun and allows them to be creative. For governance and managers this means focus should be on what is happening after measuring the food waste, meaning helping the kitchen personnel to reduce the food waste by removing barriers and utilising drivers.

In short, the change is about changing the behaviour in the kitchen to reduce food waste. This could be done either by cooking the exact amount of food consumed, i.e. reducing overproduction, or by making sure any leftovers will be reheated or recooked and served again. From a production point of view, best possible solution to reduce food waste would be to cook the right amount of food, thus significantly reducing the time for purchasing, cooking and waste handling. However, this approach is difficult in school kitchens due to a number of reasons. How much each child eat varies. How many children that come to eat on a given day varies and the distribution over the serving hours is uneven. How much is consumed of each dish varies depending on the other dish served. There are mitigation strategies.

Monitoring the amount of food consumed is one mitigation, but because of the uncertainties mentioned it is not always enough. Therefore, daring to cook a bit "too little" and instead have a back-up plan is an important mitigation strategy. Another mitigation is increased collaboration with other personnel at the school, such as teachers and the headmaster. By this, the lunch schedule can be better and the children can be on-boarded in the change project.

Yet minimising overproduction is still difficult. Instead, the kitchen personnel need help in taking care of leftovers which seems to be both the most rewarding part and the most time consuming part. Rewarding in the sense of offering a possibility to be creative and to cook appreciated food from a not so popular dish. Time consuming since it takes time to cool down and store the food as well as deciding how and when to use the food and to reheat or recook it. Even though less time is needed for waste handling, it is still more time consuming to save and recook the food than to throw it out in the bin and reducing waste at the root-cause (overproduction) is difficult.

Noteworthy, the respondents who talked about reduce food waste in more ease (kitchen 1 and 3) have had a long practise of reducing food waste and thought creating new dishes out of leftovers were both easy and fun. The other two respondents (kitchen 2 and 4) still thought creating new dishes was rewarding, yet tricky and time consuming. To conclude, minimising overproduction is the ultimate goal yet taking care of leftovers is more rewarding and should thus be targeted when starting to reduce food waste in the school kitchen.

At last, the identified drivers and barriers are presented below.

The following drivers were identified:

1. Higher purpose as individual motivators, such as environmental matters or money for better ingredients.
2. Seeing clearly that food waste is reduced, either in a protocol or in the waste bin, is satisfying.
3. Being creative and come up with new dishes is something to be proud of.
4. With the right equipment it is easy to take care of leftovers, hence food waste reduction becomes more rewarding and less time consuming.
5. Slight changes, such as using smaller trays and other cutlery for serving is a quick way to reduce food waste.
6. Other school kitchens' ideas and success stories is a source of inspiration.
7. To keep food waste low a collaborative way of working is needed.

The following barriers were identified:

1. Not understanding why the work with reducing food waste needs to start now.
2. Not having the right people on board for the change, such as managers with economic and decision making power along with personnel familiar with the work process in the kitchen.
3. Variating and unpredictable numbers of students eating and how much they eat makes it hard to produce the right amount of food.
4. A pressured time schedule and lunch schedule means decisions on how much to cook need to be taken early during the day.
5. The fear of running out of food makes it difficult to keep amounts of food down.
6. Reducing food waste also means adding another process, to take care of leftovers, and despite gaining time from less waste handling this is a new time consuming activity.
7. To get the rest of the school, such as scheduler and teachers, on board is difficult but crucial to reduce food waste.

9 Discussion

The results are foremost applicable to school kitchens undergoing a change to reduce food waste by utilising the tool Göteborgsmodellen. This is since data is collected from this field. However, the results are interesting for any school kitchens aiming to reduce their food waste. For example the result could be used to design a food waste reduction programme for school kitchens in another municipality or for other types of large-scale kitchens such as restaurants. The tool is focused on kitchen waste and serving waste, hence leaving no suggestions on how to mitigate plate waste. This study however uncovered some drivers and barriers related to plate waste, simple due to the interrelation of the three types of wastes. The drivers and barriers and correlated suggestions about plate waste should thus been seen as suggestions for development and further improvement of the tool Göteborgsmodellen.

Four kitchens were interviewed for the thesis. The number seems low, but at the fourth interview stories was repeated to a great extent. If time allowed, one or two more interviews might have been feasible. However, given the constraints for this thesis, a decision was made to instead focus on making a thorough analysis. After all, the study is qualitative, meaning the result should not be regarded a general truth anyhow and therefore it is more important to put the data into context than to increase the data set.

As for the interviews, it would have been optimal to conduct only one interview at a time and then have time for transcription and reflection regarding that interview. However, since the thesis was written in Lund and the kitchens were located in Gothenburg, one day contained two interviews. The alternative would have been to have phone interviews, allowing for greater flexibility on when to perform the interview. On the other hand, in phone interviews visual ques are not shared. In video calls visual ques can be seen to a certain extent, but not fully. Additionally, by performing the interviews in rooms within or close to the school kitchen, the respondents could show different practical solutions they made which gave a more holistic understanding of their work. Therefore, conducting two interviews on one day was still better than the option to do them over phone or video call.

Furthermore, the interviews were held in Swedish. Translation might twist the result a bit, however since most of the respondents as well as the author/interviewer had Swedish as their first language Swedish was chosen. Allowing the respondents to share stories with ease, by conducting the interviews in a language they were comfortable with, were more important than the possible drawbacks of translating the answer would cause. After all, sharing stories in a language that is not the preferred language will also contribute to linguistic drawbacks.

The selection of respondents affects the result if not made properly. To get a comprehensive view of the change, a widespread selection were aimed for. This was fulfilled in terms of size of the school, age of the children eating, and type of kitchen. A weakness of the study, making it hard to draw conclusions on the first steps of change, is that all kitchens had already bought-in on the change and had actively been working with it for a while. Even though their experience differed from a year to over ten years, a kitchen which just had started, would have provided even more insight. The reason for this weakness in terms of respondents is primarily since the kitchen personnel volunteered to participate in the interviews. Even though all kitchens in the municipality received the questions, it is not strange that only those who thought the work was important and were happy with their results signed up to participate. Furthermore, a question regarding the why, when and how the school kitchen started to monitor the food waste and work with food waste reduction would have provided more insight on the initial phase and the early steps of Kotter and Cohen's (2002) model. Nevertheless, with the information in the tool, the comments from the representatives from Göteborgsmodellen and to a certain extent also the experience of the already bought-in kitchens (i.e. the respondents), provided enough insight to draw some general conclusions for the average kitchen within the work with Göteborgsmodellen.

The choice of analytical framework is important for the outcome, since it provides the frame for the whole analysis. The reason for choosing Kotter and Cohen's model (2002) was for it being a well-known

model on change management as well as providing an holistic and comprehensive view on the change process. The model could of course have been complemented with for example theories on behavioural science and psychology and validated with other theories on change management. Due to time constraints and the purpose of this thesis (to find barriers and drivers for food waste reduction in school kitchens with a focus on technical and organisational structures) only Kotter and Cohen's (2002) model was used as an analytical framework. Other models on change would have given the thesis another focus and thus other conclusions. Elaborations are instead suggested as future research.

How the themes (and thus the stories told by the respondents) have been organised within the analytical framework can of course also be discussed. Some of them might also fit at another step then the one they were given, however they are presented where they fit the best according to Kotter and Cohen's theory and explanation of the steps. While the results from the interviews (Chapter 7.3 Interviews with Kitchen Personnel) are organised according to common themes, the analysis sometimes split themes into different steps. This is expected, since the experiences shared by the respondents can be of different character yet sharing their core. For example, creating new dishes is a process of several steps: saving food for later use, plan what to do with it and when to use it, and to actually recook the food into a new dish. For the same reason, some quotes are also referred to at more than one place in the analysis.

To summarise the study, it was possible to answer the research questions. First, the lists created on identified drivers and barriers is a condensed summary of the stories told by the interviewed kitchen personnel. Second, the list puts the drivers and barriers into a technical and organisational context. Thanks to Kotter and Cohen's (2002) model, the stories were not possible to analyse from a change perspective which thus give leaders and managers suggestions on how to implement food waste reducing actions. The results on the earlier steps, for example increasing urgency and creating a vision, was not fully satisfying. This is since all the respondents were already involved in the change effort and no direct question on how the change started for them was asked.

Even though the selection of respondents is limited to school kitchens within Göteborgs Stad, results could be applied to other school kitchens with similar organisations and strategies for reducing food waste. A qualitative study, as this one, never provides statistically proven results. Yet, due to the variation among the respondents (see Table 2) and the saturation of data the results it is reasonable to assume that the conclusions are generalisable with in certain frames. The frames are school kitchens actively working with reducing their food waste. Further, being able to map the steps of the change studied (reduction of food waste in school kitchens using Göteborgsmodellen) within the chosen model for change, also indicates that this study is general.

10 Conclusion

Göteborgsmodellen is a practical tool presenting several action points for reducing food waste. This thesis have not evaluated each and every step in detail, rather focused on the complete process in light of change management. In line with the research questions, the conclusion focus on drivers and barriers which in turn can be applied to the action points of Göteborgsmodellen.

The first research question is: What drivers and barriers are there for reducing food waste in school kitchens? The second research question is: How can structures (organisational as well as technical) in the school kitchens be linked to drivers and barriers for reducing food waste? To answer these research question, two lists of the identified drivers and barriers and how they relate to the work in the school kitchens are presented.

The following drivers were identified:

1. Higher purpose as individual motivators, such as environmental matters or money for better ingredients.
2. Seeing clearly that food waste is reduced, either in a protocol or in the waste bin, is satisfying.
3. Being creative and come up with new dishes is something to be proud of.
4. With the right equipment it is easy to take care of leftovers, hence food waste reduction becomes more rewarding and less time consuming.
5. Slight changes, such as using smaller trays and other cutlery for serving is a quick way to reduce food waste.
6. Other school kitchens' ideas and success stories is a source of inspiration.
7. To keep food waste low a collaborative way of working is needed.

The following barriers were identified:

1. Not understanding why the work with reducing food waste needs to start now.
2. Not having the right people on board for the change, such as managers with economic and decision making power along with personnel familiar with the work process in the kitchen.
3. Variating and unpredictable numbers of students eating and how much they eat makes it hard to produce the right amount of food.
4. A pressured time schedule and lunch schedule means decisions on how much to cook need to be taken early during the day.
5. The fear of running out of food makes it difficult to keep amounts of food down.
6. Reducing food waste also means adding another process, to take care of leftovers, and despite gaining time from less waste handling this is a new time consuming activity.
7. To get the rest of the school, such as scheduler and teachers, on board is difficult but crucial to reduce food waste.

The third research question is: how can drivers for reducing food waste be implemented? I.e. how can leaders/managers use the drivers and remove the barriers to get their teams to reduce food waste? The short answer is to start by facilitating the process of taking care of leftovers while later on implement actions for reducing overproduction. This conclusion is based on the barriers and drivers listed above.

Facilitating taking care of leftovers can be done in several ways. Introduce a flexible meal on the menu, either once a week or as one of the daily meals, to create an opportunity to use the leftovers and support the personnel by investing in equipment which makes saving leftovers more convenient (such as a Blast Chiller). Further, create networks where the personnel can share ideas and advices on how to take care of the leftovers (for example sharing recipes). Thus the fear of running out of food can be avoided to start with and the focus is instead of making work more fun and rewarding. After a while the new process of recooking leftovers becomes routine. This happens when time that earlier were put on ordering ingredients, cooking new food and waste handling, instead in used in the new process. Later on, the goal is of course to target overproduction. However it is important to make kitchen personnel buy-in on the change first and reducing overproduction seems to be a difficult steps since it is affected by several external parameters such as lunch schedule, absent children and variating consumption. Even so, all the action points for reducing food waste (such as mitigating overproduction and keeping track on the storage and expiration dates) can also utilise the drivers. For example, invite the kitchen personnel to contribute with their ideas and creativity to make a solution suitable for their kitchen.

To conclude, minimising overproduction is the ultimate goal yet taking care of leftovers is more rewarding. Likewise, taking care of leftovers is based on the identified drivers (number 3, 4, and 6 in the list of drivers) while minimising overproduction requires removing barriers (number 3, 4, and 5 in the list of barriers). Even though the barrier of an extra process (number 6) targets reusing leftovers and minimising overproduction can be implemented with the driver of using smaller trays and other cutlery (number 5), the recommendation is still to start with reusing leftovers. For that approach, the number of drivers are still higher.

Despite only collecting data from school kitchens within Göteborgs Stad, results could be applied to other school kitchens with similar organisations and strategies for reducing food waste. This is due to the variation among the respondents (see Table 2) and the saturation of data.

11 Future Research

The first suggestion for future research is to do a study on kitchens which did not start to measure their food waste at all or started late (compared to other kitchens in the municipality). What was the barrier for them and how did they overcome it? If that is answered the results could be combined with the results from this study to create an efficient strategy for how to increase urgency for reducing food waste in school kitchens.

As a second suggestion, the study needs to be deepened. By looking in to for example cognitive biases, the technical and structural effects on human behaviour could be complemented by psychological effects. This way, the understanding of why it is hard to implement food reducing strategies or making the changes stick can be better understood.

For both suggestions, the ultimate result will be reduced food waste from school kitchens. To broaden the research, the same study could be done on other types of public sector or commercial kitchens, such as kitchens in elderly care or restaurants. Their prerequisites are similar, but not identical, which makes it interesting to do another study covering these kitchens respectively.

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Appendix A: Advance Letter

Masteruppsats om matsvinn i skolkök

Hej och stort tack för att ni vill ställa upp på intervju för min masteruppsats!

Arbetet syftar till att bättre förstå hur vi tillsammans kan arbeta för att utnyttja resurserna, såväl råvarorna som personalens tid, på ett effektivt sätt och få skolmaten att hamna i magen istället för sophinken. Fokus ligger på att identifiera drivkrafter och hinder och det är här era erfarenheter av matsvinnsarbetet blir viktiga. Ni valdes ut för intervjuerna för att ni har erfarenheter och kunskap om hur arbetet i skolkök funkar. Vad har underlättat respektive försvårat för er att ta tillvara på maten som köpts in och tillagats?

Intervjuerna kommer äga rum i november (just din intervju är planerad till [datum]) och vara i ungefär en timme. Ingen särskild förberedelse krävs, utan jag vill höra om era upplevelser i köken. Intervjuerna kommer spelas in för att säkerställa att ingen information missas eller misstolkas, men det kommer i efterhand inte att gå att koppla svaren till er. Ni kommer ha möjlighet att läsa igenom era svar och komma med förslag på förändringar och förtydliganden. Allt för att rätt information ska ligga till grund för studien och för att ni ska känna er bekväma med vad ni delar med er av!

Jag tänkte även presentera mig själv kort. Jag heter Marika, är 25 år gammal och pluggar sista terminen på civilingenjörsprogrammet i bioteknik på Lunds Tekniska Högskola, en utbildning jag har kompletterat med ett års studier i management. Jag valde att göra min masteruppsats inom det här området för att jag är intresserad av hållbarhet och resurshushållning samt förändringsarbete och genomföranden. Livsmedel och mat är såklart också ett starkt intresse för mig!

Jag ser fram emot att träffa er och höra om hur ni arbetar! Hör av er om ni har några frågor eller funderingar.

Varma hälsningar

Marika Arvidsson
Telefon: xxx xxx xx xx
Mejl: xxxxxx

Appendix B: Introductory Statement

Innan vi börjar vill jag bara få bekräftat att det är _____ [Namn på informanten] på _____ [Skolan] i rollen som _____ [titel ex. Köksmästare] som jag har framför mig?

[Om OK: fortsätt. Om felaktig information: be om rättelse. Avgör utifrån informationen ifall personen är tillräckligt insatt att svara på frågorna].

Bra! Jag ska också presentera mig: Jag heter Marika och skriver just nu min Masteruppsats på Lunds Tekniska Högskola och i samarbete med företaget RISE, Göteborgs Stad och Göteborgsmodellen. Syftet är att hitta framgångsfaktorer i projekt kring minskat matsvinn, att helt enkelt ta reda på vad som driver och hindrar arbetet med minskat matsvinn och får maten att hamna i magen istället för soptunnan. Därför vill jag nu samla in erfarenheter och kunskap från er som jobbar i köket och är direkt involverade i förändringsprocessen. På så sätt kan vi utveckla Göteborgsmodellen och göra arbetet för er enklare!

Det kommer inte gå att koppla dina svar till dig, utan ditt namn och andra kännetecken såsom skola eller titel kommer lämnas utanför resultatet. Om någon fråga mot förmodan skulle kännas obekväm så är det helt okej att inte svara eller att avbryta intervju. Intervjun kommer att spelas in och du kommer få möjlighet att läsa igenom transkriberingen av dina svar efteråt och vid behov rätta till det.

Har du några frågor eller funderingar? [Om ja: invänta och svara]

Är det okej at vi går vidare till frågorna?

Appendix C: Interview Questions

Introductory statement

Se separat dokument.

Inledande frågor

- Vad är din roll i köket?
- Hur länge har du jobbat i det här köket? Inom måltidsservicen i Göteborg?
- Vad är viktigt för dig i ditt arbete?
- Känner du till Måltidsmodellen (Livsmedelsverket) sen innan?
    - Vilka av pusselbitarna är viktigast för dig? Varför?
    - Vad känner du att du kan påverka? Hur?

En vanlig dag

- Berätta hur en vanlig dag ser ut, från det att du kommer till jobbet till dess att du går hem.
    - Ankomst
    - Förberedelser
    - Servering
    - Efterarbete
    - Svinnmätningen
- Berätta hur arbetet med att minska matsvinnet har påverkat din arbetsdag (referera till första frågan)
    - (Endast relevant om de varit med innan matsvinnsprojektet började)

Förändring

- Vilka är de tre största skillnaderna mellan före och efter ni började jobba med matsvinn?
    - (Endast relevant om de varit med innan matsvinnsprojektet började)
    - Alt: vad har du sett för förändring under tiden du varit här?
- Vad har varit enklast respektive svårast med att ställa om arbetet för att minska matsvinn?
- På vilket sätt känner du att du själv kan påverka mängden matsvinn?
- Vilka delar känner du att du inte kan påverka?

Kontext

- Kan du berätta hur det funkar med beställningar för er?
    - Från grossist?
    - Från tillagningskök/till mottagningskök?
- Hur gör ni för att ta tillvara på kunskapen mellan köken i regionen?
    - Goda exempel?

Positiva aspekter (drivers/drivkrafter)

- Berätta vad du är mest stolt över i ert arbete med att minska matsvinnet
- Berätta om något nytt ni infört i köket som hjälpt er att minska matsvinnet (få maten att hamna i magen)?
    - Obs teknisk aspekt!
    - Ny utrustning, flyttat på utrustning, ny rutin (maskin/teknisk förändring)
- Berätta om någon gång då du kände dig riktigt nöjd med hur du bidrog till minskat matsvinn
    - Vanligt förekommande? Vad behövs för att det ska kunna göras oftare?

Negativa aspekter (barriers/hinder)

- Berätta om någon gång då du kände dig riktigt missnöjd/arg för att ni fick slänga mat
- Vilket steg i arbetet tycker du känns onödigt eller besvärligt?
    - Varför?
    - Hur kan det underlättas?
- Berätta om senaste gången ni fick ett stort svinn
    - Vad hände?
    - Varför?
    - Vad hade du/ni kunnat göra annorlunda?

Expert/tips och råd

- Beskriv en typisk dialog ni har kring matsvinnsarbetet (på fikarasten, under arbetet, eller annat tillfälle)
- Vilket råd skulle du vilja ge till andra som vill minska matsvinnet i sitt skolkök?
- Vilket råd skulle du vilja ge till din chef/annan person med ansvar gällande ert matsvinnsarbete?
- Om du fick ändra på något i hur ni arbetar i köket, vad skulle det vara?
    - Varför?

Till sist

- Tycker du att det är viktigt att minska matsvinnet?
    - Varför?
- Har du något du vill tillägga? Något viktig aspekt jag missat att fråga om?

Avslutning

Tacka för intervjun, påminna om att det finns chans att komplettera och ändra sig, påminna om att intervjun är konfidentiell.