Let’s practice to not waste food!
Case of food waste in the preschools of Malmö

Madhuri Muralidhar

Master Thesis Series in Environmental Studies and Sustainability Science, No 2017:024
A thesis submitted in partial fulfillment of the requirements of Lund University International Master’s Programme in Environmental Studies and Sustainability Science (30hp/credits)
Let’s practice to not waste food!

Case of food waste in the preschools of Malmö

Madhuri Muralidhar

A thesis submitted in partial fulfilment of the requirements of Lund University International Master’s Programme in Environmental Studies and Sustainability Science

Submitted May 16, 2016

Supervisor: Wim Carton, LUCSUS, Lund University
Abstract:
The issue of food waste is a growing global problem having social, environmental and economic consequences. Over the recent years, this issue has received attention at International, national, regional and local levels. One such example is the case of Malmö which, in their Sustainable food policy has identified food waste as one of the key areas to reduce Greenhouse gas emission down to 40% of 2002 levels by 2020. Meals provided in the preschools of Malmö come under the auspices of public food service sector which is the third largest contributor to the overall food waste from a consumption perspective. This study focuses on the barriers faced by the preschools chefs in order to bring down food waste in their kitchens. It employs integral theory to categorize the obstacles into personal, cultural and structural barriers and the themes derived from literature and insights from discussion with relevant actors are embedded in it. Through semi structured interviews with the chefs and teachers, various obstacles to waste prevention are identified. It was found that, every preschool was different from each other due to the fact that the daily practices followed was mainly driven by the kitchen staff. They differed greatly in terms of education background, years of experience, awareness, communication skills, strategies applied, their relationship with the children so on and so forth. What was lacking was the aspects such as routine measurement and monitoring, incentive schemes for waste reduction and continuous learning prospects. These issues are further analysed using the lens of Social Practice Theory which de-centers the individual from the spotlight and instead focus on everyday practices to bring about change. In the end, policy gap is identified and implication of looking at practices in policy formation is discussed.

Keywords: Food waste, sustainable consumption, public food service, integral theory, social practice theory, practices, policy

Word count (thesis): 14 051
Acknowledgements

First of all I would like to thank Sara Gabrielsson for introducing me to Gunilla Andersson of Malmö stad through a seminar which was a part of the Health & Sustainability course during the Autumn semester of 2016. This marked the beginning of my journey towards food waste in general and this thesis in particular. The subsequent meeting that happened with the wonderful Environment department manager of the municipality of Malmö, Gunilla andersson helped identify the core tenets in this thesis. Without her constant support and coordination, this would not have been possible.

I also would like to deeply thank the preschool staff who were my interviewees. They were extremely patient and supportive of my work. Their inputs were extremely valuable and indispensable for this study.

My heartfelt thanks to Wim, my supervisor and Gregor and Neha, my thesis group members. Without your review comments and useful insights, I would have been so lost in the web of the thesis writing process. Thanks for giving me direction.

Lastly, I would like to thank my family for extending their support in my interests. A special thanks to my sister who helped me in last minute editing!!!
# TABLE OF CONTENTS

Abbreviations ........................................................................................................ 1

List of tables ............................................................................................................. 1

List of figures ............................................................................................................ 1

1. Introduction ......................................................................................................... 2
   1.1 Problem framing ............................................................................................ 2
   1.2 Food waste definition .................................................................................... 4
   1.3 Research Focus ............................................................................................. 5
   1.4 Aim & Research Question ............................................................................. 6
   1.5 Contribution to Sustainability Science ......................................................... 6

2. Background .......................................................................................................... 7
   2.1 Food waste in Europe .................................................................................... 7
   2.2 Food waste in Sweden .................................................................................. 8
   2.3 Previous Studies on food waste ..................................................................... 9

3. Methodology ....................................................................................................... 11
   3.1 Epistemological & Ontological considerations ........................................... 11
   3.2 Research method: case study ....................................................................... 11
      3.2.1 Case of Malmö ..................................................................................... 12
   3.3 Data collection ............................................................................................. 14
      3.3.1 Document Analysis .............................................................................. 14
      3.3.2 Participant Observation ...................................................................... 15
      3.3.3 Waste Quantification .......................................................................... 15
      3.3.4 Interview ............................................................................................ 16
   3.4 Limitation .................................................................................................... 17

4. Theoretical framework ....................................................................................... 18
   4.1 Integral Theory ............................................................................................. 18
   4.2 Social Practice Theory .................................................................................. 22
      4.2.1 Materials .............................................................................................. 23
      4.2.2 Competence ......................................................................................... 24
      4.2.3 Meanings .............................................................................................. 24

5. Results & Analysis ............................................................................................ 25
   5.1 Food waste Quantification results ............................................................... 25
5.2 Identification of Barriers ........................................................................................................... 26

5.2.1 Personal Barriers .................................................................................................................. 27

5.2.2 Cultural Barriers .................................................................................................................. 29

5.2.3 Structural Barriers .............................................................................................................. 31

5.3 Summary .................................................................................................................................. 33

6. Discussion ................................................................................................................................... 34

6.1 Kitchen Waste .......................................................................................................................... 35

6.2 Serving waste ............................................................................................................................ 36

6.3 Plate waste ................................................................................................................................ 37

6.4 Web of practices ....................................................................................................................... 38

6.5 Policy analysis & implication .................................................................................................... 40

7. Conclusion ................................................................................................................................... 41

8. References ................................................................................................................................... 42

Appendices ...................................................................................................................................... 46

Appendix A - Food waste initiatives across EU .............................................................................. 46

Appendix B - Form for recording Storage loss ................................................................................ 47

Appendix C - Interview Consent form ............................................................................................. 48

Appendix D - Interview Guide & Interviewees list .......................................................................... 49

Appendix E ...................................................................................................................................... 50
ABBREVIATIONS

EU European Union
FAO Food and Agriculture Organization of United Nations
FUSIONS Food Use for Social Innovation by Optimising Waste Prevention Strategies
GHG Greenhouse Gas
SDG Sustainable Development Goals
SEPA Swedish Environmental Protection Agency
SPT Social Practice Theory
UN United Nations
WRAP Waste and Resources Action Programme
WFD Waste Framework Directive

LIST OF TABLES

Table 1: Snapshot of food prepared and wasted  
Table 2: Result summary of barrier identification

LIST OF FIGURES

Figure 1: Food loss and waste along the food supply chain  
Figure 2: EU Waste Management Hierarchy  
Figure 3: Themes related to food waste barriers in hospitals  
Figure 4: Structure of food distribution in Malmö city  
Figure 5: Integral theory Four quadrant approach to identify barriers to change  
Figure 6: Sources of food waste themes embedded in the Integral theory quadrant approach.  
Figure 7: Elements of practice  
Figure 8: Breakage of the wastage areas
1. Introduction

1.1 Problem framing

The issue of food waste is a multi-dimensional global phenomenon; one that cannot be ignored at present times. Roughly one-third of the food produced for human consumption goes to waste, which amounts to 1.3 billion tons per year (Gustavsson, Cederberg, Sonesson, Otterdijk, & Meybeck, 2011). Food loss occurs throughout the food supply chain from production to household (Gustavsson et al., 2011) (refer figure 1). The causes of food waste differ in case of developed and developing countries. In developing countries, food losses occur mainly at the pre-consumer stage due to financial and structural limitations in harvesting, storage and transportation. Whereas in westernized countries, food waste occurs primarily at the end of the supply chain, i.e. consumers (Gustavsson et al., 2011; Parfitt, Barthel, & Macnaughton, 2010). To illustrate this with empirical data, the per-capita amount of edible food intended for humans, from production to retailing in the EU and North America, is 900 kg/year, of which, nearly 280-300 kilograms ends up as waste. Whereas, in sub-Saharan Africa and South/Southeast Asia, about 120-170 kg/year of edible food is lost out of a total of 460 kilograms of production. On the consumer side, Europe and North-America wastes about 95-115 kg/year per person, whereas in sub-Saharan Africa and South/Southeast Asia is only 6-11 kg/year (Gustavsson et al., 2011). The global consequences of such food loss and waste are multi-fold. It has implications on social, economic and environmental aspects.

Environmental implications of food waste

Loss of edible food implies, loss of natural resources such as land, water, fuel and energy and loss of nutrients (Parizeau, von Massow, & Martin, 2015). Food loss and waste is also a significant contributor to human induced climate change. Food that gets thrown away often ends up in landfill where it decomposes releasing methane, a greenhouse gas (GHG) that is 25 times more potent than carbon dioxide for inducing climate change (Hall, Guo, Dore & Chow, 2009). On a more nuanced level, food waste contributes to climate change due to the release of embedded GHG at every step in the supply chain from production to disposal. Food items such as meat & dairy products are highly resource intensive. When such food items are discarded, there is substantial loss of natural resources and increase of GHGs emissions which could have been prevented. Roughly, 3.3 gigatons of carbon dioxide equivalent are emitted (not accounting for GHG emissions from land use change), which makes food waste (if treated as a country), the third biggest GHG emitter after the US and China (FAO, 2013).
**Economic implications of food waste**
According to FAO(2013), the associated cost of the above mentioned losses is estimated to be around $750 billion per year. This is completely unnecessary as food waste causes lowered income to the producer while the customer spends more money(Lundqvist et al., 2008). The average British household wastes food and drink worth £ 470 each year, and retailers and consumers in the USA waste food which is valued to be approximately US $ 165.6 billion annually(Betz, Buchli, Göbel, & Müller, 2015). In a world with growing inequalities, such extravaganza doesn’t seem just.

**Social implications of food waste**
World population is expected to increase to 9 billion people by 2050. Global food insecurity will worsen if the prevailing food loss trends continue. The social consequences food loss and waste are numerous, especially with over 870 million people going hungry everyday(FAO, 2013), food waste becomes unacceptable from an ethical point of view as well. Lowering of food losses and efficient handling of food is one of the potential measures of reducing world hunger(Engström & Carlsson-Kanyama, 2004).

These factors have given the necessary impetus for the issue of food waste to rise to political prominence. It has gained much attention in the sphere of sustainability debates, culture politics, and more concretely in policy & regulation(Evans, Campbell, & Murcott, 2012).
1.2 Food waste definition

Before going any further, the definition of food waste must be set. There is no unified meaning of the term food waste till date (Garcia-Garcia, Woolley, & Rahimifard, 2015). FAO categorizes wastage produced i.e food that becomes unsuitable for human consumption in the pre-consumer stage as ‘food loss’, and at the post-consumer stage as ‘food waste’ (Gustavsson et al., 2011). According to the Waste Framework Directive (WFD) by EU, waste is “any substance or object which the holder discards or intends or is required to discard”. In this light, the project funder European Commission namely, Food Use for Social Innovation by Optimising Waste Prevention Strategies (FUSIONS) states “Food waste is any food, and inedible parts of food, removed from the food supply chain to be recovered or disposed (including composted, crops ploughed in/not harvested, anaerobic digestion, bio-energy production, co-generation, incineration, disposal to sewer, landfill or discarded to sea)” (FUSIONS, 2014). Further, some studies differentiate between avoidable and unavoidable food waste. Unavoidable food
waste refers to the waste that occurs in the preparation or processing of food e.g. peels, scraps, bones, shells etc. which are generally not edible. Avoidable food waste can be defined as food that is fit for human consumption that could have been eaten but instead thrown away as waste. Some studies make another distinction among waste which is categorized as possibly avoidable food waste, i.e. food which may or may not be culturally or personally acceptable for consumption such as bread crusts or eating potatoes with peels(Garcia-Garcia et al., 2015). However, in this paper, only the broad definition of food waste by FUSIONS is employed as any deeper categorization of waste is beyond the scope of the research.

1.3 Research Focus

For my thesis I decided to focus on food waste from the food service industry which is at the end of the food supply chain(refer figure1). It represents 12% of the total food wasted annually in the EU and is the third largest sector where wastage occurs(FUSIONS, 2014). It includes food produced in public kitchens such as restaurants, schools kitchens, elderly homes, prison, hospitals, hotels(FUSIONS, 2014). However, this study focuses on public meals supplied by the local government rather than privately funded restaurant sector. From a Swedish perspective, it is especially important to focus on public food service, as more than 50% of all the midday meals served are in the public sector(Livsmedelsverket, 2017). Therefore, food waste lowering effort directed towards the public food service can result in significant economic and environmental benefits. Keeping this in mind, I approached the project manager of the Environmental department of Malmö to explore opportunities in the space of public kitchens in the city. The discussion that ensued helped me identify that there is a potential for research at their preschool kitchens as there was no quantification of food waste done before and that there is no common framework to guide the administration of the kitchens. It is crucial to know how much food waste there is and where it occurs in order to implement appropriate measures and instruments(Naturvårdsverket, 2014). What gets measured gets managed, going by this mantra, I decided to take on the task of studying their practices to uncover obstacles in food waste reduction and identify possible intervention points for change.
1.4 Aim & Research Question

With this information in mind, the question that intrigued me was, which also happens to be the overarching research question

*How sustainable are the preschool kitchens in Malmö with respect to food waste?*

To operationalize this broad line of inquiry, the following sub-research questions were formulated.

**RQ1:** How much of food is getting wasted in the preschools of Malmö?

This step is done to ensure the validation of my initial supposition that there is food waste happening in the preschool that need to be addressed. However, this is not to say that the quantification is exhaustive. The aim is to only get a representative sample of waste generation and in what particular area, in the preschools of Malmö.

**RQ2:** What are the barriers to lowering food waste in the preschool kitchens?

The aim of this step is to understand barriers faced by the kitchen staff in lowering food waste.

**RQ3:** What practices enable them to move towards sustainable consumption with a focus on food waste?

This is a question posed to analyse the situation holistically, without putting the individual at the spotlight as is most commonly done when it comes to changing behaviour. Using the Social Practice Theory lens, everyday practices in the kitchen is analysed to address the barriers and finally potential intervention points for change is identified that directs towards sustainable behaviour.

1.5 Contribution to Sustainability Science

Since the early 1990s, the literature is consistent that the present patterns of consumption are unsustainable. Consequently, It is beginning to receive attention in policy-arena and academia(Sahakian & Wilhite, 2014). It can be said that there is a general consensus on the areas of consumption that are particularly unsustainable - transport, food and heating homes(Sahakian & Wilhite, 2014). When it comes to the aspect food, food waste becomes a ripe topic of analysis in the field of sustainability sciences. Sustainability science as Kates(2001) put, is a field that “seeks to understand the fundamental character of interaction between nature and society”. As demonstrated in the introductory paragraph, the issue of food waste has social, economic and environmental consequences that show the interconnection between nature and society. An important step when operating in this field is to be able
to guide those interactions along sustainable trajectories and promote social learning to transition to sustainability (Kates, 2001). This is exactly what my research seeks to achieve in the end. I offer the necessary knowledge and leverage points for change in the preschool kitchens in Malmö for reducing food waste.

2. Background

When you look at the history of food waste, this phenomenon seems to have existed in the past. It became invisible for a period of time only to resurface and become visible again in the last couple of years. Eighteenth-century cookbooks and household management manuals seems to have a great deal of advice on how to reuse leftovers and minimize waste with undertones of aspects such as morality of thrift and frugality (Evans et al., 2012). That changed in the wake of post-war era when the global food regime was marked by agricultural intensification through techno-industrial production systems (Evans et al., 2012). It rendered the western world with overproduction of food supplies which only led to food waste. This issue of food waste then became invisible under the mask of food abundance. The period of invisibility was abruptly ended when the global economic crisis hit in 2008. Since the recession, the issue of food security and food waste have hit the political spotlight (Southerton & Yates, 2014). In the following section we will see the attention food waste has received in EU in general and Sweden in particular.

2.1 Food waste in Europe

To effectively manage waste, European Commission has set up a Waste Framework Directive (EU Commission, 2008) (WFD) which lays down certain basic waste management principles considering environment and human health aspects. It applies to all waste streams and requires that the EU member states implement their own waste prevention goals in their policy, plans and programmes. WFD’s Waste management hierarchy shows the best to least desired methods of waste management options.

There are various initiatives across EU to tackle the issue of food waste. Some of which are that are applicable to Sweden are listed in Appendix A.
2.2 Food waste in Sweden

Following the Directive 2008/98/EC of the European Parliament, Swedish Environmental Protection Agency (SEPA) established a National Waste Plan which aims at reducing food waste and improving resource efficiency in the food supply chain by 2020 (Naturvårdsverket, 2012). The first main goal for the minimization of food waste in Sweden is to lower amounts by 20 percent by year 2020 in comparison to the 2010 food waste levels (Naturvårdsverket, 2014). According to the SEPA, Sweden generated around 1.3 million tons of food waste in 2014 (Naturvårdsverket, 2014).

The treatment of food waste in Sweden follows the WFD’s Waste Management hierarchy as shown in figure 2. Landfilling, which is at the bottom of the pyramid is forbidden for organic waste disposal in Sweden since 2005 (Avfallsverige, 2009). It is instead composted or treated with anaerobic digestion so that nutrients are recovered, which is the next best option to landfilling in the hierarchy. The energy recovered from the share of the food waste that is anaerobically digested, 27% of it is recovered as biogas that is used as fuels in Sweden (Naturvårdsverket, 2014). From sustainability point of view, waste valorization measures such as the ones mentioned above have less potential to recover fully the resources that went into food production. Hence prevention of food waste in the first place becomes paramount. SEPA recognizes the importance of prevention and has rightly so included in their goals and action plan. However, it acknowledges that although they are on the right path, they can still do better in this direction (Naturvårdsverket, 2012).
2.3 Previous Studies on food waste

Food waste is a broad issue consisting of scholarship on various stages of the food supply chain on both micro and macro levels (Gille, 2010). The analytical lenses of social science has explored waste-society relationships on aspects such as governance, citizenship, ethics, politics and material flows as well as on micro-level practices and reuse (Gille, 2010). The issue at hand is complex and dynamic spanning across various spatial and temporal scales. Majority of the scholarship on food waste divides the issue into production-side and consumer-side for waste management. The public food services comes under the purview of consumer-side and it include households, restaurants, schools and other large scale institutions. For the sake of brevity, I’m only going to elaborate more on the studies which helped in shaping the focus of my research. Food service sector has received relatively less attention compared to households. Even much lesser at the preschool level which pose a unique kind of challenge in itself given the age group (1-5yrs) of the children. However, there are some commonalities with other studies done at schools, hospitals and other food service areas from which I have gained insights.

It can be said that, Engström & Carlsson-Kanyama (2004) was the first study to categorize the sources of food waste into different wastage points. Other studies (Heikkilä et al., 2016 and Eriksson, Osowski, Malefors, Björkman, & Eriksson, 2017) that have attempted to quantify the waste volumes have based their study on such categorization and is reflected in my research as well to guide my first research question.

- Storage waste: Anything that gets thrown away from the pantry/fridge/freezer. To measure this kind of waste, the kitchen staff needs to monitor and make a note of anything that gets thrown.
- Kitchen waste: This category of waste consists of unavoidable food waste such as peels and scraps generated as a result of food preparation. It also includes incorrectly prepared food e.g. burnt food.
- Leftover waste: Food that was prepared but never made it to the plates and can be potentially reused later.
- Serving waste: Food that gets left out in serving bowls after the meal.
- Plate waste: Food that is left on the plate after the meal is finished is called plate waste.

A study conducted Finland measured food prepared and waste generated from meals in schools, preschools, workplace canteens, petrol stations, restaurants and diners indicated serving waste to be
the biggest contributor to the overall waste and preschools being the top contributor to waste compared to other food service settings (Silvennoinen, Heikkilä, Katajajuuri, & Reinikainen, 2015).

A recent study in Sala municipality in Sweden carried out similar quantification of public catering services serving meals in schools, preschool and elderly care identified hotspots of food waste also identified serving waste to be the major waste area (64%), followed by plate waste (33%) and others (3%) (Eriksson et al., 2017). Sauces, special diet food especially in elderly care homes, and kitchens that received food from other sources were found to be the major hotspots for food waste. However, the finding which is of most interest pertaining to this study is that the preschools had the lowest rates of food waste amongst others. The authors presume that, it could be due to the fact that meals at preschools followed the principles of pedagogic lunch where the teachers sit with the children and eat the same food as them had a positive impact of food waste levels. Pedagogic lunch also advocates that the children get sufficient time to eat and have a recess which is shown to have lower levels of food waste in schools (Engström & Carlsson-Kanyama, 2004; Silvennoinen et al., 2015).

Quantitative studies on the volumes of food waste generation are not sufficient to tackle the problem efficiently. Underlying causes need to be examined. This pushed me to further to explore studies that have dealt with such inquiry through qualitative methods. One such study is a research done in Finnish food service industry exploring the elements affecting food waste in this sector (Heikkilä et al., 2016) identified factors such as Society, Business, product development and procurement, management, professional skills, diners, competitors and communication to be the most important elements affecting the catering sector. This study included restaurants and other eatery in their scope which makes some elements irrelevant for my research. Certain elements were found to be common and relevant across the food catering sector such as communication and skills of the chefs.

Another study on catering in large scale institutions such as hospitals also offered similar themes (Ofei et al., 2015). Figure 3 shows themes that emerged from interview with the kitchen and the hospital staff was found to be suitable to be applied to the preschool setting. This partially helped me in constructing my interview guide to answer my second research question which will be elaborated later.
3. Methodology

3.1 Epistemological & Ontological considerations

Throughout this research, I take critical realism as my epistemological standpoint. I concur with Sayers(2000) that, “there exists a realist out there independent of observers”. This approach allows me to critically analyse the issue of food waste in the preschools of Malmö to identify causal mechanisms and bring about a change to “transform the status quo” (Bryman, 2012).

When it comes to analysing open-ended social systems such as Food Waste, it can be said that it is socially constructed (Bryman, 2012). What meanings are ascribed to objects such as food and food waste and its representation as either valuable or indeed waste lies in the interpretation. Hence, my ontological position is constructivism.

3.2 Research method: case study

Case studies are commonly used when researching the real world using a qualitative approach(Robson, 2011). According to Yin(2009), case study as a research strategy is employed when the researcher has little control over the events and the focus is on “a contemporary phenomenon within real-life context”. As explained in earlier chapters, the issue of food waste is a contemporary phenomenon in a real life context. To understand food waste in a specific setting, I must choose the unit of analysis. the unit of analysis strongly depends on certain contextual conditions(Yin, 2009). Therefore, I apply a single case
design, with practices followed in the preschool kitchens as my unit of analysis. In my case, I aim to understand how much waste is happening and the sources to uncover the barriers faced in reduction at source. Then I chose to strategically analyse those conditions with the Social Practice theory. This path will help me answer all my research questions. Following Yin’s case study types, my case food waste analysis in the preschools of Malmö exemplifies the broader category of waste prevention which has received much attention from local to international spatial scales(Yin, 2009).

3.2.1 Case of Malmö

Malmö is the third largest city in Sweden in the region Skåne. Malmö city administration has various departments and Miljöförvaltningen(Environmental department) is responsible for aspects related to food and sustainability among others. The policies and other mandates developed by Miljöförvaltningen covers the public food services as well. Which include preschools, schools, healthcare, public hospitality, social and leisure clubs and all events that are arranged by the city of Malmö as shown in figure 4. The public catering in Malmö serves around 50,000 portions daily to various different recipient group(Malmö stad, n.d.-b, p 6).

![Diagram](https://via.placeholder.com/150)

*Figure 4: Structure of food distribution in Malmö city (Malmö stad, n.d.-b)*
Preschool administration and kitchens
There are approximately 260 municipal preschools in Malmö organized under förskoleförvaltningen (preschool management) since 2013. Previously, the administration in the city was organized into ten different districts and each district was responsible for the administration of schools, preschools and elderly care homes falling under its jurisdiction. Since 2013, the city administration was reorganized and the number of districts was reduced by half in order to have a faster decision-making process and to be able to improve the quality of service provided to the citizens of Malmö. Förskoleförvaltningen, a result of new organization is still in a transition period towards a more central coordination and a common framework therefore lacks complete statistics about preschools. In order to take stock of the situation, Förskoleförvaltningen commissioned a study assessment with a mission to include all the municipal preschools and record the inventory and kitchen equipment under each preschool. The findings highlighted that equipment, working hours of kitchen staff, budget and kitchens standards differ greatly between different preschools. This also indicates that such kitchens might be potential hotspots for food waste generation (Malmö stål, n.d.-b).

Depending on administrative and infrastructural issues, preschools vary from each other. Looking from a food waste perspective, I reckon that preschool can be categorized in 3 types; (1) Preschools with large kitchen with an in-house chef (2) Preschools with a basic kitchen, receiving food from other sources (3) Uteförskolor where kids are mostly outside and receive food from other sources. Children get to eat three times a day: breakfast, lunch and snacks. Irrespective of the type of preschool, breakfast and snacks are prepared always in place in the facilities available at the preschool. But lunch, which is the hot meal is prepared only in the kitchens that have capacity to cook for a large group. Preschools type 2 and 3 receives food from either MSR kitchens\(^1\) or other nearby preschool’s kitchen or by an external caterer.

For my research, I decided to focus on type 1 preschools that have their own kitchens with an in-house chef because it is most common to find preschools\(^2\) with this arrangement and any new preschool built in Malmö will be equipped with a kitchen to prepare hot meals (G. Andersson, personal communication, 2017). Hence, this is the most relevant category for my study.

---

\(^1\) MSR is a revenue-funded activity that acts as an entrepreneur and offers various meal solutions. It belong to Service department of Malmö stål. It is fully responsible for kitchen staff and equipments and provides meals to all the elementary and secondary schools of Malmö. It has a decentralized kitchen with the capacity to cook upto 3000 portions (Malmö stål, n.d.-b).

\(^2\) Data on the number of preschool in each category is unknown.
Food waste in policy

The Environment department in the municipality of Malmö has envisioned a goal to reduce the GHG emissions and be a climate friendly city by 2020. In 2010, "Policy for sustainable development and food for Malmö City" was adopted, which has the main goal that all food purchased must be organic by 2020 and GHG emissions from food procurement should be reduced by 40% by 2020, compared to the 2002 level (Malmö stad, n.d.-a). This policy applies to all public catering coming under Malmö city administration.

The policy enlists food waste as an area for maintaining a sustainable economy in the city. It also emphasizes that there will be environmental benefits by reducing food waste. According to the report, “by reducing waste we will be doing something for the environment and the climate. Everyone who handles food in some way in the City of Malmö shall work to reduce food waste, without risking food safety. The food waste that is generated by the City of Malmö’s operations shall be used in biogas production.” (Malmö stad, n.d.-a)

3.3 Data collection

The process of collecting data is based on common methods used in case study. Multiple sources such as waste quantification, participatory observation and semi-structured interview were done which is my primary source of data and secondary sources include literature review and document analysis. This approach can be said as triangulation which is done to ensures the internal validity of my research (Bryman, 2012).

3.3.1 Document Analysis

To understand the issue of food waste from a multi-level perspective, I referred to the grey literature and policy documents. To gain insights from a global perspective, I referred to documents such as FAO’s “Global Food losses and food waste” and SDG’s goals and targets. At an EU level, I perused EU regulations such as the WFD and EU FUSIONS. To learn more about the issues in a Swedish context, I studied reports from SEPA(Naturvårdsverket). I reviewed Sustainable development and food policy document made by the Environmental department of the municipality of Malmö which enlists goals and targets relating to food and food related aspects to be achieved by 2020 (Malmö stad, n.d.-a). I also reviewed the half-time evaluation of Malmö’s Sustainable development and food policy (Malmö stad, n.d.-b) which was conducted in 2010 to gain an understanding about the current position of the city and
future trends in achieving those goals. Besides that, I referred to several peer-reviewed journal articles and books on food waste which helped me gain an overall understanding of the subject as well as theory which help me in analysis.

3.3.2 Participant Observation

Participatory observation is one of the often used research methods where the researchers seek to become a part of the observed group (Robson, 2011). My role was that of a non-participating observer with interaction where the main goal of observation is to gain useful insights about the practices followed (Bryman, 2012). To understand the practices around food preparation and waste generation in the preschool kitchens, I employed the method of participant observation. I visited one of the bigger preschools in Malmö which consisted of 200 children and 35 teaching staff and 2 chefs. It helped me get familiarized with the setting in which the interviewees work and prepared me better for the follow up interview and waste quantification process (Bryman, 2012). Field notes were taken throughout the observation period.

3.3.3 Waste Quantification

The first practical step towards identifying the problems related to food waste is to quantify the waste generated using scales (Eriksson et al., 2017). The hotspots of waste generation as identified earlier are the storage loss, kitchen waste, serving waste and plate waste were measured. This was done to establish a baseline measurement of the amount of waste produced and identify the area that generates most waste in the preschools. The process of weighing the food prepared and waste generated was conducted in all the four selected preschools for one day each.

The storage loss was recorded during a period of two weeks since food from the storage (refrigerator, freezer, pantry) is not thrown away on a daily basis. The chefs were asked to make a note of any storage losses in the form shown in Appendix B. The other type of losses - kitchen, serving and plate waste was observed for the food cooked and served only for lunch since this is the biggest meal that is eaten in the preschools.

Chefs and the teachers were informed beforehand about the measurement of food waste in their preschools. The first step in the process of quantification was all the prepared food on that day was measured and recorded. Then to measure the waste, chefs were asked to use fresh waste bag which only consisted of peels and scraps from preparation (unavoidable) for lunch on that particular. It was later measured after the food was prepared and categorized as kitchen waste. Kitchen waste also
included food that was prepared but was considered unfit to serve, for e.g. burnt food, incorrectly prepared food. Once the food was prepared, it was sent on food trolley to each sections during lunch time. After eating lunch, the teachers were asked to use separate waste bag to dispose waste from the plates and serving bowls in order to record plate waste and serving waste respectively. Finally, all the waste bags were collected and quantified at one designated place. The food that remained unserved in the kitchen was categorized as leftover and was recorded.

### 3.3.4 Interview

One of the methods to get insights into the phenomena of food waste is by conducting interviews. Interview is a common way of data collection in qualitative research and one of the important sources of case study information(Yin, 2009). The flexibility associated with semi-structured interviews helps to glean the ways in which the interviewees perceive the issue of food waste and also provides a space for them to open up and raise additional issues(Bryman, 2012). Due to flexible nature and lack of standardization in a semi-structured interview, it raises concerns about the reliability of the data(Robson, 2011) because of reasons such as bias from poorly constructed questions or responses from the interviewees(Yin, 2009). In order to overcome the latter, the interview questions were peer reviewed through which I got some constructive feedback. All the interviews were conducted face-to-face. Face-to-face interviews allow the interviewer to build a rapport with the interviewee and to observe non-verbal cues which may help understand the verbal response (Robson, 2011).

Five chefs and two teachers from four different preschools were chosen for interviews. The choice of preschools mainly depended on Gunilla Andersson, Project manager at the Environmental department Malmö municipality who is my primary contact person. It also depended on the availability of English speaking chefs at the preschools.

Interviews of chefs were transcribed and coded for data analysis. All the interviewees are kept anonymous and the interview guide and interview list can be found in Appendix D. Transcripts will be made available to ensure the reliability of my research.
3.4 Limitation

This research is based on qualitative data from four preschools of Malmö whilst there are about 230 preschools in total. I conducted in-depth qualitative interviews, an inference can be drawn about the general situation at the preschools of Malmö. However, to obtain an accurate picture of the food waste volumes and the barriers faced, further study needs to be conducted.

When it comes to selection of interview participants, I was faced with a limited choice which was based on factors such as availability, accessibility and the ability to converse in English. There might have been a bias in the response of the interviewees since they knew my stand on food waste and they may have provided details based on what the interviewer wanted to hear (Robson, 2011). There might have also been an influence from the fact that I was sent to them through the manager of the Environment department.

The sample of preschools selected for this research was only the ones where the kitchen was present in the preschool building and did not include preschools which received food from bigger kitchens or other sources. The inclusion of such preschools could have added richness to the data and hence enhanced the analysis (Tracy, 2010).

In the quantification process, other meals such as breakfast and snacks were not included. It did not include liquids drained away which indeed contribute to the overall waste generation. Such omissions must be considered as a limitation of this research.

The quantification of food waste was carried out only on one day in each preschool in my research. This is not a true indicator of the actual waste generation since it depends on various factors such as type of raw food used on that day (fruits and vegetables that has a lot of peeling and scraping), whether there is any reuse of old food on that day which means a lot of less preparation is done leading to relatively less waste generation, whether the chefs had done some advance food preparation the day before which also leads to a lot less wastage on the measurement day and how many children were present and their health condition etc. Ideally to get an accurate estimate of the food waste generation, a detailed study of the measurement must be conducted over a longer period of time so that the reasons mentioned above can be factored in.
This research could have been benefitted with two people working on it for a wider selection of data collection and better analysis of the topic in question. Preferably, a person with Swedish language skills would have made the interviewees feel more comfortable for them to express freely without the hesitation of using English for communicating with the interviewer.

4. Theoretical framework

4.1 Integral Theory

To get a holistic understanding of the factors inhibiting food waste reduction in preschools, I have used Integral theory approach. Integral theory is a comprehensive theory developed by Ken Wilber which draws insights from major disciplines such as natural sciences, social sciences and arts and humanities and subsequently has its application is a wide range of fields e.g. art, healthcare, law, ecology etc. (Esbjörn-Hargens, 2010). The Integral approach aims to cover all the important dimensions of reality through AQAL model (Esbjörn-Hargens, 2010). AQAL stands for all quadrants, all levels, all lines, all states and all types and they represent basic repeating pattern of reality (Esbjörn-Hargens, 2010). The first step in order to apply this model to any problem would be understand the four quadrants defined by the AQAL model (refer figure 5). The upper-left quadrant represents the subjective dimension of individuals dealing with aspects such feelings, attitudes, beliefs and awareness. The lower-left quadrant is the intersubjective domain aiming to understand cultural aspects such as worldviews, group relationships etc. The lower-right quadrant is known for inter-objective reality exploring more tangible aspects such as environmental, political and social infrastructure. Finally, the upper-right quadrant, seeks to understand individual behaviour which is in turn influenced/informed by the other three quadrants (Owens, 2005). Such a conceptualization is the first the first step towards scanning any situation to bring out multiple perspectives (Esbjörn-Hargens, 2010). The other aspects of the AQAL model as mentioned earlier, go further deeper into the complexities of each quadrant which in my case might not be required. I am interested in finding out the factors that is perpetuating food waste in the preschool kitchens of Malmö and in order to do so and not leave any stone unturned, I use Integral theory’s four quadrant approach to categorize the barriers.
To apply the quadrant approach to operationalize my research inquiry, I used different themes drawn from multiple sources. I used themes such as Personal Values & beliefs, Awareness, Knowledge building, Communication and Legal aspects from a study conducted by in hospitals in Denmark by Ofei et al (2015). Organizational and Infrastructure themes were included as an outcome of the meeting with the Environment department manager. Group relationships was an idea born out of the study of Integral theory which would bring about interesting insights into the group dynamics where sustainable practices are being studied. The following are the themes used shown in figure6
Figure 6. Sources of food waste themes embedded in the Integral theory quadrant approach.

Personal Values & beliefs
Factors operating in the level of mind such as values and beliefs are important to understand the level of motivation one has towards reducing waste(Owens, 2005).

Awareness
Awareness is about a given problem is that first step towards preventing it. It is one of the main reasons which inhibit people from behaving in a sustainable manner. Although research has shown that being aware does not necessarily led to change in one’s habit(Ofei et al., 2015), it is nonetheless an important factor to examine.

Communication
Communication among the actors involved is shown to have positive effects towards waste prevention(Heikkilä et al., 2016). Hence, it is crucial to examine the level and nature of communication between chefs, teachers and children in the preschool.

Group relationships
Communities and networks act as effective channels for sharing information and learning new things(Shove et al., 2012). It is important to look at chefs belonging to the preschools of Malmö as a
close-knit community to understand how conducive these channels are for learning, fostering relationships and developing shared understanding.

**Infrastructure**
Kitchen equipment and facilities such as refrigerator, freezer, cooling unit, pantry space etc which help in storing food and maintaining quality were being assessed.

**Legal**
Regulations such as food quality control and hygiene or the use-by dates is responsible for causing food waste (WRAP, 2010). It is important to examine how whether these rules are hindering them from lowering food waste.

**Organization**
The organizational structure of the preschool kitchens of Malmö was being looked as to whether it hinders or enables food waste prevention.

**Knowledge building**
Knowledge building initiatives such as training, workshops and a continuous learning process to is known to have positive effects towards the goal of food waste reduction (Ofei et al., 2012). Provision of such opportunities and the willingness to participate was examined.

Integral theory and themes helped me to explore different areas in which barriers to food waste reduction potentially exist. This thematic categorization was instrumental in formulating my interview guide.

While Integral theory is useful in uncovering the processes that occur in different areas, it fails to explain how the different categories interact with each other and dynamics to bring about social transformation (Riddell, 2013). Upon deeper analysis, Integral theory over-emphasize the upper-left quadrant, privileging the individual’s consciousness development as a path to social transformation. Undoubtedly, individual’s role is crucial for bringing about social change, however, the individual is embedded and surrounded by other forces such as governments, institutions, technologies and materials that facilitate change towards sustainable behaviour. Theories that overtly place emphasis on individual’s attitudes and values to bring about transformation and promote sustainable lifestyles have received criticism. Therefore, to understand what can bring about social change, Social Practice Theory
is being used to analyse the dynamics and interconnectedness between various elements surrounding the individual to discern how practices evolve and eventually led to mainstreaming sustainable pathways.

4.2 Social Practice Theory

To tackle sustainable consumption in the present day, new ways of framing the problem is essential. People do not develop the way of doing things by themselves but instead is shaped by fellow-citizens, objects and situational factors around them(Spaargaren, 2011). Individualist paradigm emerging mainly out of fields of psychology or economics to explain human behaviour needs to be revisited. Neither does top-down structuralist approaches help in changing behaviour(Spaargaren, 2011). Instead, understanding consumption in the context of practices lends itself as a useful starting point in this endeavour. Social Practice Theory(SPT), a theoretical approach having roots in mid-20th century mainly through the works of Bourdieu(1979), Giddens(1984) and Schatzki(1996) has been revived to study the interrelatedness between consumption and sustainability(Sahakian, & Wilhite, 2014). This approach shifts the analytical focus from individuals, products, technologies and instead focuses on everyday practices. Practices becomes the fundamental unit of social analysis(Shove, Pantzar, & Watson, 2012). There are several flavours of SPT and there is no common unified practice approach(Hargreaves, 2011). Proponents of SPT have looked at everyday practices as either various elements coming together to make up practice (Reckwitz, 2002; Shove et al., 2012) or connection between these elements (Schatzki, 2002; Warde, 2005) or as practices acting as a bridge between individual and socio-technical systems of provision(Spaargaren, 2011). Accordingly, the definition what is meant by practice itself also varies. For Reckwitz(2002), “A ‘practice’ is a routinized type of behaviour which consists of several elements, interconnected to one other: forms of bodily activities, forms of mental activities, ‘things’ and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge.” In another school of thought, Schatzki(1996) identifies two notions of practice; practice-as-entity and practice-as-performance. He describes practice-as-entity as “practice as a temporally unfolding and spatially dispersed nexus of doings and sayings...To say that the doings and saying forming a practice constitute a nexus is to say that they are linked in certain ways. Three major avenues of linkages are involved: (1) through understandings, for example, of what to say and do; (2) through explicit rules, principles, precepts and instructions; and (3) through what I will call ‘teleoaffective’ structures embracing ends, projects, tasks, purpose, beliefs, emotions and moods”(p 89). Practice-as-performance is the actual performing of the doings and sayings which “actualizes and sustains practice
in the sense of nexuses” (Schatzki, 1996, p 90). One can say that the former notion is more the representation of what constitutes practice and the latter is about reproduction through regular enactment of the practice. Practices according to him can be dispersed or integrated. Dispersed practices are the ones that usually appears in different social setting and their performance requires understanding e.g. following rules, explaining, imagining. Whereas, integrated practices are much more complex and found in a particular social domain e.g. cooking or farming (Schatzki, 1996). It involves the understanding, know-how and the teleoaffective structures. Practice of food waste reduction can be constituted as an integrative practice involving all these elements. Warde(2005), drawing insights from these aspects conceptualizes practice a connection between three components (1) understandings (2) procedures (3) engagement. He stresses that understandings can be shared but differentiated and that engagement of an individual with a particular practice drives consumption and not through individual’s desires. According to Warde(2005), practices are social constructions because they shape and form of practices are conditional to the institutional arrangements that exist at a specific point in time, bound to the current cultural traditions and social context.

Shove et al, (2012) propose that social practices consist of elements that are integrated when practices are enacted and that practices emerge, persist and cease to exist as the links between the elements are broken and made. The elements are explained below and shown in figure 7.

![Diagram](image_url)

*Figure 7: Elements of practice (Shove et al., 2012, 25).*

### 4.2.1 Materials

Material objects such as infrastructure, tools, our bodies and other physical objects are connected to a specific practice(Shove et al., 2012). Performance of a practice presupposes the availability of material. Shove et al, (2012) explain material elements as physical objects and/or infrastructure and that their availability plays an important part in facilitating and enabling a potential practice. Sahakian, &
Wilhite (2014) shows that even our bodies have agentive power to change and adopt new practice. Through *Habitus*; a concept developed by Bourdieu, argues that an individual’s disposition for thought and actions is created by past experiences. *Habitus* and the social world are mutually structuring each other i.e *habitus* compels us to act in a certain way due to past experiences and history, but, this can be changed when repeatedly exposed to new practices.

### 4.2.2 Competence

This element captures the ‘know-how’, the practical consciousness, acquired skills, the shared understanding for what is considered a desired performance and knowledge (Shove* et al.*, 2012). The practical know-how or the understanding is the element typical of dispersed practice as described by Schatzki (1996).

### 4.2.3 Meanings

This element encompasses all the mental activities such as emotions and motivations for performing a practice (Shove *et al.*, 2012). Meaning can be the shared understanding within a group about a behaviour, or an aspect which brings the group together (Shove *et al.*, 2012). It encompasses all the mental activities such as emotions and motivation performing a practice. It is critical to develop a common meaning or a shared understanding in a group to consider a practice “normal” for its subsequent enactment that determines its endurance.

Practices are not uniformly distributed and it is constantly developing. By interfering with the elements practices can be changed. In a study by Sahakian, & Wilhite (2014) it was shown that, by introduction of a new material in a restaurant or changing infrastructure of a city to encourage the city dweller to take up walking or through changing meaning around locally produced food by serving such food in a restaurant and distributing recipes, practices can change people’s habits and behaviour to be more sustainable. This is the strength of SPT, to analyse situations as web of practices influenced by context and structures that can enable desired behaviours, rather than putting the individual in the spotlight for finding solution.
5. Results & Analysis

In this section, I will answer my first and second research question. To refresh our memory, first research question seeks to quantify the losses occurring in the kitchen and preschool in total. This is done to get an estimate of the wastage and identify the most problematic area. The second research question attempts to uncover various barriers faced by the kitchen staff for food waste reduction.

5.1 Food waste Quantification results

Method used for quantification is described in the Waste Quantification section (chapter 3.5.3). Table 1. gives an overview of the total food prepared for lunch during the measurement day in each preschool. It also shows how much food was totally consumed, how much food was wasted and how much was leftover after the food was consumed. Split of the total waste as different wastage areas such as kitchen waste, serving waste and plate waste are also shown. Finally, a total of all the waste is calculated to identify the most problematic area.

Table 1: Snapshot of food prepared and wasted

<table>
<thead>
<tr>
<th>Preschool</th>
<th>Total food prepared (kg)</th>
<th>Total food eaten (kg) (%)</th>
<th>Total food wasted (kg) (%)</th>
<th>Leftover (kg) (%)</th>
<th>Kitchen waste (kg) (%)</th>
<th>Serving waste (kg) (%)</th>
<th>Plate waste (kg) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>12</td>
<td>7.1 58.5%</td>
<td>1.9 15.5%</td>
<td>3.185 26.5%</td>
<td>0 0%</td>
<td>0.796 42.6%</td>
<td>1.071 57.3%</td>
</tr>
<tr>
<td>B</td>
<td>40</td>
<td>21.2 53%</td>
<td>12.5 31.25%</td>
<td>7 22.4%</td>
<td>1.7 5.4%</td>
<td>6.8 21.7%</td>
<td>4 12.8%</td>
</tr>
<tr>
<td>C</td>
<td>29.4</td>
<td>20.5 69.7%</td>
<td>10.1 34.3%</td>
<td>0 0%</td>
<td>1.2 11.88%</td>
<td>5.5 54.45%</td>
<td>3.4 33.66%</td>
</tr>
<tr>
<td>D</td>
<td>10.7</td>
<td>8.4 78.5%</td>
<td>2.3 21.5%</td>
<td>0 0%</td>
<td>0 0%</td>
<td>1.7 15.88%</td>
<td>0.6 5.6%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>26.8</td>
<td></td>
<td>2.9 10.8%</td>
<td>14.8 55.2%</td>
<td>9.071 33.84%</td>
<td></td>
</tr>
</tbody>
</table>
Figure 8: Breakage of the wastage areas

The results show that serving waste (55.3%) to be the highest followed by plate waste (33.9%) and kitchen waste (10.8%). This is in line with other studies (Silvennoinen et al., 2015; Eriksson et al., 2017). Storage loss is not shown here as it was zero in most cases except for one preschool it was negligible compared to other losses. In the calculation of total waste, leftover has not been included which is different from other quantification methods because the chefs would reuse the leftover so it is in essence not “waste”. Leftover food was either a consequence of unknown number of portions or dislike for the food items prepared on that particular day or it was a conscious decision made by the chefs to make extra food which was meant to be used on a later date. Hence, this category was not included in the calculation of total waste produced. The formulae used to calculate total food eaten and total food wasted is show in Appendix E.

5.2 Identification of Barriers

Semi-structured interviews are the primary source of data to explore the themes identified in section 4.1 and understand whether it is a barrier towards food waste reduction or not.
5.2.1 Personal Barriers

- Values and beliefs
When asked the interviewees about how they value food and their beliefs towards wasting of food, it was found that everybody highly valued it and believed that it must not be thrown away. It meant a lot to them personally especially the chefs, as they interact with food and has a very close relationship with it in their everyday lives. It was unanimous that food had a very special place in their life and they also tried to inculcate such values in the children as well. Teachers also expressed the same. Although the level of value they attached to food varied, one can say that they were a common belief system around food and the food waste.

- Awareness
Awareness regarding food waste was studied from multiple dimensions. They were questioned about awareness regarding (1) implications (2) different wastage areas and quantities of food thrown away in their preschools (3) food waste in Malmö’s Sustainable food policy. It was observed that the level of awareness in the areas mentioned above varied from each other.

- Implications
It was found that most of the interviewees were very sensitive to the aspect of economy. They were able to clearly articulate that throwing away food meant wasting money, especially when there is a fixed budget for every preschool that they are allowed to spend.

“I don’t feel good when I throw things away because its money”(Interview Aa, 2017).

They were also socially conscious about wasting food mainly due to ethical reasons.

“I think it is very sad to see that food is being thrown away. We have so much food waste, where we live there is so much food waste. I mean, from the stores and the people throwing food. Out of four bags of food we throw away one bag...It’s really sad to just.. Ya.. and also for the animals.. Why kill the animal if you don’t eat it”(Interview Ba, 2017).

Overall they were clear about the implications of food waste and this was not an area of concern. However, this is not so say that awareness about the implications of food waste necessarily will translate into sustainable behaviour(Owens, 2005).
• **Quantification**

When asked about the estimate of food waste in their kitchens and overall in their preschool, the awareness level varied greatly. It ranged from a vague “not much” to quoting of actual numbers. Some preschools even did the quantification of waste using scales themselves for their understanding of the amount of food they are throwing away as indicated by one of the chefs.

> “I had one period when I wrote everyday [how much] we throw away” (Interview D, 2017).

Another chef mentioned that there were about 5 preschools in their area and the preschool head had ordered them to track the wastage for a period of two weeks when they recorded all the waste that was generated in their preschool and compared it with the previous months to understand where they stand currently.

These kind of variations about their awareness of the extent of food waste in their preschools (much less about the wastage areas) exist due to the fact that there is no formal or regular measurement and monitoring in the preschools of Malmö.

• **Sustainable food policy**

Sustainable food policy of Malmö has a small section on food waste, but it does not have a specific target to achieve it. It comes under a broad umbrella of GHG emission reduction by 2020. The interviewees expressed that there is not much emphasis given to food waste when it comes to policy discussion. Other aspects such as using organic products, reducing sugar consumption and cooking from scratch were given higher priority. One of the chefs made a clear point on this

> “Eko [organic] is so much more important for them and food waste is not so much...I think it depends, it’s easier to meet the eko because we can see the green spots in the computer, but food waste is not so easy to see how much” (Interview Bb, 2017).

Some were oblivious to the fact that food waste is a part of the sustainable food policy of Malmö.

> “I’m not aware of food waste in the policy” (Interview Ca, 2017).

In order to bring down the food waste in the public kitchens, policy-makers and other involved stakeholders must emphasize the issue effectively and must be made a part of active discussions in policy debates and in other platforms including in their everyday lives.
5.2.2 Cultural Barriers

Communication
In the formative years of the life of children, it is essential for them to have a balanced diet consisting of right amounts of carbohydrates, proteins, vegetables and fruits. They also need to be introduced to various kinds of foods with different flavours and textures. Oftentimes, children waste food due to reasons such as sickness, moodiness or simply because they are fussy eaters. This presents as a direct challenge to food waste reduction goal. However, it can be mitigated through effective communication between the kitchen staff, teachers and children.

It was found that chefs have a crucial role in creating this balance between children’s nutritional requirement and fun. One of the chefs had some interesting ways of making the children eat the food that they would normally throw away

“If I write spinach soup they don’t eat, if I write Popeye soup they eat. If I write broccoli soup they don’t eat then I write crocodile soup they eat. There is something with the names” (Interview D, 2017).

“Experiment is very important. We have microscope and an ipad. I show them chickpeas [and ask] do you want to eat? Big no. Then I show them under microscope to see how beautiful it is. Then they want to taste one.. After tasting one they like it and they want more. I introduce [new foods] when we are playing” (Interview D, 2017).

Another challenge was to understand the amount of food to be prepared everyday, all the preschools had a chart which was supposed to be filled up by the teachers in the morning which indicated how many children were present and also state special food requirements and allergies. This practice was followed in most cases except one.

“We have a board on the wall and they have to fill in by 9.30am but it doesn’t work. I have dropped that. I think 25% less than the total number of children in the school. Because it is annoying to run around and point that you have to write on the board. And I see in the morning when I go around so I know” (Interview Ca, 2017).

Communication practices varied a lot in the preschools. In preschool B is was found that there was very minimal interaction between the chefs and the children and is reflected in the amount of food eaten(53%)(refer Table 1) which is low compared to other preschool(of course, it would be oversimplifying to say it is the only reason for low levels of food intake. Nevertheless, it is an important contributing factor).
Aspects such as physical separation between the kitchen and the preschool, introvert nature of the kitchen staff, issues of power or the size of the preschool becomes important factor when it comes to communication. It would be beneficial to have a closer look at the practices of communication in order to level out difference in the preschools.

*Group relationship*
If all the preschool chefs in Malmö were looked at as a community where they can exchange information, share ideas and form a shared understanding about food and food waste, it would be useful to look at the existing mechanisms which facilitate such organization. It would be important to understand the relationship between the chefs, their level of interaction and their participation in networks to gain insights about their group dynamics.

Number of people working in the kitchen depends on the size of the preschool. Preschool having less than 100 children would have just one chef working in the kitchen and preschools having more than 100 children would have two or more chefs(Ca, personal communication, 2017). Most of the preschools in Malmö has only one chef in the preschool, so it was found that there was a very few or no group existing in the premises of the preschool. Instead, there were other mechanisms through which groups were formed. All the preschools in one particular area formed a group that met often to discuss ideas and exchange information.

“My head boss for the preschool is a head boss for 5 preschools...So we have meetings every second Monday. We sit and discuss ideas, share info, problems”(Interview Aa, 2017).

Some happened in an informal way, which mainly depends on the motivation of the individual

“I try to talk to my friends who works as chef. I try to inspire them. I have 13-14 friends in the same area and they work in preschools and we discuss it is very important to realize it is a big problem and we must try to cut food waste”(Interview D, 2017).

There is also an online platform called *köksnätet* where chefs can contribute recipes and ideas for other to use. But it was found that the level of engagement with the online sharing platform varied greatly. However, they all agreed that it is important to have such a network but stressed it must be organized better for it to be effective.

“Network runs by people in the kitchen not by boss or people in miljöförvaltning. I would like it to be more programmes for the chefs or the kitchen. Like here teachers have what they gonna do with the children. I don’t want rules but some tools to work with, some contacts persons we can call. Like everything in this is done by email everything is online no personal contact
whenever. That is really sad. It is voluntary I’m not interested in köksnätet... Little bit more pinpoint for the staff in the kitchen and not only for the teachers. There is no policy how to discuss wages for the people in the kitchen. There is a policy to discuss wages for the teachers. I think they have forgotten about the kitchen. I would like to see some more tools in the intranet for us guidance”(Interview Ca, 2017).

5.2.3 Structural Barriers

Infrastructure
Kitchen equipment such as refrigerator, freezer and pantry shelves are necessary for storing food items. Excess food can be managed only when there is sufficient space for storing it. It was found that the chefs were quite satisfied with equipment they had for storage and it did not prove to be an obstacle with regards to food waste reduction. It is also reflected in the Food waste quantification process that showed storage loss was negligent thereby indicating proper storage facilities were in place. However, an in-depth study or survey of all the preschools with different food provisioning arrangements must be done to ensure that the infrastructure is in place.

Legal
Regulations such as hygiene policy is one of the reasons for food waste in schools(WRAP, 2011). Children are more vulnerable to contamination risk than adults and hence the standards are stricter for schools and preschools compared to restaurants(Interview Ca, 2017). The food that has left the kitchen cannot be taken back and such leftovers must be thrown away(Interview Ca, 2017). Chefs did not perceive this to be a constraint in their food waste reduction efforts. Careful planning of the menu and portioning was the key to bypass this barrier. The chefs employed strategies such as serving in small bowls and refilling it many times from the kitchen or providing one large bowl of food and asking the teachers to take small portion in a separate bowl while serving to the children. The food that is then leftover in the big bowls could be returned to the kitchen for storage and reuse later. This strategy also made the teachers to encourage children to take smaller portions of food but as many times as they want until they are full. Best before and the use by date regulation also did not pose a threat to the waste reduction at preschools as they follow strategies such as first in first out i.e the older foods are stored in the front and the foods purchased recently are placed at the back to ensure using up of the older items first. They also use their sensory functions to understand the quality of the food before tossing it out. Another
important strategy they follow is that they order the foodstuffs on a weekly basis from the wholesaler. This is done to avoid overstocking and forgetting which could lead to food waste. Such strategies either come out of experience or through knowledge dissemination. Preschool chefs in Malmö vary very much in their education background, competence and years of experience. Hence, a thorough investigation must be conducted across all the preschools to ensure such strategies are followed.

**Organization**

Organization of Malmö’s public food catering is shown in section3.2.1. According to the organizational structure, preschool kitchens exist as independent entities. It is run mainly on the decisions made by the chef(s) working in the kitchen unlike the school kitchens(MSR) which is more centralized having the capacity to cook for 2000-3000 children. Decentralization, as in the case for preschools, enables the chefs to be creative and flexible with the menu planning, food ordering, cooking from scratch and, reuse of excess food. Concomitantly, less food waste is generated. Due to the above mentioned factors, chefs favour this arrangement. As one chef noted during the interview

“This is good to work as a chef in the preschool kitchens because it is the freedom to do whatever you want. But you have guidelines as well.” (Interview Aa, 2017)

They also like it because they can take the children’s likes and dislikes into account while cooking and make it a pleasant experience for the children.

“Because I was working in schools and as chef they can’t do anything, they have to follow the menu that and this. We have so much freedom in what we can do [in preschools], what the children want, for children to play with the food. It is important for children to play with the food. We can make it interesting for them. We do everything by hand here from scratch but schools don’t. Some kitchens have the capacity for 2000 they cannot do meatballs by hand”(Interview Bb, 2017).

This freedom and flexibility makes all the preschool kitchens different from each other. The efficiency of the kitchen then depends on the individual’s knowledge, competence, planning skills, time management, awareness about current issues etc. which makes every kitchen different. Such difference can be overcome by taking several steps such as strengthening networks, regular measurement and monitoring of the kitchens for food waste and other food related issues (there is a regular monitoring done for hygiene and food safety) and increasing awareness through trainings and workshops on a continuous basis.
**Knowledge building**

Continuous knowledge building through regular trainings and workshops for the kitchen staff and teachers have been recognized as an important step towards bringing down food waste (Betz *et al.*, 2015; WRAP, 2011). At the preschools in Malmö, there seems to be a lacuna when it comes to organizing trainings and workshops for the kitchen staff. Although the chefs in Malmö are encouraged to undertake training and attend seminars, it is completely done on a voluntary basis and no such initiatives are provided to them from the municipality. One of the chefs had recently got an opportunity to attend a training on voluntary basis

“I attended a training on fermentation yesterday which I found on Facebook. I think I’m going to implement them. It is also a way of saving surplus food production” (Interview Bb, 2017).

Another chef noted that it is not a problem for her to attend any trainings and she get support from her manager.

“Yes my boss would like to support me. They see and hear and it is important not to throw away food. But not only food it’s other things also like energy etc but I read a lot and I am interested how to save more but sometimes it is not so easy” (Interview D, 2017).

Knowledge building programmes should not only be restricted to chefs, but can also extend to teachers. Teachers have an important role in shaping children’s habits. Hence, it is very important to sensitize them as well to the aspect of food waste. This can be done through imparting trainings targeting the teachers. When asked the teachers about their willingness to gain such knowledge, they expressed that they are keen to attend any trainings or seminars given to them related to food and food waste.

In general, it was found that the interviewees were interested in improving their knowledge about current issues around food and such potential must be tapped and encouraged further in an organized fashion. Opportunities must be made available to everyone by disseminating information through emails or with the help of network and online forums.

**5.3 Summary**

Quantification of food waste in four preschools showed us that the highest waste generating area was serving waste(55.3%), followed by plate waste(33.9%) and kitchen waste(10.8%). Storage waste was found to be negligible and hence, not included in the total waste calculation. Semi-structured qualitative interview to uncover barriers to food reduction is summarized in Table 2. These results are accurate for
the sample of preschool in this study and are not a representative of all the preschools in Malmö. However, all these aspects are taken into consideration in the analysis to understand how they affect in waste reduction.

Table 2: Result summary of barrier identification

<table>
<thead>
<tr>
<th></th>
<th>Values &amp; Belief</th>
<th>Not a barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal</td>
<td>Awareness</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Implication</td>
<td>Not a barrier</td>
</tr>
<tr>
<td></td>
<td>• Quantification</td>
<td>Barrier</td>
</tr>
<tr>
<td></td>
<td>• Policy</td>
<td>Barrier</td>
</tr>
<tr>
<td>Cultural</td>
<td>Communication</td>
<td>Barrier</td>
</tr>
<tr>
<td></td>
<td>Group Relationship</td>
<td>Barrier</td>
</tr>
<tr>
<td>Structural</td>
<td>Infrastructure</td>
<td>Not a barrier</td>
</tr>
<tr>
<td></td>
<td>Legal</td>
<td>Not a barrier</td>
</tr>
<tr>
<td></td>
<td>Organization</td>
<td>Not a barrier</td>
</tr>
<tr>
<td></td>
<td>Knowledge Building</td>
<td>Barrier</td>
</tr>
</tbody>
</table>

6. Discussion

After having put forth all the aspects that is inhibiting or enabling waste prevention, to answer my third research question, I will analyse these processes through the lens of SPT to gain insights into the dynamics and interconnections between them. It is important to classify what kind of practice is food waste reduction. I argue that, according to the notion of practice by Schatzki(1996), it is an integrative practice because, it is a complex practice in a particular domain. The domain being “waste”, which has social embeddedness and cultural meaning of what is waste and what is not. Waste prevention as an integrated practice constitutes of dispersed practices and elements of practice; meaning, competency, material. These practices are interconnected and form a web of practices which are mutually reinforcing each other to be on a sustainable path. In what follows below is an analysis of how these practices are linked to each other and show how elements of practice play an agentive role in enactment of the
practice. In addition, how social learning can occur for practices to spread and recruit more practitioners is examined. In our case, people involved with food i.e chefs, teachers and children are seen as active practitioners who reproduce these practices in their daily lives.

Empirical data on quantification results showed that the highest area of waste was serving waste followed by plate and kitchen waste. Going beyond numbers and in an attempt to analyse various dynamics at play, it is necessary to look at practices that lead to or alleviate the issue of food waste. The practices that go on before the preparation of the food and during and after mealtime are indicators of the wastage outcomes.

6.1 Kitchen Waste

Food ordering can be said to be one of the most influential practice when it comes to food preparation in the kitchen. Food ordering determines what kind of food to be ordered and how much to order within the given budget. Usually the chefs order food that is enough to last for a week. This avoids the problem of overstocking and food ultimately going to waste due to reasons such as expiry date, becoming rotten or mouldy. Of course, the elements of practice play a role in ensuring that this is reproduced on a continuous basis. One would need material objects such as storage facilities like fridge, freezer, pantry space to store appropriately. To be able to order the right amount and the right kind of food one would need to have the correct knowledge and planning skills. Knowledge about what is right for their preschool comes about through various channels and nexus of other practices. One such practice which receives special attention is communication. Chef’s interaction with children will shed light on their preferences, likes and dislikes which assists them partially in understanding what to order. Knowledge is also influenced by the meaning that is being associated with food and the cultural understanding of what good food for the children. As one chef pointed out “I have 97% of eko. I buy it, it’s very expensive though but I buy it because it is good for the children”(Interview Aa, 2017). Another noted that “Children around 3, 4, 5 yrs must have 70gms of proteins, 70gms of carbohydrates and 30gms of vegetables. So when I order food I take that in calculation”(Interview Ca, 2017). As Warde(2005) points out, the understanding is shared but differentiated. Such shared understanding or meaning around what is good food drives purchasing habits.

Systems of provisioning shape various practices(Spaargaren, 2011). A lot of food stuffs that is purchased through the wholesaler is already pre-prepared i.e it is already peeled(potatoes, carrots), chopped(onions, garlic), fillet or pre-cut meat and frozen food. Usage of such foods also leads to less
waste in the kitchens but causing the loss to occur somewhere up in the food supply chain. When it comes to procurement, the quantities of the food products sold have an effect on the waste generation (Heikkilä et al., 2016). For eg. frozen fish when defrosted need to be used up fully and cannot be frozen again. If the quantity is more than the desired number of portions, skills and knowledge of the chefs to creatively use the leftover is needed to save the food from going waste. One of the chefs noted that potatoes come in 7kg packets and two of such packet is cooked on one day although it is way more than the number of portions required. The leftover will be made into a potato salad or something else for the next day(Aa, personal communication, 2017). Such a practice demand competence from the chef for reusing old food.

6.2 Serving waste

Serving waste is the trickiest area and the most waste generating area amongst others. It is the area where there is crisscrossing of multiple practitioners, strategies, shared meanings and power dynamics makes it a complex issue.

Cultural understandings about the nitty-gritties of how much to serve, how much is enough, what must be the size of the serving bowls etc is known to have effects on food waste generation. In this case, teachers who become the recipient or carriers in the practice of serving add another level of complexity. Serving bowl, which is the main object used while serving, no doubt, has agentive properties and influences waste generation. Size of the bowls, the perception of fullness and the aesthetics around mealtime matter. It is shown that in other food service setting such as school lunch, office canteens etc, the serving bowls used in a buffet must look full and tempting during mealtimes(Heikkilä et al., 2016). To get around the issue of mental image of the “ideal serving bowl”, a common strategy used in the preschools was that the food was served in small batches using smaller serving bowls and the teachers could refill it as many times as they wanted. This was done to avoid excess leftover food in the bowls which would be rendered waste due to hygiene policy. The practice was considered ‘normal’ and there was a social acceptability of the meaning of this practice(Shove et al., 2012). Except in one preschool where the entire food cooked was served as the teachers didn’t want to be interrupted for helping themselves with more food by coming to the kitchen each time while having lunch. As expected, this led to more food waste since the food remaining in the serving bowls could not be taken back into the kitchen for later use. This slightly different practice not only shows that it could alter food waste outcomes but also highlight hidden power at play. It shows that the cultural understandings around how mealtime must be, presents a challenge in changing practices. Meanings, social aspects and the micro
politics of practices deserves more attention when it comes to changing towards sustainable behaviour(Hargreaves, 2011).

6.3 Plate waste

In a preschool with children ranging between the age group of 1-5yrs, one can expect to have plate waste as children in their formative years need to be exposed to different kinds of food. Nonetheless, consumption of it depends on multiple factors such as how much they have eaten before, sickness, moodiness, familiarity with food, taste etc. Given these variable factors, the practice of communication has a prominent role to play. It is through active communication with children, one can influence the young minds for example different chefs have different strategies to make the children try new foods. make funny bread or different experiments with food involving children in order for them to accept and eat different kind of foods. Food itself as a material object acts as an agent in influencing plate waste habits of the children. Of course this must also be complemented through oral discourses about food waste during meal times. Communication is not only important between the chefs and children but also among teachers and children. Teachers can influence children’s eating habits by talking to them about the quantities of food to be served, its nutritional value and the meaning of food waste. The habitus that is formed during childhood determines one’s habits, tastes, dreams and wishes and becomes their worldview(Gram-Hanssen, 2010). Thus, the habitus and understanding of the world that is instilled during early childhood manifests as routines and practices later in their lives. One of the kitchen staff, as a child had experienced hunger during war times who now in the capacity as a chef, values food deeply and hence, turned around practices in the preschool such as; introduction of single-point breakfast buffet, and involving children in cooking in their preschools which led to cost saving and waste reduction(D, personal communication, 2017). Keeping, long-term sustainability in mind, the assemblages of meanings and images related to food developed in the preschool becomes an important part of the children. Chefs during the repeated enactments of such forms of creative communication with children create an atmosphere where social learning can occur. Learning comes about through cognitive and practical processes, which lead to acquisition of practical knowledge(Sahakian, & Wilhite, 2014). Through exposure to such practices, teachers can be “recruited” into this practice and create an atmosphere where there is a shared understanding of the importance of food and implication of food waste.
6.4 Web of practices

Communication emerged to be one of the salient practices that needs to be followed in the preschools to avoid food waste. The enactment of any practice presupposes all the elements of the practice are in place. For communication between the chef and children to happen, the proximity between the kitchen and the preschool becomes key. Decentralized kitchens reduce the distance between sites of production and consumption of food. Studies have shown that food production which is done closer to consumers in the form of decentralized kitchens helps to adjust cooking and to reduce waste (Kjær & Werge, 2010). One cannot address an issue without the awareness that it is occurring in the first place. To know how much waste, the preschool is generating, routine measurement and monitoring is necessary. Notwithstanding the benefits, the practice can only be sustained if done on a timely fashion and not “too often” as it will lose its meaning. Chefs were in favour of quantification as it would enhance their awareness about food waste levels in their kitchens. Some even did it voluntarily in their kitchens. However, to ensure even adoption of the quantification process in all the preschools, one of the elements can be changed, which might in turn lead to stabilizing the practice i.e the introduction of technological solutions such as Winnow3 or Leanpath4 that can make the process easier and more acceptable. It not only quantifies the waste but also generates reports which can be collected from all the preschools to make an overall assessment. As a spinoff of the routine measuring and monitoring practice, an incentive scheme can be developed (like the Green smiley sticker5 for food quality and hygiene indicator). Through the use of materials such as certificate/sticker, which acts as an incentive for reducing food waste levels, practices around quantification can be affected. Chefs were usually proud of the Green smiley sticker and tried to maintain good hygiene in the kitchen in order to obtain or retain the sticker. The meaning they associated with the material helped to sustain the practice of maintaining good hygiene. The same can be argued for food waste reduction. Hence, introduction of incentive scheme can be beneficial towards lowering food waste. Apart from the meaning attached to it or the feel-good-factor of the incentive scheme, there is an added benefit to it.

Usually the kitchens have a given budget to operate with. According to the Half-time evaluation report (Malmö stad, n.d.-b) the budget vary for each preschool. The chefs perceive this to be less and due to reasons such as the weight placed by the Sustainable development and food policy on organic food (which is expensive) (Malmö stad, n.d.-a) makes it difficult to stay with the budgetary limits. As

3 www.winnowsolutions.com
4 www.leanpath.com
5 http://malmo.se/smiley
noted by one of the chefs, there have been instances where the budget has been crossed but there were no negative repercussions; “I heard another [chef], you crossed your budget and nothing is happened” (Interview D, 2017). The underlying meaning of it might be the notion of “free food” that reside in the minds of the people which can be detrimental in the effort to reach our goal of waste reduction (BIO Intelligence Service, 2010). Practices such as routine measurement and monitoring can help in identifying food waste levels and coupling it with incentive scheme can help tackle such irregularities.

Increasing awareness about the issue is considered a positive step towards finding solution to it (Ofei et al., 2012). In order to remain conscious about food waste and work efficiently towards reducing it, involved actors must be provided with trainings and workshops in a regular basis. It is important to sensitize teachers also regarding this issue since they have a close relationship with the children and can influence their eating and thus food waste habits. However, knowledge building schemes is one of ways in which learning can happen. Learning also comes about through “cognitive and practical processes, which in turn lead to the acquisition of practical knowledge” (Sahakian, & Wilhite, 2014, p 30). One of the ways through which social learning can be facilitated is through active networks. Practices spread through already established networks and communities (Shove et al., 2012). They act as crucibles in which arrangements are formed and as conduits for diffusion of innovation (Shove et al., 2012). Benefits of having a strong network are numerous. It enables to have a common understanding and a shared vision regarding the issues of food waste and other aspects related to sustainable consumption. By strengthening and streamlining the existing network for chefs, a platform can be established where everyone is given equal opportunity to participate in it, share thoughts and have meaningful discussions.

Chefs in the preschools vary widely in education, skills and experience. As a community, one should share ideas and transfer competencies for example, older experienced chefs can hold workshops or seminars to share his/her strategies for reuse of old food or someone that attended an external training can share the new information learnt with others. These are only a few examples of how learning can occur and competencies can be built. Organizations must be arranged in a way that such interaction or the “conduits” are made possible. Material objects and technologies such as internet and physical meeting locales must be harnessed in order to do so. By strengthening of network, new practitioners can be “recruited” in the broad integrated practice of food waste reduction.
6.5 Policy analysis & implication

According to Schatzki(1996) practices are “temporally unfolding and spatially dispersed nexus of doings and sayings”(p 89). It not only important to look at practice are physical activity but also crucial to look at it as representation. How we express about it in everyday life is instrumental in creating shared meanings and norms. When the interviewees were asked about the presence of food waste in the Sustainable development and food Policy of Malmö, most of them seemed to be unaware of it. Policy discourse mainly highlights aspects such as usage of organic products or no-sugar usage or cooking from scratch when compared to food waste. These aspects are beyond doubt important. However, if Malmö municipality is keen on bringing down food waste, more attention must be paid to it in the policy and everyday lexicon. Policy discourses evolve and circulate(Shove, 2010) hence, the issue of food waste must be brought up in debates and during meetings with the kitchen staff and teachers. Currently in the Sustainable development and food policy of Malmö, food waste is mentioned under Sustainable Economy and there is no clear target for waste reduction(Malmö stad, n.d.-a). Whereas the National waste plan by SEPA has envisioned a goal to minimize of food waste in Sweden to lowering amounts by 20 percent by year 2020 in comparison to the 2010 food waste levels(Naturvårdsverket, 2014). Having a clear target can help channelize the effort towards achieving it. Chefs mostly voiced economic implications of wasting food in the interviews. This might be an indicator of the fact that policy places food waste under the category of reducing overall costs. Nonetheless, it would be beneficial to frame it not only as having economic benefits but also highlighting social, ethical and environmental values for far-reaching effects.

The food waste generated in Sweden in 2014 was around 1.3million(Naturvårdsverket, 2014). Policy makers tend to advocate raising awareness and improving education as a right step to tackle the issue(Naturvårdsverket, 2012). The problem with such narrow understanding of learning is that it turns out to be a weak predictor of actual behaviours(Spaargaren, 2011). When the focus is instead placed on practices and social learning, the learning proposition becomes more meaningful. In addition, when there is a “top-down” greening of the systems of provision like infrastructure, technologies and products, and when green images and norms are developed through practices, the citizens will have no choice but to behave in a sustainable manner(Spaargaren, 2011).
7. Conclusion

Food waste in the current times present itself as sustainability challenge. Actors from international organizations, governments, non-governmental organizations, businesses acknowledge the issue and are taking active steps towards finding solutions. Malmö, an aspiring young city is directing its effort to become more sustainable and to this end, analysis of food waste in preschools is a tiny step in the right direction.

In my thesis, through food waste quantification coupled with Integral theory approach to uncover barriers, I have demonstrated the factors that are perpetuating food waste in the preschools of Malmö. Knowledge gained from literature and active discussions with relevant actors, I have laid down a comprehensive set of themes that play a role in food waste generation. Further, using Social Practice Theory, I analyse the food waste reduction itself as a complex integrated practice. It entails, Looking at themes as either dispersed practice, or the elements that constitute the practices or as conduits of social learning. The analysis sheds light on the important practices that can be sustained or taken up if not already existing by the relevant actors or the practitioners. Practices such as food provisioning, communication, routine monitoring & measurement are influential in lowering food waste. Material aspects such as physical location of the kitchens, kitchen equipment and the food itself play a role in the performance of food waste reduction practice. Competencies in the form of culinary skills, planning and strategies proved important. Lastly, meaning around practices and materials forms a crucial component in influencing practices. To change meanings and norms around practice, I made recommendations such as introduction of incentive scheme for waste reduction and use of new technologies for quantification. It also sheds light on how interconnected these practices are and the agentive powers of the elements of practice to bring about change.

Further, a note on policy for sustainable development and food in Malmö was made to illustrate how policy discourses are played out in action in everyday lives and that it is highly important to bring matters of food waste in discussions and debates. In addition to that, policy-makers interested in change should consider more broadly aspects around practices and systems of provision rather than advocating narrow learning propositions.

More research with a broader waste quantification scope is necessary to assess the overall situation better. A deeper investigation into the feasibility of deployment of commercially available waste quantification solution is needed. Also, future research on other food settings using social practice theory would be beneficial to address the situation holistically.
8. References


## Appendices

### Appendix A - Food waste initiatives across EU

<table>
<thead>
<tr>
<th>Initiative</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainable development Goals</td>
<td>Adopted in September 2015, United Nations published the Sustainable development Goals (SDG) to set an agenda for a sustainable future. The goal 12, target 12.3 of the SDG reads, “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” (SDG, 2015)</td>
</tr>
<tr>
<td>FUSIONS</td>
<td>FUSIONS (Food Use for Social Innovation by Optimising Waste Prevention Strategies) is a project funded by European Commission Framework Programme 7 for a period of four years from 2012 - 2016. One of the main objective of this project was to reduce food waste by 50% in EU and a 20% reduction in the food chain’s resource inputs by 2020 (FUSIONS, 2014). According to the report, there was a total of 88 million tonnes of food waste generated in EU in 2012. Households represent the biggest source of food waste(53%) followed by food processing industry(19%), food service sector(12%), production(11%) and finally wholesale and retail(5%).</td>
</tr>
<tr>
<td>The circular economy package</td>
<td>An EU level attempt to transition to a sustainable low carbon and a resource efficient economy(European Commission, 2015). It aims to create a more circular economy, and includes food waste in its action plan. It also aims at supporting the SDG targets on food waste (European Commission, 2015)</td>
</tr>
</tbody>
</table>
Appendix B - Form for recording Storage loss

STORAGE LOSS
(Measurement record for 2 weeks)

<table>
<thead>
<tr>
<th>Date</th>
<th>Item</th>
<th>Weight</th>
<th>Reason (Mold, expiry, bad smell etc...)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix C - Interview Consent form

Lund University Centre for Sustainability Studies

Informed Consent Form

Researcher: Madhuri Muralidhar

I am a Master’s student of Environmental Studies and Sustainability Science at Lund University.

For my master thesis, I am conducting semi-structured interviews of around 30-60 minutes.

At any point of the interview, you can ask questions or decide against taking part in the interview. Furthermore, you can demand that certain statements are not published.

By signing this form, you agree to participate in the interview. Your anonymity will be ensured during the entire research process if wished for.

Do you agree to being recorded?

☐ Yes  ☐ No

Do you as an individual want to remain anonymous?

☐ Yes  ☐ No

The results of my research can be shared with you if you are interested.

Thank you very much for your time!

Date  ______________________

Name  ______________________

Signature  ____________________
Appendix D - Interview Guide & Interviewees list

General Questions
1. What is your name and position in this preschool?
2. What is your education background and years of experience?
3. Can you tell me little bit about the preschool? Like the number of children, teachers etc

Interview - Kitchen staff
1. What does food mean to you. How do you value food?
2. Are you aware of the issue of food waste and it’s implications?
3. According to you, how much food is getting wasted on a and what areas is most waste happening on a daily basis?
4. Is there any particular food(s) that might be getting wasted more?
5. Do you ever measure the amount of food waste in your kitchens using scales? Would you be open to the idea of measuring and analysing food waste with the help of software?
6. Is there communication between the kitchen staff and teachers regarding food requirements (no. of portions, preferences, allergies etc)?
7. Do you have any strategies to reduce food waste?
8. How much of preprocessed food is used in your kitchen? How much of raw food is purchased?
9. How is the menu planned? Do you have flexibility to reuse old food stuff such as opened package/leftover boiled potatoes etc?
10. Do you have necessary equipments/infrastructure for storage such as freezer, boxes and bowls?
11. Do you study about food waste in your education? Do you think it must be included as a part of the programme?
12. Do you get any training/workshops about reducing food waste? If not, would you and your colleagues be willing to participate in it?
13. I understand that there is no organization that all the preschool kitchens come under. Do you wish there were such a hierarchy in order to manage better and have a common framework?
14. Do you participate in the network for preschool kitchen staff?
15. Do you have any regulation that is hindering you from lowering food waste? Such as hygiene policy, use-by dates etc
16. Does your contract agreement with your food supplier hinder your from reducing food waste? Do you get too much of certain items which might go to waste?
17. If you wish to change something in the system that would help in reduction of food waste, what would that be?

Interview - Preschool Teachers
1. Are you aware of the issue of food waste?
2. Do you actively contribute in reduction of food waste in your preschool?
3. Do you communicate issue related to food, preferences, portions, wastage etc to the kitchen staff?
4. Do you discuss food waste to the children during mealtimes?
5. Do you discuss with other teachers about food waste?
6. Is food waste and sustainable consumption discussed as a part of your trainings/workshops/seminars for teachers?

**Interviewees List**

<table>
<thead>
<tr>
<th>Preschool</th>
<th>Interviewee</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preschool A</td>
<td>Interviewee Aa</td>
<td>Chef</td>
</tr>
<tr>
<td>Preschool A</td>
<td>Interviewee Ab</td>
<td>Teacher</td>
</tr>
<tr>
<td>Preschool B</td>
<td>Interviewee Ba</td>
<td>Chef</td>
</tr>
<tr>
<td>Preschool B</td>
<td>Interviewee Bb</td>
<td>Chef</td>
</tr>
<tr>
<td>Preschool C</td>
<td>Interviewee Ca</td>
<td>Chef</td>
</tr>
<tr>
<td>Preschool C</td>
<td>Interviewee Cb</td>
<td>Teacher</td>
</tr>
<tr>
<td>Preschool D</td>
<td>Interviewee D</td>
<td>Chef</td>
</tr>
</tbody>
</table>

**Appendix E**

<table>
<thead>
<tr>
<th>Entity</th>
<th>Formula used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total food waste</td>
<td>Kitchen waste + serving waste + plate waste</td>
</tr>
<tr>
<td>Total food eaten</td>
<td>Total food prepared - (serving waste + plate waste) - leftover</td>
</tr>
</tbody>
</table>