



Aalborg University

# Food Waste in Danish Restaurants

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**MASTER'S THESIS**  
Integrated Food Studies

# **Extended Master Thesis (45 ECTS)**

## **Food Waste in Danish Restaurants**

Management practices and future initiatives to reduce food waste

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# Abstract

## Background

Food waste occurs through out the food system starting from agricultural production to serving consumers. They have negative effects on the economy and the environment, and they are not justifiable from an ethical point of view. The food service industry was identified as the third largest source of food waste based on food input at each stage of the value added chain. The survey conducted by Ministry of environment in Denmark revealed that 288000 tones of food waste is generated each year out of which 60,800 tones comes from restaurants and cafes. This paper however, aims to study the food service sector's management practices and various elements related to minimizing food waste.

## Method

A total number of 9 participants were approached for semi-structured interviews as a part of qualitative research method. 3 managers from 4 restaurants in Tivoli, head chefs, So chefs, day chef and cooks were interviewed from 5 other restaurants located in Copenhagen to get detailed insight on factors leading to food waste and prevention strategies and future initiatives to mitigate its loss. The interviews were transcribed, categorized into number of themes/headings and analyzed on the basis of literatures reviewed.

## Results

All the respondents were highly aware of issues of food waste in their businesses/workplace. 3 of the respondents were very keen on the subject and had future initiatives in mind but not in practice yet. Only 2 out of 9 different food outlets had budget allocated for FW management. Over preparation and production of food were the leading causes of food waste in the restaurants, followed by lack of inventory control and customer leftovers. The company segregated organic food waste from other waste, which is collected daily, or every other day by the municipalities and portion of it is being donated to animal farms.

## Conclusion

Food wastage should be avoided as far as possible, but it is not realistic to have no waste after food distribution in the buffet or serving plates. This study concluded that minimizing food waste emphasizes especially on the role of skilled workers and everyday leadership and management activities like recipes and menus, planning and management, monitoring of the actual portion size and documentation of all activities. Policies to prevent food waste should address range of strategies and motivations for wastage.

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## **Abbreviations:**

CO<sub>2</sub>: Carbon Dioxide.

FAO: Food and Agriculture Organization

FW: Food Waste

SWFM: Stop Wasting Food Movement

WFD: European Union Waste Framework Directive

FWRA: Food Waste Reduction Alliance

EU: Europe

GHG: Green House Gas

HFW: Household food waste

FWRA: Food Waste Reduction Alliance

AD: Anaerobic digestion

WTE: Waste-to-energy

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## 1. Introduction

Food is an essential component of human existence. Not only does it provide nutrients and energy that allow us to grow, develop and remain healthy, the culture and tradition surrounding food also helps define us as individuals, families and nations. Food losses occur throughout the food system starting from agricultural production and ending with consumer. In recent decades, food waste (FW) has become recognized as a significant social, nutritional, and environmental problem (WRAP, 2008). While developing countries are gravely suffering from under nutrition and malnutrition, situation differs in industrialized countries where enormous quantities of food are thrown away every day. In developed countries a significant amount of food is wasted at the consumption level, while in developing countries food loss is much more prevalent in the early and middle stages of the food supply chain, due to poor infrastructure, low levels of technology and low investment in the food production systems (Gustavsson et al., 2011; FAO, 2011). Lowering FW is one of the potential measures for overcoming hunger. Heller and Keoleian (2002) state that one calorie of food saved can result in a sevenfold reduction in the energy used across the life cycle.

The amount of food lost or wasted every year is equivalent to more than half of the world's annual cereal crop, which was 2.3 billion tones in 2009/2010. In total one-third of the globally produced food gets lost or wasted which is around 1.3 billion tons a year, while currently still 842 million people in the world suffer from undernourishment (FAO, 2016). According to FAO, the per capita consumers waste in Europe and North America is between 95 and 115 kg per year, while in Sub-Saharan Africa and South/South-East Asia, the "throw away" represents 6 to 11 kg per capita per year. Food losses and waste amounts to roughly 680 billion dollar in industrialized countries and 310 billion in developing countries. These numbers show the significant adverse economic impact from FW on respective countries.

Given the rising food prices and food shortages, FAO forecasts global food production must increase by 60% by 2050 in order to meet the demands of the growing world population (FAO, 2013). This figure demands better initiatives to reduce FW and to make food available for those derived and malnourished. Therefore, the topic of FW has attracted attention of governments from various nation, NGOs, INGOs and major food sectors involved to make a change for the

future. Future demand and rising costs of food items calls for the need to invest actions in potential saving and recycling of food waste, which not only benefits the environment but also brings financial benefits and savings to businesses as well as households.

Eventually, this context has raised the need for studies that investigate the sustainability of a FW management system in present food establishments. The author conducted a number of semi-structured interviews to provide insights into the current management practices, barriers, opportunities, and future initiatives for more sustainable management of FW. This paper also aims to find the knowledge and awareness level and practices of handling FW in food service business in Copenhagen, Denmark. Results will be based on semi-structured interviews conducted with various actors of food service providers. Additionally, study will also provide an overview of existing Danish policies and national and international research on FW through extensive review of literatures and publications identifying plans and actions that can aid in reducing FW.

### **1.1 Outline of thesis**

The study consists of 10 sections, which will be explained in this section. The first section consists of introduction, which is followed by literature review in section 2. Literature review provides the context, offering a brief overview of the scale of the FW challenge, relevant waste and sustainability concepts and theoretical basis for this research. Similarly, section 3 contains research statement and section 4 contains research question, which explains the justification for conducting this research, and the goal that drives this research. Section 5 presents the methods employed for data collection and analysis. Section 6 provides findings of the interviews and section 7 contains detailed analysis of findings under the heading 'discussion' along with strength and limitation of this study and implications of this research. Finally, the conclusions and recommendation of this research are presented in Section 8. Lastly, section 9 contains food scape project, which includes stakeholders' analysis and plan for handling risks and contingencies.

## **2. Literature Review**

This chapter provides detailed review of authorized reports and scientific literatures on FW and its management. In order to make discussion well grounded and coherent, all relevant literatures are covered in this section. Literature review on topics of FW will help to detect a pattern in the developments of FW in restaurant business. The review is focused particularly in Denmark, but researches

from other parts of the globe are included to strengthen the problem/research statement following this chapter.

Electronic database like Medline, EMBASE, Science Direct, PubMed, Google Scholar, and Biomed Central were searched for relevant articles. Key words used to identify the three main concepts were: 'Reducing Food Waste' 'Managing Food Waste in restaurant and 'Challenges in Food Waste management'. Inclusion criteria of the articles were: (I) published during 1995–2016; (II) quantitative study/qualitative study; (III) reported in English. The full texts of the potentially relevant articles were retrieved and quality assessment and data extraction were then undertaken.

## **2.1 Definition of Key Concepts**

FAO defines FW as food that was originally produced for human consumption but was not consumed by humans, instead it was directed into a non-food use (for humans), feed for animals or waste disposal (e.g. feedstock to an anaerobic digestion plant or incinerator, disposal at a landfill) (FAO, 2014).

There are different types of Food Waste; *Avoidable* and *Unavoidable* FW. Avoidable FW can be defined as products, which could have been eaten and consists of prepared but uneaten food e.g. cooked pasta, food items losing its quality after certain period (e.g., dry bread or rotten fruits and vegetables) and other food products that were disposed of in edible condition. Unavoidable FW can be defined as waste that occurs in the preparation of food: peels, bones, shells etc., which commonly are not regarded as edible (WRAP, 2008).

According to Engström and Carlsson-Kanyama (2004), food losses in food service sector is divided into five categories:

- (a) Storage losses – losses through incorrect storage (also prepared food for serving at the buffet, which was stored for one more day after preparation, e.g. salads collected when they occurred
- (2) Preparation losses – losses occurring during food preparation and cooking (mostly fruit and vegetable peel, spoiled food, or food which was dropped), collected in the morning during cooking processes
- (3) Serving losses – food remaining from the buffet and serving bowls at the counter, collected during and after lunch
- (4) Plate waste – residue left on consumers' plates, collected after service.
- (5) Leftovers-Food prepared but never served

Commercial Kitchen: Commercial kitchens are defined as any kitchen that makes food for a group of people and generates over 100 kg of food per week. This type of kitchen is found in hotels; workplaces with canteens, and institutions like child care facilities, hospitals, or universities. (Halloran et al., 2014)

## 2.2 Global Food Waste and its Social, Economical and Environmental Implications

Recent data from the United States (US) and the United Kingdom (UK) demonstrates the real implications of problem with FW. Almost one quarter of the food produced in the US worth 96 billion dollars is wasted every year. Studies in the UK estimates that between 18% and 22% of the purchased food items are wasted which accounts for approximately 7.6 - 8.3 million tones per annum (WRAP, 2008; WRAP, 2009). According to WRAP, (2011a) food that is thrown away without consuming costs an average UK family an estimated £680 per year. The provided examples are indicative for the overall FW situation in the developed world, where the FW tendency keeps on worsening. It is reported that wasted food costs the commercial food service industry roughly \$100 billion annually (FWRA, 2014).

The FWRA commissioned a study to identify the amount of food being wasted and from what sector that FW was being generated. The largest sector generating FW was residential with almost half the FW coming from households (47%). The second largest FW generator sector is restaurants (37%), followed by the institutional sector (11%), which represents hospitals, schools and hotels.

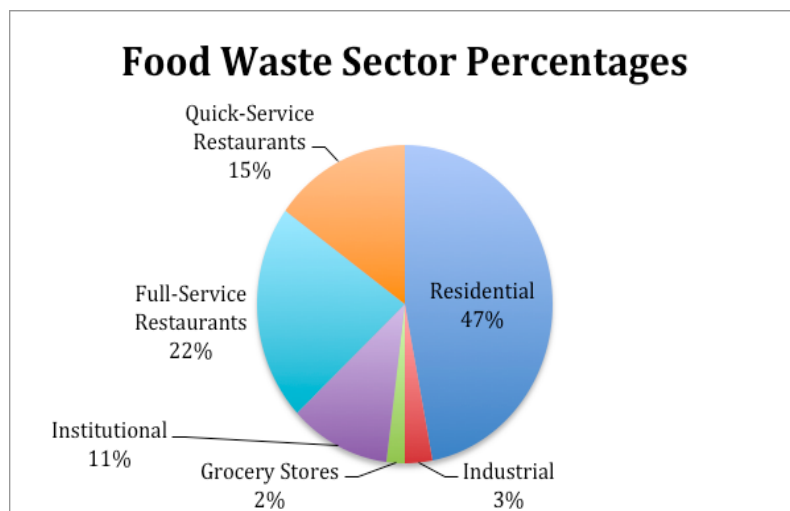


Fig 1: Food waste sector percentages (FWRA, 2014)

It is clearly evident from data that billions of dollars are spent on food that has never been consumed. This eventually contribute towards increase in global food prices, making food less accessible for the poorest as well as

increasing the number of malnourished people both in developed and developing countries (Stuart, 2009).

Nonetheless, wasting millions of tones of food despite significant portion of world population still undernourished and living under food insecurity is simply unacceptable.

According to Gustavsson (2011), avoidable food losses have a direct and negative impact on the income of both farmers and consumers. For those living on the margins of food insecurity, a reduction in FW can have an immediate and significant impact on their livelihoods. Economic impact of FW includes food production and purchasing costs, as well as costs associated with the final disposal of food waste.

Food produced but not effectively used in human consumption is a mismanagement of natural resources which can lead to unnecessary CO<sub>2</sub> emissions, loss of economic value of the food produced because wasted food is wasted investment paid for resources, wages of production, processing, supply, and preparation of the food (Lundqvist et al. 2008).

FW affects environment through Greenhouse Gas (GHG) emissions and increased water use from production, transport, disposal, land use, and eutrophication (FAO, 2013). One of the main environmental impacts of FW is related to its final disposal in landfills. When FW is disposed in landfills, methane and carbon dioxide (CO<sub>2</sub>) are produced as part of its natural decomposition process. Methane and CO<sub>2</sub> are GHG contributing to climate change, with methane being the more potent of the two, trapping 21 times more heat than CO<sub>2</sub> (Adhikari et al., 2006). Europe (EU) estimates that the food sector is the cause of approximately 22% of the global warming potential in the countries of EU alone (EU, 2006). FW is accountable for almost half of all CO<sub>2</sub> emissions in UK. They calculate that preventing FW has the potential of a 456 million tons GHG emission reduction by year 2050 in the UK (Defra, 2011). WRAP estimates that avoidable FW led to 17 million tons of CO<sub>2</sub> production in 2010, equivalent to the emissions of 1 in 5 cars on UK roads (WRAP, 2011). In Germany, food products rank second in terms of highest production cycle, wide use of resource and environmental impact potential (Moll and Jose, 2006). Hence, the effect of FW is seen in all aspects of human life. In the context of ever growing world population and diminishing natural resources, the disparity between food poverty and food wastage raises concerns over global food security and highlights the social and moral dimensions of FW. (Halloran et al., 2014)

### **2.3 Overview of Food Service industry in Denmark**

According to Marthinsen and Sundt (2012), the total consumption of food in Denmark was 3.5 million tons (636 kg/ inhabitant, or 1.7 per inhabitant per day). The hospitality sector has an important role in managing FW since it represents one

third of the consumption of food. The number of guests at restaurants etc. is estimated to 234 million, e.g. 42meals/inhabitant/ year, exclusive meals in canteens and by catering.

	<b>Total turnover DKK mill</b>	<b>Food turnover DKK mill</b>	<b>Number</b>	<b>Guests (mill)</b>	<b>Number employees</b>
Restaurants	12,536	8,950	4,415		
Fast Food (incl. pizzerias)	6,302	4,096	4,481		
Event catering	1,794		859		
Other restaurants	3,805		1,281		
Cafes, bars, disco	4,506		2,340		
<b>Total</b>	<b>28,943</b>		<b>13,376</b>	<b>234</b>	<b>64,427</b>

Table 1: Restaurants (incl. catering and canteens) in Denmark in 2009 (Marthinsen and Sundt, 2012)

### 2.3.1 Food Waste in Denmark

Denmark is the European country with most movement and initiatives to reduce and proper manage FW. According to Danish Trade Magazine and Danish Agriculture & Food Council, FW in Denmark has fallen by 25% since 2010, the equivalent of 4.4 billion kroner (CPH Post, 2015). This figure is nonetheless a commendable result towards FW prevention. Denmark has no national plan for FW but the Resources Strategy "Denmark without waste " is a general plan that aims to reduce and recycle waste in general. The municipalities are responsible for the management of waste, such as regulating the collection and treatment of household waste.

'Stop Wasting Food' is Denmark's largest non-profit consumer movement against FW creating awareness among consumers and food industry (SWFM, 2013). The study conducted by Stop Wasting Food Movement, Danish Agriculture & Food Council (2013), shows that every 2nd Dane has reduced his/her FW. Therefore the Government has a vision that Denmark will protect its resources and materials, and recycles more FW while incinerating less. Denmark has been incinerating almost 80 % of household waste up to date. Government of Denmark is aiming to recycle 50% of the household waste by 2022 (SWFM, 2013). This will entail more materials being sent back into the economic cycle with benefits for the environment.

Although Denmark has been successful in its waste management planning with its waste incineration policy, it is one of the countries in Europe producing the most waste per habitant, averaging 719 kg of municipal waste per capita in 2011 (Juul et al., 2016). The analysis of FW survey in service sector by Ministry of Environment

in 2014 showed that out of 288,000 tones of FW per year from service sector, 227,286 tones of FW was avoidable. The annual FW breaks down into 60,800 tones in restaurants and cafes and 17,000 tones in catering and canteens. Approx. 20 % of FW derives from restaurants. The largest share is found among traditional restaurants, while concept restaurants, coffee shops, pizzerias, etc. have far lower FW generated among others, perhaps due to increased use of semi-processed raw materials. Out of total FW generated by restaurants, avoidable FW accounts for 20,100 tones corresponding to 33% of total FW generated by restaurants while avoidable FW with 40,700 tones corresponds to the share of approximately 67% were unavoidable FW. This data shows that food business sector seriously lacks the capacity to reduce and manage FW in the country. They need more robust plans and strategies to control FW in their respective business (MOE, 2014).

In 2012, the survey done by the market research group named, TNS Gallup on what Danish people think about having doggy bags in cafes and restaurants showed that every 2nd Dane would like to have doggy bags in cafes and restaurant (TNS Gallup, 2012). Thorsen and Jensen published a study on FW in connection to an organic conversion of the food procurement for public kitchens at the Danish Organic Action Plan on March 2016 which concluded that canteens and public kitchens are able to reduce their FW significantly by serving fewer dishes every day but in return diversifying what is offered during the week and by recycling excess food into new dishes. The Danish Veterinary and Food Administration town hall canteens converted their food procurement to organic food. During the conversion process the total FW was almost halved in both canteens. The study showed that the canteen in Roskilde reduced the total FW by 46% from an average of 74 kilos per day before the conversion to 40.1 kilos after. At a canteen in Fredensborg, the daily FW was reduced by 50%, as FW dropped from 43.2 kilos per day before to 21.6 kilos after the conversion. The reduction is in large part due to a drastic decrease in buffet serving waste, food that is served but not eaten (Thorsen and Jensen, 2016).

FAO (2011) insists that FW in developed countries like Denmark is generally related to consumer behavior as well as policies and regulations that address priorities in other sectors. Kjær and Werge's (2010) research noted that FW in Denmark is largely avoidable or partially avoidable. They also acknowledged the fact that some amount of FW will always occur and 100 per cent utilization is unrealistic.

## **2.4 Various aspects of Food Waste**

### **2.4.1 Sources of Food Waste**



In food supply chain, everyone can play a role in reducing FW, often with minimal effort. FW can be reduced, reused or recycled, saving money and helping to protect the environment. Loss of food between farmers field and food consumer's table, in transport, storage, processing, retail and in kitchen is huge.

The commercial food sector includes many different types of businesses- restaurants, cafeterias; fine dining, buffets, quick service restaurants. The options for decreasing and diverting FW differ significantly for each of these different types of restaurants (FWRA, 2014). The sources of FW vary widely in restaurants. Waste is generated not only from the customer's leftover but way before the food falls on customers table. The pre consumer kitchen waste such as incorrectly prepared food, spoiled food, trims waste or over production constitutes wastes before it reaches the table. Post consumer FW i.e. food that neither gets eaten or doggy bagged due to over sized portion of food or an effort to entice customers with large or family size portions often leads to food being wasted. The plate size also determines the size of waste. Larger the plate size, food appears less while the same portion size looks bigger in smaller plates. Thus, smaller plates can trick customers into reducing waste. Analysis of FW Survey conducted in U.S.A by Food Waste Reduction Alliance (FWRA), 2014 showed that approx. 15.7% of FW generated by restaurants was donated or recycled while 84.3% of waste was disposed. (FWRA, 2014)

However, there are parts of food and its wastes that are unaccountable in figures or statistics. The FW from the hospitality sector is not only limited to food sorted in the bin for organic waste. More or less food is wasted in the bin for residual waste. In addition some food is flushed into the sewage when plates and pots etc. are washed after the service including the waste from liquids and beverages. FW from beverages is almost unrecognized and till date no research exists on it. In addition, catering and take away restaurants also include deliveries outside the hospitality sector. This way, waste is distributed to the customers who consume food at home or other public areas.

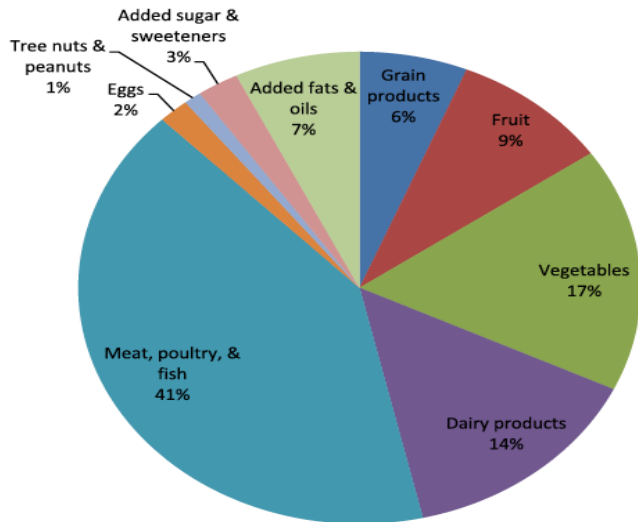


Figure 2: Food group contribution to total food loss (Buzby and Hyman, 2012)

Figure 2 above highlights each food group's contribution to the total value of food loss in US in 2008. The top three food groups in terms of the share of the total value of food loss at the retail and consumer levels are meat, poultry and fish (41%), vegetables (17%), and dairy products (14%). These estimates may be helpful for US consumers, industry members, and governments to put total food loss and food loss by food group into perspective and when initiatives are being developed to efficiently reduce food loss (Buzby and hyman, 2012)

## 2.4.2 Prevention/Minimization of Food Waste

### *a. Reuse/ Recycling*

Most foodservice operation generate massive amount of FW, most of which could be reduced or recycled. Most of the organic wastes can be recycled as animal feed especially to pigs and poultry. The FW from households and food service sectors are highly nutritional when microbiological factor are taken into account, after removing the undesirable substances from the waste. Research confirms that recycling of FW as feedstuffs is an adequate alternative to avoid or reduce the cost (environmental and economic) of disposing them in a sanitary landfill (Garcia, et al., 2005). A nationally representative consumer survey focused on wasted food in US reported that dehydrated restaurant FW have the potential to produce a nutritious feedstuff for pigs while offering a viable solid waste disposal option (Myer et al., 1999)

The results from the waste composition analysis indicate that an average of 35% of household FW is avoidable. Minimization of this waste could result in reduction of GHG emissions of 800e1400 kg/ton of avoidable FW. Thus, a minimization strategy would result in increased avoidance of FW compared to the current situation (Bernstad Saraiva Schott and Andersson, 2015).

The European Union Waste Framework Directive (WFD) encourages separate collection and recycling of bio-waste and schemes for source-separation of this fraction and has been introduced in several European countries. Due to the energy and nutrient content of this waste and the potential for its recovery in the treatment process, previous studies have suggested that treatment of FW can result in net environmental benefits using anaerobic digestion or composting alternative (Møller et al., 2009; Boldrin et al., 2009). Hence, the studies however suggests that there is real potential to reduce FW among restaurants, cafes and canteen most of which could be recycled or reused.

### *b. Food Donation*

The donation of edible food to social welfare services is a well-established FW prevention measure, which is implemented in several countries all over the world. Restaurants and supermarkets were throwing away good food with only small flaw. Typically, food banks are organizations that solicit food and grocery products from a variety of sources, receive and store the products in a warehouse and distribute it to impoverished families and individuals through charitable human service agencies. However, food safety and hygiene regulations are paramount to donation activities, thus all organizations should be well acquainted with the relevant authorities (Schneider, 2013).

Scherhauser and Schneider in 2011 reported that some bakeries stated 'hygiene' as a reason for not donating bread to social organizations. It noted that the bakes felt that as soon as the bread was beyond company premises the hygiene could not be guaranteed. The study concluded that due to possible legal complications, this method of waste prevention is often overlooked.

### *c. Legislation*

According to Halloran, one of the ways to prevent excess FW might be to broaden legislation by increasing the length of expiry date of certain food items. It points out to the fact that strengthening food safety regulations can lead to increase FW (Halloran et al, 2013). The example given in the study stated that the current EU

legislation on the shelf life of eggs permits a seven-day timeframe between the last day that they eggs can be sold to consumers and the last day the eggs are of the highest quality direct consumer utilization, and not for reasons of food safety. Although this legislation has been created in order to prevent salmonella in countries where refrigeration of eggs does not occur, this is not an issue of high concern for Denmark, as eggs are refrigerated. However, EU legislation strictly restricts consumption of eggs after expiry of the “sell by” date for (EC, 2013).

#### *d. Food Banks*

Food banks can be described as a redistribution center for food, distributing edible food to people in need, often organized by charity organizations (Marthinsen and Sundt, 2012). In Denmark, food bank has been in operation since 2008 but due to possible conflicts with food safety regulations government of Denmark doesn't regard the use of food banks in food service sector (Marthinsen and Sundt, 2012). However, food banks are more common in other countries for example in UK there has been more than 400 food banks providing emergency food aid in response to economic hardship and food insecurity (Loopstra et al., 2015).

### **2.4.3 Factors/Barriers to Reduce Food Waste**

The restaurant sector faces huge challenges with regard to diverting and recycling FW. The results obtained from FWRA, 2014 survey revealed some of the major barriers to manage FW. It explains that the main barriers to food donation are transportation constraints, insufficient on-site storage, and liability concerns, while the top barriers to recycling are insufficient recycling options, transportation constraints, and management or building constraints. Other barriers to donation includes difficulties tracking data from individual locations, employee training and engagement, short product shelf life, too small an amount of FW to justify a food bank pickup, liability for branded products, storage at food banks for large donations, high cost of transportation relative to the value of the product, and lack of control given a franchised business model. Likewise, barriers for food recycling include difficulties in tracking data from individual locations, employee training and engagement, extra cost relative to waste disposal, lack of available recycling options, a lack of information on how to start recycling programs, lack of space on site, food handling risks, and pest concerns. (Hyde et al., 2001)

#### *a. Perception/Attitude/ Knowledge of food service provider*

The small food businesses tend to be resistant to voluntary change in relation to

their environmental practices. Studies show that most owner-managers of restaurants think environmental measures as expensive and optional in their business and therefore tend to be highly resistant to voluntarily improving their waste management practices (Revell and Blackburn, 2007; Rutherford et al., 2000)

In one of the few qualitative studies on owners/managers of restaurant's environmental practices Rutherford, found that they resisted making environmental improvements because of the perception that they rarely resulted in economic benefits. Because of the perceived 'burden of environmentalism', owner-managers felt that only regulation could provide the level playing field necessary to take action on environmental issues and prevent 'free riders' from gaining a competitive advantage. Responsibility for the environment was thus ascribed to the government and individual efforts were seen as more or less meaningless in the face of structural barriers (Rutherford et al, 2000).

Commercial food businesses have the challenge to minimize FW for the sake of economical reasons more than for the environmental reasons. The findings from 40 in-depth interviews with the owners of restaurant sectors in UK and 12 'key informants' from the industry and government showed that environmental impact of businesses appeared to be of low priority among restaurant owners/managers. They tend to neglect the impact imposed by their food business on the environment, therefore little resources were devoted to reducing the environmental impacts of their firm. Although they try to minimize FW as less as possible, since they perceived waste as cost driven, they felt waste separation procedures would create problems for busy staff and the effort required by managers to polish such practices was prohibitive. This study has highlighted, there is some degree of frustration at the government's lack of partnership and consultation with the restaurant industry, and as a result some owner-managers feel ill equipped to respond proactively to policy measures. (Revell and Blackburn, 2007)

The result from the study done by Heikkil et al., (2016) revealed that a restaurant's management has a significant effect on how kitchen activities are controlled and regulated and how various practicalities like maintaining and correcting recipes, deciding on the amounts of food to be prepared, menu planning and inventories are dealt with. The study showed that employees' experience of methods, mastering new recipes and carrying out general tasks has an effect on the creation of both kitchen and buffet waste. The study found that low appreciation of food and piling too much food on the plate increase the amount of plate waste. Competitors were identified as having an influence on FW in restaurants. It concluded that with better communication with the employees, kitchen waste could be reduced (Heikkil et al.,

2016). Another study done by Hillary, added that unless restaurateurs have clear understanding of the amount of waste generated on their premises, circumstances behind its generation or the associated costs, it would be difficult for them to reduce the cost of waste management (Hillary, 2008).

### *b. Individual behavior and other factors*

Waste prevention requires changes in people's behavior both collectively companies and individually (Graham-Rowe et al., 2015). Attitudes, preferences, values and behaviors towards food, which contribute to the FW at residential, institutional and commercial sectors, these factors may differ from person to person. National circumstances and cultural norms have also been linked to food wastage. So, wastage pattern and approach may differ from region to region and country to country (Buzby et al., 2011). Policies for FW prevention should target the circumstances and actions that lead to food wastage and should be informed by motivations for waste production. Graham-Rowe et al. (2015) found that at the household level, survey participants were more likely to intend to reduce fruit and vegetable food wastage if they felt favorable about waste reduction, that others would approve of these behaviors, and confident in their ability to reduce waste. The result also revealed that the concept of saving money has been found to be a powerful motivator to FW prevention. Also determined that people should be trained in food management skills to empower them to reduce waste. Neff et al. (2015) found that concern for foodborne illness was the most common reason for discarding food by American consumers. Providing education training and skills to help people better understand food safety may be essential for waste prevention.

Thyberg and Tonjes (2016) reported that a package of prevention policies is necessary to prevent FW they should encompass three key aspects: Values, Skills, and Logistics. The first aspect, Values, involves addressing values and perceptions, which drive behavior. These values are grounded in the motivations for FW prevention. Skills, enables people to change their behaviors, such as by providing training on how to prevent FW. Logistics, which means buying and storing right amount of food items, facilitates prevention of FW prevention.

### *c. Business Model*

A Finish study noted that the amount of leftovers varied notably from one restaurant to another, depending on the restaurant's business model, which in turn determined the portion sizes and menu. It was found that the licensed restaurants discarded 19% of all food produced and served. Of that, 6% was kitchen waste, 5%

service waste and 7% leftovers. FW in licensed restaurants in Finland totals about 18 to 20 million kg per year. While in workplace restaurants and canteens, 24% of food went to waste, as follows: kitchen waste 3%, service waste 17% and leftovers 4% and they produced 13 to 16 million kg of FW annually (Katajajuuri et al., 2014).

A study done by Engstrom and Carlsson (2004) showed that waste from buffet in institutions was 12% while FW from school kitchen was approx. 6% of prepared food. Heikkila et al. (2016) reports that one factor arising from the business concept that influences the amount of waste created is buffet-style of catering, which involves having the food ready and available for customers to help themselves. The study pointed that controlling the amount of buffet waste, as part of serving loss is a considerable challenge, since it is very difficult to predict the number of diners. Similarly, Marthinsen and Sundt (2012) reported that all 3 Nordic countries reported that buffet style restaurants generated more waste than any other commercial kitchen.

### 3. Problem Statement

The consulted literature allowed us to understand that FW have global impacts, whether those impacts are environmental, social or economical. Reducing FW can save money through disposal costs, over purchasing, labor and energy costs as well. Reducing FW has the dual benefit of relieving the burden that waste places on the waste management system and environment, and simultaneously reduces GHG emissions by eliminating the initial production of the wasted food. The European Commission has FW on the agenda of year 2012, setting the goal of reducing avoidable FW by 50% by 2020 (EU, 2016). EU's ambition on reducing FW stresses every member state to develop waste prevention plans.

Commercial food service providers; restaurant, cafe and canteen are the important part of the food supply chain. Despite the obvious imperative for research to identify key factors that motivate, enable or prevent FW minimization behavior, little research to date has directly addressed to food service providers such as restaurants and canteens, which represents one third of food consumption. The evidence in terms of FW management practices is quite incomplete and requires investigation among Danish food providers. So far literature and reports from Denmark and international papers have concentrated explicitly on households and retailers FW primarily focusing on identifying what type of food is most likely to be thrown away. On the other hand, most of the research addressing FW issues has used methodologies that involve people being given closed ended questions

followed by a series of possible responses. These methodologies have limitations as they impose response on the participant and don't give them the opportunity to voice their own views about a particular phenomenon. Qualitative research methodologies can overcome these limitations as they allow for the researcher to explore and understand complex phenomena without imposing limitations (William, 2007).

There is a lack of understanding of the nature of FW minimization behavior. Knowing more about people's FW minimization motivations as well as their perceived capabilities to minimize FW and perceived opportunities or barriers to FW practices is essential to design effective intervention. Studies from Revell and Blackburn, showed that despite attempt by policy-makers to represent eco friendly FW management measures as cost reducing, most owner/managers of small businesses view environmental measures as expensive to undertake. As a result, owner-managers tend to be highly resistant to voluntarily improving their environmental performance (Revell and Blackburn, 2007). Given that food service industry is such a vast sector of the economy, this friction of perception between profits and environmental protection is clearly a major barrier to sustainable management of FW.

Better and more recent data on the management of FW by commercial and institutional kitchen is necessary to determine the potential FW prevention measures. This research will therefore, stress the policy makers on need of updating the rules and regulations directed towards the minimization of FW from commercial kitchen. On the whole, studies done on food wastage from food service industry have produced variable results and existing studies from Finland, Europe and America have focused mostly on the amount of food being wasted rather than the factors contributing behind it. Thus an illustrative framework of the dimensions of avoidable FW is still lacking.

Hence, the main purpose of this study is to shed more light on the food service provider's waste management strategies and the factors that trigger more FW to contribute in the research gap. Moreover, accomplishing the main purpose requires a detailed overview of the potential factors that inhibit or foster FW from commercial kitchen. In the future, it will important to deal with FW in commercial kitchen, to achieve food security and lessen the demand for natural resources in the food sector.

This paper uses the case of Denmark in order to understand how FW can be reduced in food service business. Denmark offers an interesting case study because of the relatively high degree of potential reduction in FW. As a small country, it can be argued that within Denmark it is easier to encourage systemic change throughout



the food supply chain. Denmark can also serve as an exemplary test-site for innovation, evaluating what innovative elements in FW prevention can be transferred to the EU and global context (Halloran et al., 2014).

## 4. Research Question

The aim of this project is to analyze FW management practices in restaurant business and their measures to minimize FW. This study aims to address the following research question

***What are the management practices of handling food waste in food service business and the measures taken to prevent or reduce Food Waste?***

To address this question, the researcher will study different restaurants of Copenhagen. Copenhagen provides an excellent research context to examine the extent to which restaurateurs and their employees in their everyday practice achieve sustainable FW minimization objectives. It is assumed that the results from this research in Denmark will also be relevant to other developed countries, and that strategies for preventing FW can be identified and that implementing such strategies can significantly reduce FW.

Given the objective of this paper is to explore

- Knowledge, attitude and perception of managers, chefs and cooks on the issues of food waste
- Present or future initiatives by the restaurateurs to prevent or minimize food wastage

## 5. Methodology

The methodological section aims to reveal the details behind the research process. Relevant aspects such as the choice of philosophical approach, research methods, tools, sample design, data collection procedures, reliability and validity, as well as the choice of research method of analysis are broadly discussed, so that all aspects of the methodological process are critically analyzed and justified.

### 5.1 Research method

This study will pursue qualitative method of research. Qualitative research is the method of choice when research question needs the understanding of process,

events and relationships in the context of social and cultural situation. It aims to produce factual description based on face-to-face knowledge of individual and social groups in their natural setting. It is useful in obtaining insight into situation and problems concerning in which one may have little knowledge (Qualitative field research, 2016). To deliver the aim of this study disciplined inquiry of the actors of food businesses such as restaurant manager and chef were conducted.

Qualitative research method allowed researcher to explore respondents' exercise of proper FW performance in detail, enabling a richer understanding of the reasons behind their practices particularly displayed in previous empirical studies. The restaurant business in this study was chosen as representatives of commercial food service industry because it attracts huge interest from many researchers seeking to investigate the changes in management practices regarding FW and its impacts globally. This commercial food industry is subject to a raft of environmental health regulations and it is interesting to see how this has influenced both the understanding and practices of restaurateurs towards the growing environmental agenda (Revell and Blackburn, 2007). The qualitative method will thus allow author to present data in the form of description of actions, perception, attitudes of managers and their employees in the light of their experiences.

## **5.2 Data collection**

Data collection involves objective and accurate reporting of statements provided by participants of their respective restaurant business.

### **5.2.1 Sampling**

In qualitative research, it is not necessary to collect data from everyone in a community in order to get a valid finding; only a sample of a population can be selected for any given study (Palinkas et al., 2013). The study population can be determined on the basis of preselected criteria relevant to the study's research question. Qualitative research is more interested in case study analysis often referring to why particular people or group of people feel particular ways, the processes by which these attitudes are constructed, and the role they play in dynamic processes within the organization or group. Embedded in this is the idea that who a person is and where that person is located within a group are important. Research participants are not always created equal because one well-placed articulate informant will often advance the research far better than any randomly chosen sample of 50 individuals (Palys, 2008). Hence, the author uses purposive sampling for choosing participants for the study purpose. Purposive Sampling is

one of many strategies whose specific objectives and interests characterize qualitative research (Palys, 2008). This type of sampling is widely used in qualitative research for the identification and selection of information rich cases related to the phenomenon of interest. But this technique is vulnerable to errors in judgment by the researcher (Palinkas et al., 2013).

### **5.2.2 Interview Participants**

In depth interviews were conducted with key informants of 9 different restaurants of Copenhagen city. The number of participants were identified and selected on the basis of their food handling knowledge and experience. In addition, the importance of availability, willingness to participate, ability to communicate personal experiences and personal opinion of the participants in an articulate, expressive, reflective manner was also taken into consideration. The participants approached in this research were managers, assistant managers, kitchen chefs and cooks of 9 various restaurants of Copenhagen who had authority, ability to influence change and decision-making in their respective workplace. In addition, they can provide valuable reflection of overall management practices at all department levels of their respective workplace, which is why they were purposely chosen for interviews to serve answers to the research question. Participants belonged to restaurants namely from Tivoli, Rosie Maggie and TGIF. Researcher had prior working relationship with some of the participants that made it easier to approach them for interviews. 3 different managers from food and beverage department inside Tivoli were approached through working relationship with the researcher. The research proposal was presented to them through emails. They showed high degree of interest in the subject matter and interview dates were fixed with the help of assistant manager who is in daily contact with the researcher during work. This made the process rather straightforward than expected due to the limited time available for the authorities to take part in an interview. Similarly, a head chef, duty manager and a head cook were approached from TGIF through researcher's own network. A general meeting was conducted to present research ideas and their willingness to participate in this project. The interview dates were fixed according to their preferences.

### **5.2.3 Study setting**

The study participants were selected from restaurants and cafes in Copenhagen, Denmark. Copenhagen is the capital and the most populated city of Denmark with a municipal population of 591,481 (Statbank.dk, 2016). Copenhagen has seen strong urban and cultural development, facilitated by investment in its institutions and

infrastructure. The city is the cultural, economic and governmental center of Denmark. It has an abundance of quality restaurants, ranging from Michelin-starred and New Nordic to budget-friendly (Visit Copenhagen, 2016).

#### **5.2.4 Question development for interviews**

In a semi-structured interview, the researcher asks a series of open-ended questions, with accompanying queries that probe for more detailed and contextual data. Respondents' answers will provide rich, in-depth information that helps us to understand the unique as well as shared circumstances in which they work and meanings attributed to their experiences (Qualitative field research, 2016).

Interview questions were designed to examine awareness, knowledge, perception, attitudes, and practices of actors in food businesses on wasted food. Questions were inspired from surveys and related journals reviewed in literature section (Neff et al., 2015; Revel and Blackburn. 2007; Heikkilä et al., 2016). The pre-prepared set of questions measured managers/chef's attitude, knowledge and awareness level, business practices regarding FW and their perspectives on importance/need of reducing FW and their future plans. First set of questions explored interviewee's knowledge on subject matter, business attitude towards the key concept. For example, the interview started with general questions on waste, and if they thought FW as an issue that needs to be dealt in their everyday business or if they were concerned to see how much food goes to waste and its effects on environment and society in the big picture. To understand their management practices questions such as ' if they are following any national/international guidelines? , If they provide specific training to their staffs? , If they are part of any association related with reducing FW? , How do they deal with leftovers and damaged/expired food items on a daily basis? , If they have any special techniques or strategies to avoid food losses? Were asked to the respondents. In order to understand their perception on existing FW policies of their own restaurant and of government, questions such as: If they find their effort sufficient in reducing waste? , What more can they or the system do to discourage discarding less food and their future plans?

#### **5.2.5 Interview procedure**

According to Bryman (2015), the phenomenological theme is important for qualitative researchers, as it explains the participant's perspective from the empirical point of departure. Questions were designed according to the needs of the research question. Qualitative approach was essential to understand the present

insight of the participants working place through their own experience and views (Bryman, 2008).

In the process of data collection, semi-structured interviews were conducted with the participants from 9 different restaurants. Semi- Structured interviews offer topics and questions to the interviewee, but are carefully designed to elicit the interviewee's ideas and opinions on the research topic. Semi-structured interview as "a qualitative data collection strategy in which the researcher asks informants a series of predetermined but open-ended questions", to allow the interviewees to follow an interview guide and adjust it according to the volume and type of information the interviewee(s) can provide. The advantage of semi-structured interviews is answers can be clarified and sensitive information can be acquired (Madill, 2011).

The interviews were planned and arranged accordingly with relevant topics and questions to be discussed upon. The interviews were carried out between September and October 2016, at the participant's workplace; at manager's office, and two of the participants were interviewed through telephone. Two of the interviews were taken through telephone due to time issues for the participants. The use of telephone deprived the researcher of seeing the respondent's informal, nonverbal communication, but is appropriate when the researcher does not otherwise have access to the respondent (Creswell, 1998). Telephone interview also limited the options of the interviewer to comfort respondents who become emotional limiting the ability of the interviewer to anticipate such a reaction due to lack of visual cues of respondent distress. In this case of our study, the researcher's interest is more narrowly focused and details in the environment was not necessary helping in obtaining good response regarding the subject.

Most of the participants were interviewed during their working hours finding time in between or mostly before they started their usual shift. 1 kitchen chef and one head cook was interviewed on the phone due to their conflicting schedules and other commitments. At the beginning of the interview, participants were provided with an overview of the purpose of this study, intended use for the interview data, and the measures to protect their confidentiality and anonymity and the right to withdraw. They were asked for permission to tape recording or note taking. Both open and close-ended questions were asked to engage in discussions. Firstly, few background questions were asked, such as the interviewee's job title and responsibilities, amount of time worked with the company. These were warm up questions, which allowed the interviewee to get in the mindset of food waste. The pre-prepared interview questions were used as a guide or to elicit further discussion of salient topic areas, if and when appropriate. Most interviews lasted

approximately 20-30 minutes on average, and with only their permission, were recorded and noted. The interviews with the general manager and assistant manager of Tivoli lasted for approx. 45 minutes. Interview transcripts were then coded. The transcripts of the participants were read thoroughly and analyzed for meaningful interpretation.

### **5.3 Philosophical Approach**

A qualitative research method was applied in this study because it enables the illustrating of unstructured phenomena, unlike quantitative approach. While conducting qualitative research, researchers need to agree on the research's possible philosophical assumptions to direct their study. There are three main philosophical assumptions that make attempt to explain the ways and means through which a valid methodological framework is based on; *Epistemological* (subjective evidence), *Ontological* (objective evidence) and *Axiological* (values). (Spencer, Pryce and Walsh, 2014)

This research is based on epistemological assumption where the researcher can base his views on subjective interpretation of knowledge and practices of participant's experience. Epistemology is the study of the process of knowing or "how we know what we know" the dynamic interaction between the researcher and participant is viewed as central to capturing the inherently contextualized experiences of the participant. Issues of rigor remain but take on different meanings and forms (Spencer, Pryce and Walsh, 2014). The goal of this assumption is not to eliminate researcher bias but rather to enhance the trustworthiness of the findings by including and documenting multiple perspectives on generation of FW. The researcher becomes immersed in the participants' experiences so as to credibly represent and interpret them.

Philosophical approaches guides and structures qualitative research. After careful consideration, utilizing the method that emphasizes gathering data on lived experience from the participant's perspective is the core of this research. Therefore, hermeneutic phenomenological approach was incorporated because it focuses on uncovering the meanings individuals give to their experiences. Hermeneutic phenomenology, aims to elucidate lived experience and to reveal meaning through a process of understanding and interpretation. This approach seeks a deeper understanding of human experience by rediscovering it and opening it up (Merleau-Ponty, 1996). The goal of hermeneutic phenomenology, is to "reveal a totality of meaning in all its relations" (Gadamer, 1997) through a process of interpretation

which involves reading between the statements provided by the interviewees and paying attention to what has been omitted and the assumptions made.

One of the reasons for choosing this method was that previous studies have been ignoring the qualitative issues such as knowledge, attitude, and perception of actors involved in food business. The choice of the hermeneutic approach allowed the experiences of the respondents to be presented openly and express their experiences and focus on knowledge of the world, the intuiting of essences and description of phenomena. The approach provided a vehicle for deepening our understanding actors of food service sector and allowed the researcher to reflect on meaning of experiences, thus providing added dimensions of understanding. This was accomplished through the use of questions aiming to draw connection between various elements of human actions, practices within their work setting and factors affecting loss of food

The open-ended and exploratory nature of the method also allowed the uncovering of participant's own interpretations of their experiences, in which it emerged that their views differ in many ways and was driven by their experience, attitude and knowledge. Their experience themselves as an important entity in regulating and acting against food losses that could be avoided by adopting various measures. Initial questions designed before the interviews were mainly to obtain information on how individual make sense of the world around them, which provided the subjective experience of the people involved in the study context.

#### **5.4 Coding Interviews**

Initially, the researcher transcribed the tapes and notes taken of the conversations during the interview process. The transcriptions were checked and rechecked against the tapes, in order to make sure that the transcripts accurately recorded the conversation. Through the process of transcribing the tapes of the conversations, the experiences described were transposed to written text. The transcripts were then examined and divided into statements. For the analysis purpose, statements were categorized in themes with the aim of finding similarities, differences and connections within phenomena. Hence, a conceptual framework is generated based on summary of description provided by the respondents.

#### **5.5 Ethical consideration**

While conducting qualitative method study, researchers can interpret people's experiences to explain, clarify and elaborate the meanings of different aspects of

human life experience, principle of 'no harm' to participants is considered by the researcher and is aware of the potential harms that might be inflicted upon study subjects. Participants were well informed about the research topic and consent was taken verbally before interviews were preceded. Due to the non-sensitive nature of the research and subject anonymity, there was not a need for additional consent procedures. Respondents had freedom not to answer the questions whenever necessary, however such incident did not occur during data collection. Recorded statements are kept anonymous and will be described in result section below without the participant's identity.

## **5.6 Methodological Limitations**

Qualitative method involves limited number of participants and investigates various indicators and their inter-relationship. But qualitative method used in this research has researcher bias, which contributes to some of the weaknesses. Participants are selected purposely and the fact that researcher knew most of participants could possibly tamper the response and interpretation process. Qualitative approach provides explanations rather than conclusions. The results cannot be generalized because of the contextual difference and sometimes; personal views and personal background of the participants can manipulate the entire outcome and findings (Kvale S, 1996).

## **6. Results/Findings**

### **6.1 Knowledge and Awareness**

The interview questions assessed respondents' reported levels of awareness and knowledge on wasted food in respondent's work place respectively. All of the respondents were from restaurants/ commercial food businesses and attained higher positions of: General Manager, Assistant Manager, Duty Manager, kitchen supervisor and head chef. Most of them possessed high degree of awareness on FW issues. The conversation started with the concept of 'food waste'. Most of the participants indicated FW in their business as waste generated from the storage of food item to food being served to the customer and it is an integral part of their food service operation.

*'I pay attention to the issue of food waste. I think it is very important. It costs a lot to our business. It is frustrating to see so much food going to garbage but we try to lessen it as much as possible.'* (Respondent A, Tivoli)



*'Food waste is our everyday concern. We have to record everything that is wasted in order to do the inventory' (Respondent D from TGIF)*

*Food waste is waste of resources, income and a medium to degrade the current environment even more. Food that can be consumed to fulfill basic needs is being thrown out openly which affects the other part of the world who don't have easy access to basic requirements of meal on a daily basis. If we calculate waste in terms of finance, it is our income and savings that is wasted. Food waste is also the waste of energy that it contains which is a basic need for all living beings in this world. (Respondent G)*

This view presented by Respondent G gives a very eloquent statement against food waste. His statement presents overarching problems of FW on food service business and society as a whole.

## **6.2 Attitudes and Motivations**

The environment appeared to be of a priority for most food businesses. Most of them understood the environmental impact of waste in general however some viewed their actions as negligible if government doesn't take enough initiatives. Waste disposal, energy and water consumption were areas where managers/ chefs saw their businesses as having an environmental impact.

Respondents were asked how much it concerns them to throw food because it was not eaten, most of them reported that it bothered them a lot and they don't feel comfortable wasting big amount of food especially when they need to throw food without even using them, two of them said it concerns them seeing food becoming waste but they don't have any choice other than to throw them. One of the respondent said throwing excessively prepared food or damaged expired food is not their choice so there is nothing to be bothered of, so he doesn't think wasting food is problem, he said it is indispensable and that it is a matter of food safety of customers and food borne illness. When asked about the reasons of throwing food, response suggested that they were concerned about consumer health and hygiene, public image of the their business and illness. Notably, 8 out of 10 respondents said that the environmental concerns of GHG emissions, energy and water were "important" motivations yet there is so little they could do.

But there were 2 respondents; a cook and the other kitchen chef they said they don't really think about reducing waste while doing their jobs. They do their respective duties responsibly but from personal level they haven't taken necessary incentives

to minimize waste while preparing food. If their restaurant policy is to separate organic and non-organic waste, they follow it otherwise they mentioned 'environmental safety had never been their concern'.

*'The environment is of a high priority for us. We are determined to make some real difference in reducing waste.'* (Respondent A)

*'It is sad that so much food is being wasted needlessly. Food waste has a serious impact on the environment because most of it ends in landfill where it decays and produces the potent GHG methane.'* (Respondent I)

*I don't think we can do much to reduce waste here in our kitchen. We throw waste in their respective bins, that's all. Our priority is customer satisfaction. Well nobody comes to restaurant because of their waste disposal strategies. Our purpose is to serve customer and generate profit. It's municipality's duty to remove waste from our property. I have no idea how waste is treated after that.* (Respondent H)

*'I think that as a cook I am so overwhelmed by the amount of pressure we have to bear in the kitchen, saving energy and environment is the last thing I would be thinking at work. I must admit we are very busy to think about anything else than cooking and serving customers.'* (Respondent E)

### **6.3 Source of food waste**

Respondents were asked to estimate qualitatively how much foods that are discarded could be avoided in their respective businesses could be avoided. Most of them reported a fair amount of waste was avoidable if they act on it. Food items most likely to end up in garbage bins are: fruits, vegetables, bread, chicken and beef followed by leftovers by the customers. Waste is produced mostly during preparation like raw foods such as potato peel, roots from leafy vegetables, bones, small pieces of meats, as well as improper preparation, fluids, and dropped food items, items those are accidentally spilled on kitchen floor. Some restaurants kept record of the waste especially for all the expired and damaged food that are discarded at the end of the shift and recorded on waste sheet while others did not. Almost all of them admitted that over preparation and expired foods are the main source waste in commercial kitchen.

*'Preparation- a lot of preparation is done most of the time as we cannot predict how much of sale will be made. The other source could be the expiring of food items. Lots of food tend not to be used in time again due to the up and down of business. We have a*

*list of food items to record the food wasted during the working hours on a daily basis. The list is collected and made a record at the end of the month to calculate the expenses and work on it' (Respondent A)*

When asked if any special measures they have taken to reduce leftovers by the customers, all of the respondents said they don't have any measures except when customers ask to pack their extra foods to take away.

*'No we don't have any tool to reuse leftover, we just throw away. Our recipes are all calculated to be enough for a good meal per person. We can't predict if someone is going to eat less than that.'* (Respondent E)

*'No, as much as I would like to solve this issue, we don't have any service regarding the leftovers from the customers and buffet cannot be re-used, so is thrown out as waste. When customer asks us to pack their leftovers, we provide them plastic containers where they can carry whatever extra leftover to their home, otherwise everything else goes to waste bin.'* (Respondent G)

#### **6.4 Storage System**

Proper storage of food is necessary to minimize waste. All the restaurants sorted delivered food items immediately mostly stored in refrigerator. All the products are stored in a standard food cool box and packaging wrap or food film to prevent bacteria contamination and they are stored in a proper temperature, with frozen foods requiring storage at -18 or below, and refrigerated foods requiring storage at 5 degrees or below. All the food deliveries are checked carefully for rotten or damaged products. Items that arrived earlier are used first and new arrivals are placed behind so that the older products are used before expiring dates.

*'Food are handled and stored according to international standards. e.g. Food that should go in the freezers is not accepted above -15 degree and in the cooler below 8 degree. In the coolers, we have hierarchy of good storing system that starts with raw poultry on the bottom and ready to eat food on the top of cooler.'* (Respondent D)

*'We have an early shift from the kitchen to place the delivered items in respective refrigerator and freezer. We use the back-to front system where new product is placed on the back or bottom of the shelf, while the older product is rotated to the front or top. Additionally, we date all products on the day we receive them so if they get mixed up we can still recognize the newer product from the old.'* (Respondent F)

## 6.5 Measures taken to reduce waste

### 6.5.1 Waste Segregation

All of the restaurants divided waste into 2 separate bins: degradable and non-degradable bins.

*'Separating waste is very hard to enforce even when we have 2 bins in kitchen. On a Saturday night when you've got a restaurant the size we have, we've got 20, 25 staff in the building and to stand by the bins and sort of say, 'No, not that one. That one there,' and at the end of the day you want to grab a plate and shovel the leftovers into a bin (Respondent E)*

Interestingly, this indicated even if they have separate bins, no one would monitor the activities of staffs when they are busy. Their focus is on serving the customers and providing good service.

### 6.5.2 Following National/International /Own Guidelines

To understand waste promoting or reducing behavior of the employees, the researcher asked if they followed any specific guidelines. They all followed same guidelines regarding separation of degradable and non-degradable wastes in respective bins. Some restaurants call degradable FW bin as pig buckets that are collected by municipalities on daily basis and are taken to animal farm to feed them.

*We work according to government regulations to improve environmental, social and economic performance. We separate all the waste and place them in their respective bin, which are generally collected on daily basis by the Copenhagen municipality. (Respondent B)*

*'Guidelines set by us is we have provided each and every food with its self-life which means that the food should be used within the day. If there left, it is discarded and recorded on waste sheet.' (Respondent C)*

*'We use what we can in kitchen. The rest goes to waste, no time to waste. If it doesn't look good at all even if it isn't bad, we throw it out. It goes to the pig bucket.' (Respondent D)*

### 6.5.3 Adjustments in Menu

Restaurant managers and chefs are concentrating on making smarter, leaner approaches regarding menus to help trim revenue loss from FW. Concentrating on menu is one of the top measures taken to reduce waste such as changing the dish specification or size to minimize unnecessary waste, followed by reusing of almost waste food such as using vegetable and meat trimmings for soup stock. Decreasing the portion of meal served can have an effect on waste, as lesser portion is most likely to be finished compare to larger portions. Restaurants typically succeed by controlling portion size.

*'We allow less choices in the menu to ensure that 1000 gram of pork is not thrown away for 200 grams that is sold. This was a brilliant idea proposed by our chef, we can make food without fear of losing customer, money and food.'* (Respondent B)

*'We're offering our cooks the opportunity to be creative and come up with menus instead, lunch and dinner menus change every day and are created out of leftover ingredients that didn't get used at an event the night before. We're offering our cooks the opportunity to be creative and come up with menus instead.'* (Respondent G)

### 6.5.4 Recycle and Reuse

All the restaurants had separate bins for organic and non-organic waste. Due to apparent lack of infrastructure compost bins, lack of space and having no kitchen garden, there was lack of other recycling opportunities other than separating waste into organic bins. None of the restaurants donated over produced/ prepared food items to food banks due to concerns food safety regulations imposed by the government, infrastructure, financial and manpower issues. When foods are over prepared they bring it to staff canteen. They admitted that very few food items that go to waste could be reused. They tended to focus on daily or every second day organic waste being collected by municipality.

*'We reuse, where and when possible in our restaurants. We make breadcrumbs out of old breads, we ask staff to bring home over produced food or foods that will expire in few days and need immediate consumption. But I have to admit we have very limited ways to reuse or recycle food items that are about to go waste. Mostly despite our best intention also we have to throw good food l when over prepared and unfortunately due to regulations we have no policy to donate food '. (Respondent I)*

*'The foods that are not consumed by customers we throw them because of possible contamination with bacteria or something. That is our policy in restaurant even if that food is untouched by the customers. We do provide doggy bags but hardly has it ever been used either.'*(Respondent E)

### **6.5.5 Budget**

Only 2 out of 9 restaurants allocated separate budget for managing FW.

*'We have appointed 2 staffs to monitor waste in the kitchen. We keep records of damaged and expired food in our waste audit. These staff reviews the quantity and type of waste from customer's plate. Once we get the result of the review at the end of the month, all kitchen staff and manager have conversation about this and we plan our food preparation accordingly. These staffs appointed are normally a cook and a waiter. (Respondent H)*

### **6.5.6 Staff Training**

None of the restaurants were part of any national or international associations that works for reducing FW. The restaurants offered some sort of staff training to their employees, each time employees are provided with all necessary information on how to manage waste, follow up meetings are conducted at the end of the month where all sort of issues are discussed including issues regarding FW. Most respondents said they provide/receive proper guidelines on waste management as a part of their duty but one respondent also stressed on the fact that it is company's responsibility to give proper knowledge on their policy but it also the individual's initiative to reduce waste.

*'Our staffs receive information about how we handle the waste that is generated from the restaurants. The part of them following it is very much up to them on how much aware and willing they are to take the initiatives.'* (Respondent A)

*'Staffs are informed about the system we have in place for the management of the waste generated. I wouldn't say it is a training or class but they are made aware about the situation and the system we have in place. We conduct follow up meetings at the end of the month. Reducing waste is always in our agenda'. (Respondent E)*

## **6.6 Perception of respondents on waste Management Practices**

The next set of question addressed restaurant's current level of effort to reduce the amount of food discarded, and their perceived difficulty of doing so. Most of them

were definitely very interested in taking actions to reduce the amount of waste. Some exerted a lot of effort in it even allocated budgets to change practices in their business.

### ***6.6.1 Waste management is challenging***

When asked about how difficult it can be for their firm to significantly reduce and act upon the amount of food discarded, most of them confessed that it is very challenging because of the time and effort to be invested on a daily basis. It is also very expensive and incurs extra costs. Their perceived level of difficulty was mostly associated with them being very busy, high operating expenses, poor accounting and inventory control and lack of storage facility.

*'Yes it is a challenge in its finance department. It can be costly issue to manage the food waste on our own. The machines, the tools required are also very tough to match. Sometimes we tend to buy excess amount of inventory leading to loss or damage of food items, which is unnecessary, sometimes we fail to keep inventory records, that makes it difficult to spot food losses. We try to be efficient in handling and storing goods but not everyday is the same, we have human errors sometimes even machine errors so it is challenging in all possible ways ' (Respondent B)*

*'Yes, I think is very important but very difficult to improve this matter, we work hard every day to minimize the impact on our restaurant in the way of costs but as well on the way of be more sustainable.' (Respondent D)*

*'Yes food waste and its management is a challenge. It is almost impossible to avoid the waste but can always be controlled on a man-to-man level. No, I am thinking to hire myself as waste controlling manager, may be. The process of preparing and consuming food is the same and so is the generation of waste. This has been going on like this for a while. There is no change in a drastic way.' (Respondent G)*

### ***6.6.2 Unsatisfied with their own management***

Most of them expressed dissatisfaction regarding their handling with food waste. They believed they have plenty of room to improve their ways to reduce waste. Wasted food is wasted money for them so on behalf of their loss, they expressed their displeasure in this matter of food loss.

*'I am absolutely not satisfied with the way we handle waste in our restaurant. The amount of food we throw away is criminal and we all need to take action and start*

*changing our behavior. That's why I'm supporting Stop food waste movement. We have tried to co operate with their movement.'* (Respondent F)

### **6.6.3 Government initiatives**

Denmark has a well-functioning system ensuring environmentally acceptable handling of all waste type. 5 out of 9 respondent trusts government authorities and believes they are doing their best but remaining 4 expressed their discontent on government measures.

*'The real body of work highlighting the problem of food waste is from the Stop food waste movement. We don't have a national food-waste policy in Denmark. I find that intriguing. Governments are more regionalized here. In the U.S. and U.K. things are more centralized, and in those countries there are greater resources and motivation to get something going.'* (Respondent A)

*'Yes the government is doing it on a good level. I have praise for the government of Denmark in providing simple rules and guidelines regarding this issue. All these food issue related rules and regulations are installed from the government to improve the state of food in the region and is also helping the waste management. Yes they are doing a good job but I still think they can do better in the future without costing such any thing.'* (Respondent C)

*'No I don't think they are doing enough. But they are working on it as well so that is a good thing. Governments has a lot tools to control this but they have to improve more, in our society, every year we consume more and more that means the waste is bigger.'*(Respondent E)

*'It is hard to say yes; there is plenty of places where huge amount of food waste has been handled in a wrong way. Most restaurants throw away everything into one bin even things like metal, cardboard. That doesn't look good. I don't know if municipality later divides the waste but that brings more waste of energy and time.'* (Respondent H)

## **6.7 Strategies for food waste reduction**

Interviews conducted with food business actors showed a potential for reduction of FW if acted upon and few measures to reduce waste have already been implemented. Although restaurants could make many changes to reduce discarding of food, some of these changes may be perceived as expensive therefore unacceptable. Accordingly, respondents were queried about which of a list of



changes would they consider as acceptable. The leading thoughts were donating or selling excess food, serving smaller portions, and providing smaller salad bar plates and participating in an app called 'Too good to go' usually helpful for buffet style restaurants, where they can update their information to customers if extra food is left, consumers can buy them at a very low price. However, interviews revealed that 5 out of 9 restaurants had no further plans, while other 4 restaurateurs were willing to make plans in future to come up with strategies to deal with sources of FW. An overview of all the measures that are either being implemented or recommended to launch in near future by the participants is given in Table below:

<p>Inventory control</p> <ul style="list-style-type: none"> <li>• Manage storage system e.g. application of first-in-first-out principle</li> <li>• Use of food that will be expired soon by flexible meal planning</li> <li>• Refrigeration of over produced food</li> <li>• Buying and storing food enough for a week</li> </ul>
<p>Preparation/cooking</p> <ul style="list-style-type: none"> <li>• Development of strategies against overproduction (e.g. freezing)</li> <li>• Reuse of leftovers (doggy bags, providing food to staffs)</li> <li>• Control of preparation losses through staff training</li> </ul>
<p>Serving at counter/buffet</p> <ul style="list-style-type: none"> <li>• Use of small serving plates at the buffet</li> <li>• Adaption of portion sizes to customer needs</li> <li>•</li> </ul>
<p>Consumers</p> <ul style="list-style-type: none"> <li>• Communicating and sensitization of customers about the leftovers through attractive posters in the walls of the dining hall to inform about FW</li> <li>• Selling food in cheap price after 10 o clock using mobile application names' Too good to go'</li> </ul>

Table 2: Strategies for reducing food wastage in restaurants

## 6.8 Conceptual Framework

The proposed conceptual framework is the result of interpretation of dialogues with several actors of food service business. It incorporates elements within the management of restaurants leading to accumulation of FW, which is supported by

literature reviewed.

In this research, an empirically based methodology for analyzing the management practices has been applied and a micro-level perspective has been decoded, i.e. individual players (manager, chef and cook) have been interviewed. The conceptualization of FW management in restaurants and possible minimization techniques that the actors of this business are adopting or are planning to adopt in future are also included in this framework.

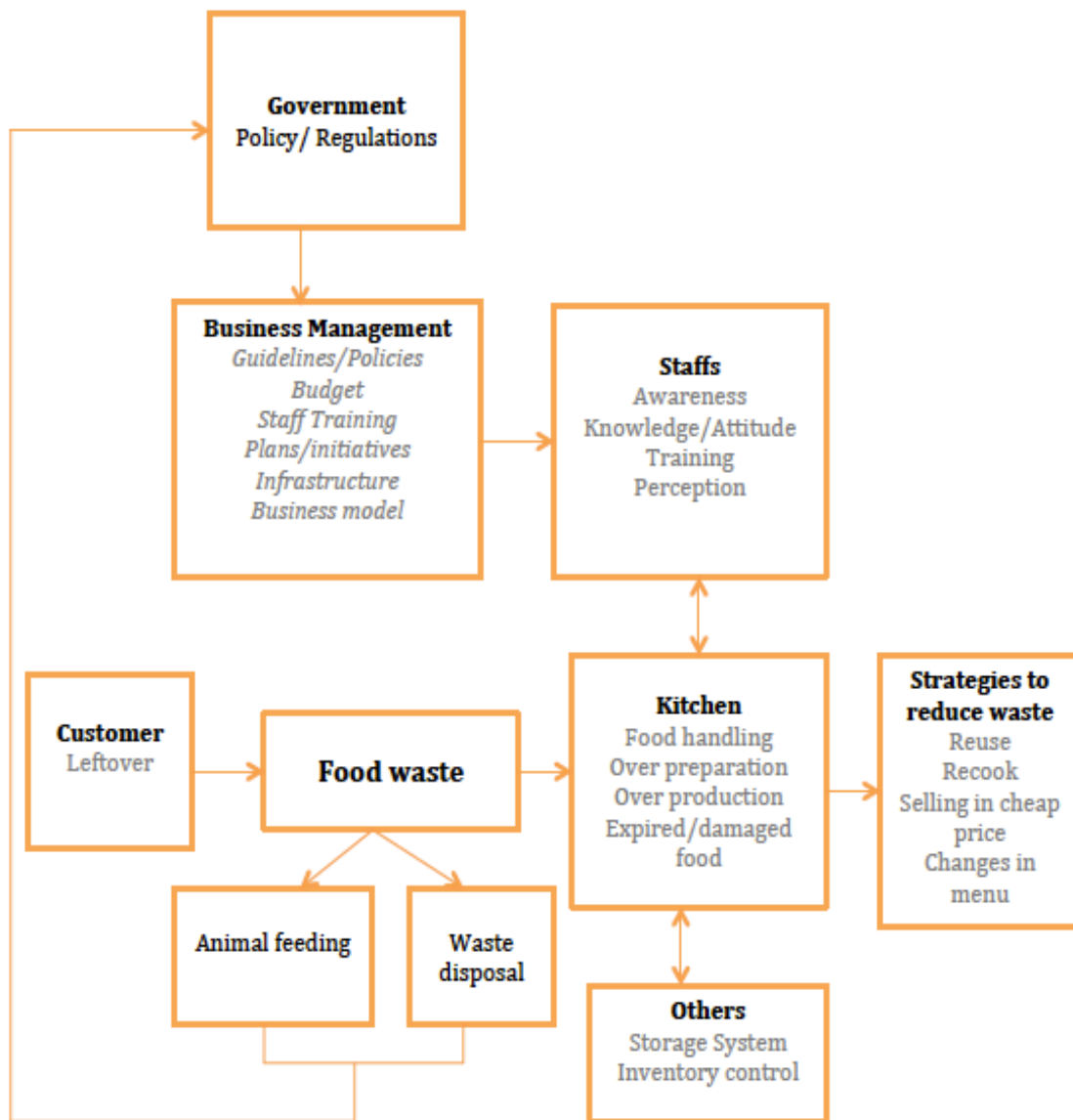


Fig 3: Conceptual framework for factors related with food waste in restaurants

All the businesses operate under the umbrella of government regulations. The overall authority in waste management is handled by the Danish Environmental Protection Agency. Local and regional councils are in charge of practical administration of waste management (MOE, 2014). The organic waste generated from commercial kitchen are collected on daily basis, which are treated and recycled by feeding to animals, or used for generating energy source. Then comes the management practices which involves a firms management policies, budget allocation, staff trainings, guidance and proper tools, and future initiatives in terms of FW management. Furthermore, attitudes, knowledge and awareness of staff members, prior training are equally important to effectively handle food from storage to preparation and the waste generated afterwards. Customers are offered doggy bags for their leftovers but this study found that it has been rarely used/asked by the customers. This may be due to their lack of awareness about doggy bag or too embarrassed to ask for it. (Sarahwilson.com, 2016)

The main source of FW in restaurants is overproduction due to errors in demand forecasting. These overproduced foods are ready for consumption but has very short shelf life ranging to 24 hours in average (Garrone, Melacini and Perego, 2014). More FW is generated if food items prepared are not being consumed on time. There has been no collaboration between food banks/charitable organizations and restaurants studied in this study due to strict food safety rules and regulations. Animal feeding is another strategy for effective utilization of FW, which is mostly common among all restaurants studied here. As mentioned by the respondents, all the restaurants had separate waste disposal bin for organic waste to be re used by the municipal to feed pigs in animal farm. Another strategy proposed by the restaurateurs is to make changes in menu and portion size of a meal. Also selling food items in cheap price after closing hours or near to closing hours has been proposed.

In summary, the demonstrated framework enables researchers and managers to better understand the factors leading to the accumulation of FW in restaurants. Moreover, policies and guidelines can be developed which directly addresses the issues and challenges faced by the owners/managers of restaurant business.

## 7. Discussion

This paper has presented evidence on the management practices for effective minimization of FW in different restaurants of Denmark. The result of this study unfolded the fact that the complexity of handling food, reducing waste in commercial kitchen while maintaining the cost is incredibly difficult. Respondents

representing various restaurants of Copenhagen revealed that FW was one of their top concerns when it came to revenue loss. The findings from this study suggested that despite participants high level of knowledge, awareness and positive intention towards minimizing FW and financial issues and their busy schedules prevented them from acting on issues leading to excess wastage of food. This study allowed examination of diverse range of drivers of food wastage and provided reflections on practical measures to reverse the trend of increased FW taking place in food service industry.

Research on health-related behaviors has suggested that those individuals make rational decisions about such behaviors when they are aware of and have some knowledge about the associated health problems (Raab et al., 1997). However, the acquisition of knowledge alone does not automatically produce the corresponding behavior, nor will it necessarily lead to appropriate changes in behavior (Ackerley, 1994). Nevertheless, knowledge allows people to make informed choices regarding their actions, so the accuracy and extent of a person's knowledge can be of major significance. The evidence from this report suggested that many respondents appear to have clear knowledge of FW and its consequences. However, there was certain degree of disinterest among actors in taking actions against FW and overcoming the challenges it possessed. Such attitude could have a negative impact on their co-workers or staffs working under their supervision. It is therefore possible that substantial proportions of responsible actors from restaurants may not fully comprehend to waste guidelines.

The perception of actors of food business themselves can help in resolving issues of FW. Analysis of interviews revealed the divisiveness among actors of food businesses when it comes to reducing waste and becoming environmentally responsible. Restaurateurs were especially concerned on the effects of FW on environment and had desire to act against it by introducing future initiatives. On the other hand, some participants had neutral view that means they have no concerns for environment other than fulfilling their duties and for some protecting environment were not a motivator in taking actions against food wastage. This neutral or opposing belief could have been triggered of their attitude and experience that being environmentally friendly can be costly and time consuming and compensating time and expenses cannot be afforded at any cost for their business. Almost half of them agreed government could still enhance the system to manage and regulate waste by introducing new regulations. Only few actors however supported imposing stricter regulations on food service industry. Many studies have also affirmed that regulation is the primary driver of environmental reform amongst food business owners. (WRAP, 2011; Revell and Blackburn, 2007; Neff et al., 2015)

Furthermore, the analysis from the results showed that buffet style and overproduction were connected with each other and was common problem when managing serving loss (Katajajuuri et al., 2014). Restaurateurs with buffet serving admitted that over production is a major headache for them since they could not predict the approximate number of customers and amount of food they would consume. Due to requirements of producing varieties of food items in a single setting also contributed in generation of FW as almost all of the items in menu had to be prepared beforehand.

The studies dealing with the food service business have mainly been conducted using quantitative methods (Thorsen and Jensen, 2016; Kjærand Werge, 2010). The study done by Thorsen and Jensen (2016), using a quantitative approach stated that focusing on the actors and procedures inside the canteens and restaurants would help control FW. An important facet of the restaurant management relates to its staff members. Since they are the ones handling food from storage to serving, it is important to increase their awareness on the issue. This study revealed that all restaurants provided some form of staff training on how to handle food to minimize its waste. Restaurant managements were aware of the importance of its staff being well rehearsed for handling food in kitchen. Skills enable people to change their behaviors (Graham-Rowe et al., 2015). Thence, studies on FW have recommended staff training to clarify problems and serve as an important waste prevention measure. (Thyberg and Tonjes, 2016) (Graham-Rowe et al., 2015).

Furthermore, financial attitudes of managers and chefs were found to have a big impact on the wastage of food. Restaurateurs are heavily guided by their profit and loss margins. The emphasis is mainly on achieving customer satisfaction and stay competitive in the market. Their businesses thrive with customer's satisfaction; therefore they are relentlessly trying to meet customer's need to win their loyalty and represent competitive advantage (Heikkilä et al., 2016) caring less about FW taking place in the process. They are motivated in saving food to save cost. Environment and other factors came secondary. They are however concerned with administrative costs of developing and implementing strategies to reduce waste including labor time to evaluate strategies, training employees, and implementing strategies. The concept of saving money has been found to be a powerful motivator to FW prevention. But very few researches have directly addressed factors that motivate, enable or inhibit FW prevention behaviors (Graham-Rowe et al., 2015). In addition, including environmental care as their business agenda could significantly increase their self-image, since Danes have high level of environmental awareness (Rikhardsson, Ulhøi and Madsen, 1996).

According to this study, overstocking is also one of the main problem leading to FW because restaurateurs would rather put more stock in than run out of items and restaurants prefer to have a wide array of available menu options (Stuart, 2009). Inaccurate forecasting of food needs also is a contributor to wastage. Although these factors may all contribute to FW, the magnitude of wastage has been shown to vary across food types. For example fruits and vegetables tends to ruin faster followed by meat and bread. In case of restaurants included in this study, staffs use first in first out principle while using the stocks. They control inventory by making weekly purchase of food items.

Conceptual framework showed the overall results of the study in a frame. The elements within the framework provide multifaceted issue of food waste. The reduction of FW is important at both the micro- and macroeconomic levels. From the company's perspective, understanding the economic impact of FW could act as an incentive for preventing, or minimizing FW. In addition, increased awareness among actors of food service industry on its impact on environment has the potential to reduce waste.

The result of this study provides a holistic approach to understand FW management in food industry by focusing on details associated with FW from the perspective of managers, chefs and cook. As mentioned earlier, most studies have focused on the quantities of discarded food in food service kitchens, also there severely lacks research on reasons of FW in commercial kitchen be it restaurants or canteens. Among the literature searched, only one study ([Revell and Blacburn, 2007](#)), has researched using qualitative method to understand reasons of FW generation in restaurants.

## **7.1 Strengths and Limitations**

Conceptual framework derived from the results gives us a general overview of the practices adapted within the organization. However, this research fails to provide concrete evidence on amount of food loss and expenses due to FW because interviews were not followed by on site observation by the researcher. It would have been beneficial to conduct focus group discussion and more interviews with the kitchen staffs that are directly responsible for food preparation and production.

The result generated by this study may be culture specific. What may be true in one culture may not necessarily be true in other cultural setting. Therefore, studies like this can face challenges of external and internal validity. Although researcher

intended to take hour-long interviews, due to highly responsible nature of respondent's job position and their busy schedule, interviews were cut short. Only average time was allowed to undertake interviews. Furthermore, due to the limited time available, only few companies were investigated. Limited number of participants limited the viewpoints. Also, the restaurants included in this paper may not be representative of all food service providers of Denmark. The sample doesn't include participants from kitchens of hospital, schools, offices, catering services and also small cafes and restaurants that are dispersed outside of the Copenhagen city. Only those centrally located are included in the study. This may explain why we couldn't establish the common trend among the restaurants. Nevertheless, we believe that the relationships between practices and professional's attitude towards wasting food will be the same in a fully representative sample.

One of the major problems of unstructured data collection is that observer bias may distort the data. Their participants affect most social phenomena. In studies like this where there are small number of participants, the phenomena can be distorted by their own biases (Patton, 2002). However, the descriptions provided by the participants were crosschecked against theoretical interpretation. To minimize distortion of phenomena, researcher insured cross validation. Interviewees were asked again whether the researcher correctly interpreted what they were saying such as. For example ' Our guideline blends with the international regulations' Researcher asked 'Blend?' then further elaboration of answer was received. In addition, interview questions asked were inspired from other studies so we could compare that with the results obtained. In addition, researcher could verify the details provided by not all but most of the respondents, if the reports were improvised or not, because of his professional link with the businesses. However, respondents were assured that the reports would be anonymous and treated with confidentiality.

The limitations adopting hermeneutics phenomenology approach for qualitative study is that it focuses on experiences that are unique to the individuals and to their setting. Kovacs (1989) argues that findings from this approach cannot be generalized to a larger population, nor can be used as the basis for theoretical constructs for policy decisions (Kovacs, 1989). However, while keeping these limitations in mind, the study presented findings that deepened our understanding of experiences of the participants and suggested directions for future practice.

## **7.2 Implications of the Study**

The findings of this research can be formulated in several suggestions to minimize the amount of food wasted in food business industry and consequently to decrease their environmental and social impact. First, professionals holding adequate knowledge and awareness on issues of FW are the most important predictor of FW in a food business. Staff members ought to be motivated to discard less food through their manager's attitudes and business norms such as strengthening their belief that wasting foods is bad, unnecessary and immoral. Additionally, employers perceived control may be improved by skills training they can be shown how to control the amount of food they and other employees waste. Determining the right amount of food to purchase, proper storage system has direct relationship with the amount of food wasted. Furthermore, it can be implied from the study that excess food is lost during various phase of food handling process in food business and this is largely due to the intrinsic factors more than physical handling with the food items. This factor includes awareness, perception and knowledge and professional attitude. These may be sector specific or culture specific but it has huge effect on how much food ends up in waste.

Understanding local specifics requires a whole new set of studies where various qualitative techniques can be applied. Culture certainly has a major role in shaping food-handling behavior. While further research is certainly needed, the evidence from the current study can provide important insights to guide intervention to address FW within the company's food service management. Additionally, businesses can be persuaded that wasting less food is cost effective and that it may be worthwhile to focus on different motivators and barriers of reducing FW by the management. However, it should be noted that some factors are fixed like restaurant size and model but it maybe worth considering efforts for their own benefit. Hence, examination of the diverse range of food wastage drivers and trends provides insight into the best ways to achieve successful FW prevention, which possibly can reverse the trend of increased food wastage.

## **8. Conclusion and Recommendation**

This study is the first empirical piece of research that deals with the management practices of handling FW in Danish restaurants. These practices involved staff training, inventory control, buffet system, controlling preparation and production loss, offering doggy bags to customers and selling extra food in cheap price. The data collected for this research provides important knowledge about the composition



and origin of FW in the food service industry. The amount of FW generated was not studied in this paper but rather focused on qualitative elements of food service business that leads to wastage of food.

There are substantial steps to influence private actors throughout the food supply chain in Denmark. These include "Stop Food waste" and the Danish Government's FW Charter. In conjunction with government regulations, food businesses should institute their own initiatives such as communicating and motivating staff members on this issue, giving away over produced foods and upgrading menus. Many of the FW reduction measures affect several operational points in the company.

More research at all stages of the food supply chain is required to understand the reasons for food losses, to determine their quantities, and to deduce solutions and implement them effectively in food service companies. There is very little research that has studied financial impact of FW. Researches evaluating the economic benefits of reducing food wastage are recommended. Detailed case study of restaurants and canteen with observation by the researcher is also needed. Certification like "The European Waste Reduction Award" is conferred for the best actions taken against food waste. These awards may provide motivation to the businesses since it can also boost their image among customers. (EWWR, 2012)

In conclusion, it is crucial to understand that FW is manageable and should be a component of a company's management system. The management of FW is an important issue and is influenced by decisions and activities made at different levels of the organization. Controlling FW emphasizes especially the role of skilled workers and everyday leadership and management activities like recipes and menus, planning and management, monitoring of the actual portion size and documentation of all activities. Policies to prevent FW should address range of behaviors and motivations for wastage. They should be multi faceted so that they target individual's value, provide them with skills to reduce waste and facilitate improvements to encourage prevention. Food wastage is an issue that demands attention, research and action particularly regarding ways for prevention.

## **9. Food scape project in Tivoli “Food for Sale”**

This section contains food scape project to aid the measures and strategies proposed by the restaurateurs to reduce FW. The result analyzed from this study presents a need of innovative ideas to reduce FW in food service business. Therefore, this proposed project will attempt to understand the “social” dynamics and team roles, to understand and analyze stakeholders and to plan for handling risks and contingencies.

### **9.1 Background**

This foodscape project will take place in the warehouse of Tivoli in front of the workers entrance and exit ports. Tivoli being the most famous amusement park in Denmark has different food service provider for its visitors from small food vendors to big restaurants and cafes. Tivoli contains more than 40 different food service businesses ranging from café, restaurants, and bakery to pancake shops, ice-cream vendors and drink stalls. Tivoli has many fun themes rides, theatres, music acts and shows through out the year on different settings and time of year. To run the park smoothly Tivoli has numerous staffs from health workers, security guards, authorities, trying to make the visitors experience as memorable as possible. Tivoli contains a canteen for its co-workers to provide free meal once a day from breakfast to dinner. Besides canteen, there are wide range of food service sector providing varieties of meals and drinks on a daily basis (Silvennoinen et al. 140-145).

The number of guest visiting Tivoli every day differs on a huge range, so the production of the food differs accordingly. Wide varieties of food is handled, prepared and served from different food and beverage departments that ultimately results huge amount of food waste. A survey conducted by Ministry of Environment; Denmark in 2014 showed that out of 288,000 tones of FW per year from service sector, 227,286 tones of FW was avoidable. The annual FW breaks down into 60,800 tones in restaurants and cafes whereas 17,000 tones in catering and canteens, which gives 20% of FW from restaurants alone. Out of total FW generated from restaurants, avoidable FW accounts for 20,100 tones corresponding to 33% of total FW generated by restaurants while avoidable FW with 40,700 tones corresponds to the share of approximately 67% were unavoidable FW. This data shows that food service sector lacks the capacity to reduce and manage FW and is in need of more robust plans and strategies to control it (MOE, 2014). A study conducted by Thorsen and Jensen on FW in connection to an organic conversion of the food procurement for public kitchens at the Danish Organic Action Plan on March 2016 concluded that

canteens and public kitchens are able to reduce their FW significantly by serving fewer dishes every day but in return diversifying what is offered during the week and by recycling excess food into new dishes (Thorsen and Jensen, 2016). Most of the food service sectors in Tivoli are part of restaurant sector, which includes types like restaurants, cafeterias; fine dining, buffets, quick service restaurants. The sources of FW vary widely in restaurants generated not only from customer's leftover but way before the food falls on customers table. The pre consumer kitchen waste such as incorrectly prepared food, spoiled food, trims waste or over production constitutes wastes before it reaches the table. Post consumer FW i.e. food that neither gets eaten or doggy bagged due to over sized portion of food or an effort to entice customers with large or family size portions often leads to food being wasted (FWRA, 2014). A high share of these losses is related to non-optimized handling during supply chain processes. 'Shelf life' is a common term that relates to the number of days that a food product has left to be of 'acceptable quality' and safe to consume (Jedermann et al. 2013). Food losses can also be attributed to factors of waste owing to oversupply and losses owing to the natural decay of food products which cannot be stopped but are accelerated especially by lacking or poor temperature management or unhygienic conditions. Products of perfect nutritional quality, but with cosmetic defects, such as bent carrots, are sorted out during production, food handlers will often overproduce in case extra quantities are required at short notice (Jedermann et al. 2013).

FAO, 2011 insists that FW in developed countries like Denmark is generally related to consumer behavior as well as policies and regulations that address priorities in other sectors (FAO, 2011).

'Food for Sale' is an initiative taken to reduce FW generated from different food service business in Tivoli by making them available for the staffs for consumption in a low price or free of cost instead of being thrown out. FW items, which are considered not sellable for the customers due to appearance or wrong order, items that will be removed or thrown out at the end of the day due to over production, will be collected and made available for staffs. This project is based on the context of information and observation done during the process of this research on FW. Need assessment has been conducted after analyzing interview results to provide an alternative measure to reduce waste by consuming or reusing food items before it is regarded non-consumable. A deep understanding of the reality has been followed up recognizing the existing problem of FW together with mapping the acting role of stakeholders that can have an impact either positively or negatively in this project. A timetable strategy with GANT chart is also conducted to establish a milestone strategy to finish the project on specific date and time. Different related agencies interest, power, legitimacy, urgency is very important in determining the success of

a project along with its smooth running. The related agencies along with their power, legitimacy and urgency have been sorted out both in backstage and front stage of the project. A project has uncertainties and problems throughout its running course due to which a plan for risk and contingency has also been carried out being based on ground reality. Following up, an evaluation plan has also been designed to evaluate the outcome of the project.

## 9.2 Stakeholder Analysis

Stakeholders are groups/individuals and organization that have potential to influence the projects aim and action in their interest, which makes stakeholder analysis an essential part of a project planning (Burgha and Varvaosvszky, 2000). Stakeholders identified in the “Food for Sale” project are general manager, assistant managers, kitchen chefs, canteen staffs, IT workers, and coworkers. Each of the stakeholders have an important role to play to implement the foodscape project in Tivoli considering each of the stakeholders have high or low power to influence the project both in positive and negative ways. Table below illustrates the potential stakeholders in implementing the Food for Sale project in Tivoli:

Stakeholders	Stakeholders role/ contribution/	How is stakeholders interest meet
General Manager	<ul style="list-style-type: none"> <li>• Influencing change and decision making</li> <li>• Provides Communication bridge between the authorities of Tivoli and the research/researcher.</li> <li>• Provides access to the warehouse. Provide permission to conduct the project in Tivoli premises. Provides financial and manpower support.</li> </ul>	Success reports. Amount of food items being consumed instead of being wasted.
Assistant Manager	<ul style="list-style-type: none"> <li>• Authority and Decision making</li> <li>• Provides communication bridge for the staffs working under them.</li> <li>• Provide help in communication and setting up the project.</li> </ul>	Success report. No of participants taking part and talking about it.
Kitchen chef/cooks	<ul style="list-style-type: none"> <li>• Manpower.</li> <li>• Control and checking the quality of food items collected.</li> </ul>	Success report

	<ul style="list-style-type: none"> <li>• Provide expertise on food items and its management.</li> </ul>	
Volunteer staffs	<ul style="list-style-type: none"> <li>• Interest and support on the project.</li> </ul>	Manpower support
IT Department	<ul style="list-style-type: none"> <li>• Provides communication tools, media mediums, websites and online features to reach whole Tivoli family.</li> </ul>	Success Report: No of participants involved
Coworkers/Buyers	<ul style="list-style-type: none"> <li>• Target groups/ active participants</li> </ul>	Success Report: No of sales made. No of participants
IFS Student	<ul style="list-style-type: none"> <li>• Idea development, consultations and research</li> </ul>	Involvement.

### 9.3 Agencies

Agencies are the human actors who have interest in a project and are regarded very important part of a foodscape assessment tool. Agencies are mainly used for selecting appropriate actors related to a project (Mitchell et.al, 1997). A simple categorization technique with three scores has been used in order to place actors based on power, legitimacy and urgency in relation to Food to Sale in Tivoli. Agency identified in this project of 'Food for Sale ' are Tivoli authorities, general manager, assistant manager, It department, Chefs, cooks, consumers/buyers and IFS student. Table below identifies different actors power and influence in this project.

<b>Agents (stakeholders)</b>	<b>Power</b>	<b>Legitimacy</b>	<b>Urgency</b>	<b>Importance of stakeholder from 1to3</b>
Tivoli Authorities	X	X		2
General Manager	X	X	X	3
Assistant. Manager	X	X		2
IT Department	X		X	2
Chefs/Cook	X		X	2
Researcher/IFS Student			X	1

## 9.4 GANT-Chart

Gant chart is a tool to facilitate an effective communication for project planners. It is a tool, which presents visual overview of important dates in any projects. It is essential to keep track of the project within its time framework and tasks, which can be done properly following GANT Chart. Gant Chart was however only used as a production-planning tool to track actual production against daily goals but has changed drastically in time (Wilson, 2003).

The table below illustrates the timetable for the 'Food for Sale' project in Tivoli. The total time period allocated for the project of 'Food for Sale' is 3 weeks starting from December 1<sup>st</sup> till December 22<sup>nd</sup>. 'Food for Sale' will take place in weekdays due to busy transactions in Tivoli and can disrupt the interest and participation of targeted groups. Secondly, weekends are most busy period in the food sector department due to high flow of guests resulting in maximum sale of food and beverages prepared. The first week of December will be preparatory week; visiting Tivoli administrations, managers and proposing a proper project proposal. The venue will also be visited and will be taken note of necessary equipment's and changes required. Second week of December will be allocated for stakeholder meeting regarding permissions, budget allocations, finding manpower, sorting out of utensils and equipment's, and mainly discussing and following up with the IT departments for their assistance in spreading the information of 'Food for Sale' in the intranet and notice boards of Tivoli. Respected chefs and cooks will also be contacted and will be discussed for the proper management of food before, during and after the project. Week 3 will be strictly used on hands on the project. The venue will be sorted out and made changes as per requirement. Necessary utensils/equipment's will be collected for each purpose of storing, warming, and packing of food items, utensil which are not available will be borrowed or bought according to possibilities, spreading of the information through meetings, notice boards, internet and staffs rooms of each working place. The shift plan for the workers working in the event will also be followed up in this week. Most of the staffs will be volunteers and from the canteen who have experience in such events. The beginning of week 4, the equipment's will be set up for running the project. All the equipment's will be tested out and final information will be passed on about the process of the project. After the completion of the first Food for Sale evaluation will follow up regarding the success of the project and its impact on the FW generated from Tivoli.

<b>Activities</b>	<b>Week 1</b>	<b>Week 2</b>	<b>Week 3</b>	<b>Week 4</b>	<b>Estimated time (approx.)</b>

Preliminary planning, approach method	X				10 hours
Meeting with administrations and submitting proposals	X				2-4 hours
Visiting the venue and confirmation	X				2 hours
Administration meeting regarding budget, manpower, and permission.		X			1,2 days
Manpower gathering and providing information		X			3,4 days
Meeting with IT personal and developing messages and strategies		X			2 days
Collection of equipment's, utensils.			X		1 week
Testing of utensils before hand			X		1 day
Venue set up completion			X		2 days
Shift plan for the volunteers/workers			X		3-4 hours
Spreading the info about the event through all possible channels			X		2-4 days
Collection of food items, sorting out etc.				X	4-5 days
'Food for Sale'				X	
Evaluation				X	

## 9.5 Budgeting

Budgeting is an overview of the finance required for a project. It is an outline of allocation of available funds for project related activities for its proper running and success. Budget allocated for 'Food for Sale' is approximately 5000-8000 Danish kroners. Tivoli is mainly responsible for the budget and can be altered accordingly where needed. Most of the funds are also expected to be refund depending on the success of the project, as people will be charged a small amount on the food items provided. Most of the budget provided will be utilized on purchasing utensils for the proper storage of food items if not available already in the premises of Tivoli.

<b>Serial No.</b>	<b>Headings/ Activities</b>	<b>Danish Kroners</b>
1	Preparation meeting:	100
2	First meeting with administrations, managers.	100
3	IT workers and preparation of posters, templates	200-500
4	Collection of necessary tools and equipment's (Warmer, gloves, to go bags, doggy bags, paying machine, money collection box, tables, food films, silver paper, electric cables, water)	3000-4000
5	Print out of possible posters, template, IT design for internet and Tivoli database.	500
6	Staffs, cooks, cleaning department employees.	1500
7	Miscellaneous and cover up	1300
	<b>Total</b>	<b>8000</b>

## 9.6 Contingency Plan

Risks and problems can always come into action at any stage of a project implementation. Problems and risks cannot be ignored but can be dealt with alternative solution and such alternative plan to mitigate such risks is called contingency plan (Andersen, 2008). 'Food for Sale' foodscape project has some risks that are identified during the course of implementation. Following is the contingency plan proposed to overcome possible risks.

<b>Possible Risks</b>	<b>Measures to reduce possible risk</b>	<b>Measure to reduce the consequences of the possible risk</b>



Authority members not motivated about the project	Open talk about the need and advantages with facts and figures.	Positive members inspiring fellow members by open talks and debate
Lack of time or favorable time for approached authority members	Meeting will be fixed with each manager's members personally in their offices.	Pushing positive members to motivate and put pressure on rest of the members.
Missing necessary utensils and equipment's	Required utensils will be managed, booked and brought a week before the project	Kitchenware and other utensils can be borrowed from other kitchens in Tivoli with the help of ass managers.
Short on no of staffs, voluntary staffs.	Better communication with staffs and requesting time of their availability.	Managers managing hours of their staffs from their respective areas to help/work in the project.
Lack of participants/interested staffs	Better communication messages. Managers will persuade staffs to involve in this project	Managers from each department making it a must visit for the staff getting free during the hours of the project. The food items can be made free of costs.

Results of the research conducted by author revealed that most of the authorities and managers were very keen to work on the issues of FW from Tivoli. Therefore, the author believes this proposal of foodscape project will most probably be accepted without much of opposition. There may be some doubts and confusion among the actors of food businesses, which can be tackled by having an open talk about our project and its benefits. The need of such an initiative can be presented with facts and figures from past studies and expert's opinions. The members who are positive about this project can be asked to have an open debate or consultation to convince the members with negative attitude. Secondly, there can be scheduling conflict among members involved in food and beverage business to attend meeting on purposed date and time due to busy Christmas season. This issue can be managed simply by proposing meeting time according to their preferences and conducting small group meetings in different time period. Each of the members can be reached in their respective offices during office hours in weekdays. Management of kitchenware, to go bags, packaging film, storage unit, tables, to go boxes, refrigerator, warmer, trolleys to transport the food items can create delays in the process if not bought or collected in time. This risk can be tackled by starting the purchase and collection process a week ahead. The kitchenware can also be

borrowed from various food courts available in Tivoli, which is done on a daily basis also. There may be inadequate volunteers from staff members to set up the project area and to run the project. In such case, managers may assist the researcher in gathering staffs for the project, since in weekdays, cafes and restaurants inside Tivoli is not that busy. Staff members can be personally asked by the managers to visit the sale after their work schedule, since the signing off monitor is situated right opposite of the exit portal where the project will be demonstrated. Better communication medium and messages can be developed making it compelling enough for staff members to participate in the project.

### **9.7 Evaluation Plan**

Evaluation of a project is done in order to determine the success of an intervention in reaching its goals and objectives. Evaluation of a project can also help in determining the reasons behind an unsuccessful project. Evaluation can be conducted considering the need; it can be done during the course of implementation of a project or at the end of the project. As mentioned above in the GANT chart the evaluation will take place during the end of the project but keeping data during the implementation of the project will be done. Food for Sale project will be evaluated on the no of participants visiting the site and the amount of food going out compare to the food received or collected. A logbook will be used to keep records of the item sold or consumed by visiting staff members and comparing them, resulting in the amount of food reused rather than wasted.

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## Appendix

### Semi structured Interview questions

1. What type of business are you?
2. How many days are you open in a week?
3. How aware are you about the issues of food waste in restaurant business? Do you find this issue important?
4. Does your restaurant follow any national guidelines/tools in managing and reducing food waste?
5. If yes, what kind of tool/guidelines/measures? What are the steps taken to minimize food waste?
6. Are you a part of any sustainable waste management association?
7. Does your staff receive any kind of training/awareness/classes regarding food waste and control?
8. What are the main sources of food waste in your restaurants?
9. How is the food handled /stored after delivery?
10. How is damaged/expired/extra foods from kitchen are managed on daily basis?
11. What about left overs by customers? Do you have any special ways to reduce or reuse leftovers?
12. Do you segregate food waste?
13. Do you keep records of how much kg of food waste is generated each day/week/ month?

14. Do you Reuse, recycle, donate or compost food waste?
15. Do you have space available outside for an on-site composting set up?
16. How is the food waste collected? Is it done on a daily basis /weekly/  
monthly?
17. In your opinion are the measures taken helping to reduce and manage food waste. Has there been a progress report regarding the amount of food waste generated?
18. Does your restaurant have allocated budget for food waste management and reduction?
19. Do you have any future Waste Management Plan or planning to adopt new/better management tools?
20. Do you consider managing food waste is a challenge? Are you satisfied with the way food waste is being handled in your restaurant?
21. What do you think are the impacts food waste has on environment if not managed properly?
22. In your opinion, is government doing enough to manage food waste from restaurants?