



**Guideline for food waste reduction in Hospitality Industry-Study Case: Hotel F6,
Helsinki**

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Abstract

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<p>Food waste remains a problem in the food industry since it is caused by a variety of sources and is difficult to eliminate it in food production. It causes environmental and economic consequences. The hotel and food service industry playing a large part in the process of generating food that is discharged into the environment at the consumption stage. Therefore, it is critical to have a substantial potential for food waste avoidance in this sector.</p> <p>The objective of this thesis is to provide guidelines for reducing food waste in the hospitality industry based on research of definition of food loss and food waste, the causes of food waste, the impacts of food waste, and current approaches and practices for food waste management in the food and beverage industry. This topic is addressed in this thesis on a limited scale, with the study case of F6 hotel. The commission was given on April 2020 and the thesis is mainly conducted and finished in May 2022</p> <p>The primary approach for the study was qualitative research. To provide an in-depth analysis of the F6 hotel's food waste management system, qualitative research was used. The primary data collection approach were observation and theme interviews. Observation is carried on based on structured observation form. Theme interviews were conducted with F6 hotel workers in order to provide an overview of food waste management.</p> <p>In this thesis, the author will provide systematic instructions on how to minimize food waste in F6 hotel in four distinctive categories: daily food waste tracking, inventory control, staff training and raise customer awareness. One of the suggestions given in the guidelines is to check storage temperatures regularly, use the FIFO method, or improve staffs cutting and trimming skills. Overall, results are given out matching up with the studied theory and the objectives of commissioner.</p>
Keywords Food waste reduction, hospitality industry, sustainability, guideline, hotel management

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1 Introduction

According to Papargyropoulou & al (2019), one-third of all food produced for human consumption globally is lost or wasted, amounting to nearly 1.3 billion tons each year. Food waste is most prevalent in developed nations such as Scandinavia and Northern Europe, Northern America, and Southern Europe. A number of organizations have presented solutions to this problem. For example, FAO recently launched the 'Global initiative on food loss and waste reduction' with the goal of reducing food waste throughout the food system via collaboration, coordination, and research, as well as increasing awareness (Papargyropoulou& al. 2014). In Finland, the Mission Zero Foodprint initiative supports small restaurant carbon neutrality by building a model and smart solutions, as well as making the changes apparent to consumers (forumvirium.fi 2020)

Food waste is an increasing problem due to its environmental and economic consequences. Food waste has a considerable carbon, water, and environmental impact, as well as negative consequences on farmland and fertility utilization. Food waste is generated at many levels of the food supply chain. In there, the hotel and food service industry playing a large part in the process of generating food that is discharged into the environment at the consumption stage. Therefore, it is critical to have a substantial potential for food waste avoidance in this sector.

After working in the restaurant industry for many years, the author understands that food waste is an unavoidable aspect of any food supplier. This is most evident in the "all-you-can-eat" buffet, which is popular in wealthy nations such as Finland. Although some restaurants have food waste prevention methods, this issue appears to be overlooked. As an environmentalist who is concerned about food waste, the author opted to investigate this topic in-dept in her thesis.

The objective of this thesis is to provide guidelines for reducing food waste in the hospitality industry based on research of the causes of food waste, the impacts of food waste, and current approaches and practices for food waste management in the food and beverage industry. To support the main objective of the thesis, two sub objectives are proposed: study on global food waste management and creating effective innovative strategies to reduce food waste in the hospitality sector. Nonetheless, food waste in general, and particularly in the hospitality business, remains to be widespread. It is difficult to conduct large-scale research on food waste. As that reason, this topic is addressed in this thesis on a limited scale, with a case study of the F6 hotel.

The thesis is broken into three main sections. In the theoretical part, the terminology of food waste is first addressed from several perspectives, followed by the reasons of food waste in the hospitality business, either in pre-customer stage or post-customer stage. In addition, there are impacts when food is tossed out, including environmental impact and economic impacts. This section also discusses these current approaches and practices for reducing food waste. The research methodology, as well as the data gathering and analysis processes, are introduced in the third and fourth chapter. Following that, chapter four will also provide results of data collecting method and give out the guidance for food waste management based on the methodology method outlined above. In discussion, author will mention about possibility and applicability of this study for commissioner to develop in the future.

Introduction about F6 hotel

Hotel F6 is a family-owned hotel which is located in the center of the in the street Fabianinkatu 6, Helsinki. The hotel's name is directly inspired by its location: The initial letter of the street is F, and the house number is 6. Jaakko Puro is architecture who designed the hotel, which has a warm, comfortable, and sophisticated style with inspirations from numerous cultures. The hotel is situated near to Esplanade Park- one of the most popular spots for locals and tourists, surrounded by a wide range of cafes, restaurants, and shops. There are in total 76 rooms divided into three categories: Standard, Superior and Deluxe. "Our modern, cozy, and chic rooms feature wooden floors, warm colors, and plenty of space. The rooms offer either a view of the octagon-shaped courtyard or a view of the city" (Nordic choice hotel). All the rooms are decorated in the Art Nouveau style and are provided with high-tech gadgets. There is a television, a kettle, an iron, and toiletries equipped in every room. Standard rooms are accessible for the disabled. There are also pet rooms at the hotel.



Figure 1: F6 hotel (Hotelf6.fi n.d.)

Regarding guests' services at F6 hotel, it provides a complimentary gym for hotel guests to use. The gym is open to guests at any time of day and is provided with high-quality equipment such as a cross trainer, treadmills, bicycles, and free weights. They are collaborating with the Finnish - based food delivery firm Wolt.

2 Food waste in hospitality industry

This section would discuss about the terminologies: what is the definition of food loss and food waste, the causes of food waste, impacts of food waste as well as mentioned about approaches and practices for food waste management in hospitality industry. These terms linked directly to practical part of the thesis.

2.1 Terminology

FAO (2013) cites the definition of food loss in Toolkit-reducing the food wastage footprint as below: Food loss is defined as a reduction in the volume (dry matter quantity) or nutritional value (quality) of food originally intended for human consumption. These losses are mostly the result of inefficiencies in food supply chains, such as inadequate infrastructure and logistics, a lack of technology, a lack of skills, knowledge, and managerial capacity among supply chain actors, and a lack of market access. Food loss is described as a decrease in the amount and quality of food caused by the decisions and activities of food providers along the FSC, omitting retail, food services, and consumers. As a result, food losses occur during the production, post-harvest, and processing phases of the food chain. Food waste, on the other hand, refers to a reduction in the amount and quality of food as a result of retailer, food service provider, and customer decisions and behaviours. (Nicastro & Carillo 2021)

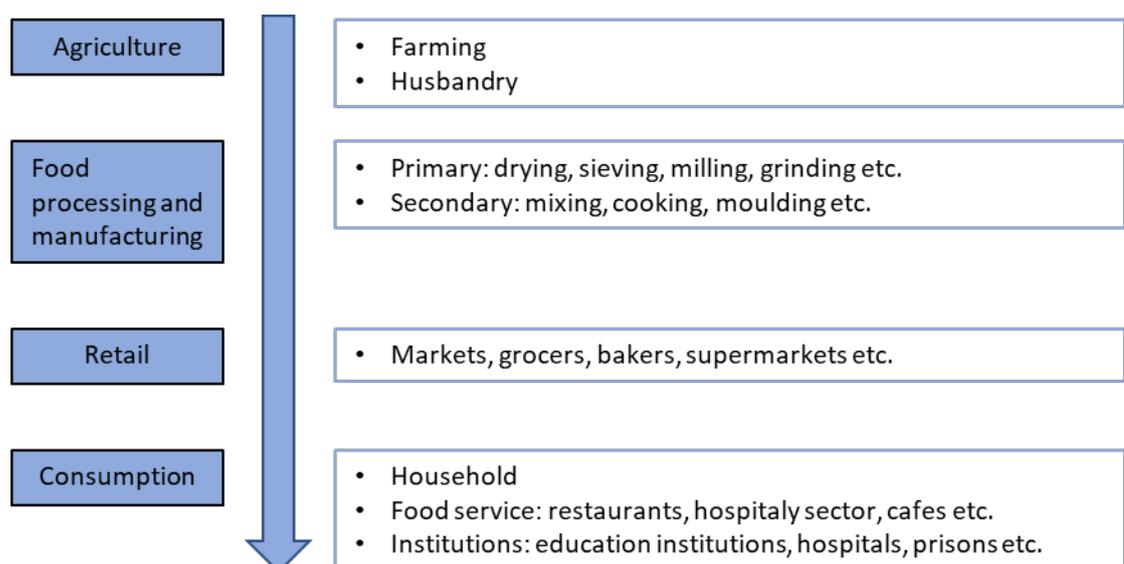


Figure 2: Activities in the food chain (Adapted from Papargyropoulou & al., 2014)

There are many definitions of food waste be found in different sources (Papargyropoulou & al. 2014). Food waste can be described as food fit for human consumption that is thrown, whether it has been held over its expiry date or has been spoiled. This is frequently related to food spoilage, but it may also be due to other factors such as market

surplus or individual customer shopping/eating habits (FAO 2011). To support for this definition, according to Cuglin (2017) food waste is defined as a type of food that is safe to eat but is not consumed because of human causes. Stuart (2009) added in his paper that edible materials which are intended to animals or by-products of food chain are also considered as food waste. If customers, staffs, or food manufacturers do not consume any kind of food item because of some reasons then this food material is called waste (Baldwin & al. 2012). The definition, is pointed out by Stuart, includes food loss because of animal using and by-product in food process. In scale of the thesis, Stuart's definition is not discussed.

Activities rising food waste and losses in the food chain is illustrated by Papargyropoulou & al.(2014) in table below:

Table 1: Food waste and losses throughout the food supply chain (Papargyropoulou & al., 2014)

Stage	Examples of food waste/loss
<i>Harvesting - handling at harvest</i>	Edible crops left in field, ploughed into soil, eaten by birds, rodents, timing pf harvest not optional: loss in food quality. Out-grades at farm to improve quality of produce
<i>Storage</i>	Pests, disease, spillage, contamination, natural drying out of food
<i>Packaging - Weighing, labeling, sealing</i>	Inappropriate packaging damages produce Grain spillage from sacks attack by rodents
<i>Post-consumer - over- or inappropriate purchasing, storage, preparation, portioning and cooking</i>	Buying more than is needed Plate scrapings and surplus food cooked and not used Poor storage/stock management in homes: discarded before serving Poor food preparation technique: edible food discarded with inedible Food discarded in packaging: confusion over 'best before' and 'use by' dates
<i>End of life e disposal of food waste/ loss at different stages of supply chain</i>	Food waste discarded may be separately treated, fed to Livestock/poultry, mixed with other wastes and land-filled

There are four basic steps in chain of food supply, ranging from cultivation; food manufacturing to trade and bring to consumption destination. While food loss is mostly produced in the first two steps in this process, food waste is mainly generated when food is either delivered to markets or consumed in families, restaurant industries. (Papargyropoulou & al. 2014). California Integrated Waste Management Board (2006) demonstrate that food waste plays the biggest role among all sources of food services' waste. The reasons can be explained as customers' negligence or poor in food management. (Papargyropoulou & al. 2014)

In customer service industry, when food items miss an opportunity to be consumed by customers for various reasons, it is called food wastage (Baldwin & et al. 2012). There are many criteria to classify food waste. In accordance with its weight and sorting, food waste falls into 2 categories: originally edible (OE) and originally inedible (OIE). Examples of first type including expired date products or spoiled food during cooking time. However, inedible parts of vegetable like skin, coffee ground or bone are classified as originally inedible (OIE). There are two types of food waste based on the origin of wastage: pre-consumer food waste and pro-consumer food waste. Pre-consumer food waste is defined as food before it is delivered to consumers, including incorrectly prepared foods that are cooked, prepared in the kitchen, or leftovers due to overcooking. When foods are served to customers, food waste is counted as the leftovers on the plate because of many reasons, for example: customers take more food than needed, or the bio waste which is inedible e.g., peelings, bones. (Silvennoinen & al. 2015)

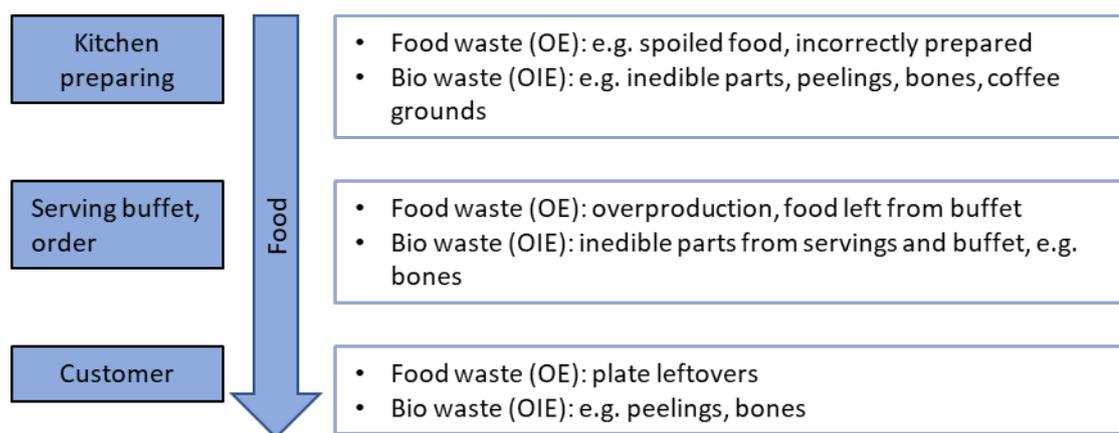


Figure 3. Sub-categories of food waste (adapted from Silvennoinen & al. 2015)

In this figure, the avoidable waste can be counted as food left due to excessive production, spoiled or spilled food during storage, burnt food when cooking, or when food product delivery to customer but not consumed. Most of food waste in customer services is not hazardous for human (Cuglin & al. 2017) One of the ways to reduce and control food waste is to minimize avoidable waste because it is in good shape but is thrown away for

preventable reasons. In the next chapter the author will discuss about majority causes of food wastage.

2.2 Causes of food waste in restaurant and hotel

This chapter discusses the most common sources of food waste in the hospitality business, as well as when it occurs. At several levels of food chain, starting when food is supplied to restaurant until after serving customer, food waste is created. A restaurant cannot, under any circumstances, avoid producing garbage. Food waste creation does not imply poor business operations because it occurs for a variety of understandable and sometimes unavoidable causes. Food waste is divided into two categories: pre-consumer food waste and post-consumer food waste with different causes. (Baldwin & al. 2012)

This table below summarizes the major sources of food waste in the hospitality sector as given by Baldwin and Shakman (2012) in their book "Greening Food and Beverage Services." There are two categories of causes: pre-consumer and post-consumer. According to (Baldwin & al. 2012) there are eight reasons for pre-consumer food waste and three reasons for post-consumer food waste.

Table 2: Causes of food waste

CAUSE OF FOOD WASTE	
Pre - consumer	Post-consumer
Unidentified demand	Large portion size
Overstocking	
Inefficient production	Inefficient service model
Poor communication	
Staff behaviour	
Unskilled trimming	Customer's menu acceptance
Over -merchandising	
Food Safety	

Unidentified demand is the first and most prevalent source of food waste. Kitchen operators frequently struggle to anticipate the number of visitors they will serve and determine which dishes are most popular and cost- effect. It is more unpredictable if restaurant is buffet style or change menu seasonally. Therefore, food waste is appeared. To improve the prediction, it is critical to investigate client preferences as well as other aspects like as seasonality, weather trends, and local competition. (Baldwin & al. 2012). As illustration in Finland, at peak season of hotel, like winter holiday or summertime, many guests willing to

spend more money for recreation like food, leisure, and accommodation, it is good opportunity for hoteliers to store more food in order to meet the demand (Katajajuuri & al. 2013)

Another reason why food service establishments must discard food is overstocking. Some restaurants do not want to notify their clients that they are unable to fulfill an order, so they prepare more than they require. This margin of error strategy may be useful in many instances, however overestimation of the margin of error might result in waste. (Baldwin & al. 2012). The solution to avoid food surpluses by preparing only what is required. In addition, restaurant manager can improve the system to forecast more accurately the number of customers coming for service. (Papargyropoulou & al. 2019)

One of the reasons being concerned is inefficient production procedures which is common at buffet restaurants where a huge volume of food must be prepared to serve clients. The chefs always try to make batch cooking as efficient cooking technique for big quantity of customers. However, it may cause food waste increasing if they do not know how to control situation. For example, a breakfast buffet is available from 8 a.m. until 11.30 a.m. The restaurant wants to keep their buffet full of food and options until closing time in order to maintain a profession of service quality. However, in last hour before buffet close, there are normally few visitors than other time. If the restaurant continues to make and serve food in huge quantities even though it is about to close. To reduce left over food after closing buffet, the chefs would cook less and change food display in counter, such as using small food container. (Baldwin & al. 2012).

Furthermore, inefficient communication among restaurant personnel might results in food waste. It is necessary to have communication between kitchen staffs and front-house employees to provide smooth working system. Miscommunication usually happen in multicultural working environment because of language barrier or cultural difference. As consequences, some conflicts at work are unavoidable, to be worst it leads to failure in regulation food production. For instance, in a la carte restaurant, waiter fails to delivery right message to kitchen, so chef make mistake in making food for customer. As the result, those incorrect food is thrown to trash. (Baldwin & al. 2012)

Another cause of food waste is staff behavior. It is undeniable that some good habits of staffs will help the restaurant save costs and increase work efficiency. In case of an experienced chef, based on his experience, he will estimate the situation to minimize food serving when the buffet is quiet. But there are also some actions needed to improve as a cause of increasing food waste. For example, restaurant order too much low-life-cycle food such as vegetables, fruits and stored them more than needed. That leads to many

fruits and vegetables to be damaged, moldy, and rotten before serving. (Baldwin & al. 2012)

Unskilled trimming is another source of food waste caused by employees. To be ready for usage, vegetables, fresh fruits, and meat must be trimmed and prepared. employees are often not careful in restaurants with higher food production while cutting or peeling food. They do not receive adequate training in avoidable waste parts of the food. (Baldwin & al. 2012). In this case, manager at restaurant should train kitchen staffs on cutting technique. (Papargyropoulou & al. 2019)

Furthermore, over-prioritizing commerce leads to major food waste. Operators naturally want their marketing items to remain fresh, beautiful, and available on the shelf. Confectionery and pastry stores, for example, typically strive to showcase their products in an attractive way in order to attract more customers, which may end in wasteful food waste. (Baldwin & al. 2012)

On the other hand, while food safety is always the priority at every food provider, it makes a significant contribution to food disposal. Food with timing, temperature, or handling concerns should be thrown for the sake of the customers' health. (Baldwin & al. 2012).

Shakman (2012) outlines three key reasons for post-consumer food waste in their study. Large portion sizes become first reason explain why food waste is created in post-consumer stage. The portion size may be so large that customers are unable to complete it. Additionally, an inefficient service model might result in a big quantity of food surplus. Buffet restaurants, lunch canteen usually offer self-service type which allow customer take "All you can eat". The original purpose of this type of service was to bring convenient in the way customers choose food. They can decide what food they want with unlimited amount. But there's also the downside that customer would take too much on the plate because they perceive value for money "quantity not quality". (Papargyropoulou & al. 2019). Also, customer menu acceptance can lead to waste because when customers do not like some of the condiments, particular ingredients, or the quality of the given food, they frequently refuse to finish their meals.

In another study, the sources of food waste were classified into two groups: food production or consumption. Food waste was created in a systematic manner during food production stage. The operational systems and processes of the restaurants (for example, their food procurement, storage, and preparation techniques, as well as their reservation system) lead in systematic food waste creation. In customer consumption, major reasons of food waste are the consumers' social practices; nevertheless, the restaurants' operational

procedures also contributed to systematic food waste formation. (Papargyropoulou & al. 2019). The table below would summarize causes of food waste generation according to this study:

Table 3: Causes of food waste generation (Adapt from Papargyropoulou & al. 2019)

Causes of systematic food waste generation	
Food production	Food consumption
Policy of preparing 30% more food than what is needed	Ordering too much food
Failure of booking system to accurately predict numbers	
Food safety policy	Customers does not like a dish they order
Lack of coordination between departments in restaurant	Taking too much on plate
Inappropriate menu for eating occasion and sitting layout	
Aesthetic standards in the buffet and plate presentation	
Avoidable preparation food waste due to poor cutting skills	The perceived value of food is linked to the price
The perceived value of food is linked to the price	

There are similarities between the reasons stated by Baldwin & et al.(2012) and Papargyropoulou & al. (2019) about food waste creation. "The perceived value of food is linked to the price", which is mentioned in the table, explain that for example, some restaurant's staffs percept that rice, noodle, local fruits or potatoes can be wasted because they are inexpensive. On the customer side, those who often do not finish potatoes or rice on the plate think that these ingredients are cheap. (Papargyropoulou & al. 2019)

In conclusion, overproduction, restaurant concept, regulating storage/inventory, and kitchen staff qualification are some of the big obstacles restauranteurs must face in order to tackle food waste.

2.3 Impacts of food waste

Nowadays when almost 800 million people worldwide are starved, food waste has undoubtedly become a global issue caused by enormous food production. Despite this, 1.3

billion tons of food are wasted globally each year. More than twice as much as is required to feed all the world's starving people. (FAO 2016)

A large amount of food is abandoned after harvesting in poorer nations owing to inefficient storage, poor road building, and inadequate cooling equipment. In comparison, developed countries waste more food farther down the supply chain, like serve or display too much food, and customers overlook leftovers in the back of the refrigerator or toss perishables away before the expiration date. (Cuglin & al. 2017)

Food waste has become more troublesome and unreasonable in Europe and throughout the world, particularly because it affects not only the environment but also socioeconomic and moral difficulties. To prevent food waste, several governments have rigorously began collecting statistics and information on this sort of waste. They are also attempting to define waste production management and are attempting to educate and enlighten the general population. (Cuglin & al. 2017)

2.3.1 Environmental impacts of food waste

Food waste cause massive impact on the environment. The environmental implications of the food waste life cycle were measured, including not only those associated with food waste treatment (such as methane from landfills), but also those created earlier in the process, i.e., needless emissions from the food production chain. (Katajajuuri & al. 2013).

One of the most significant environmental consequences of food waste is its end disposal in landfills. Methane and carbon dioxide are created as a by-product of the natural breakdown of food waste in landfills. Methane and carbon dioxide are both greenhouse gases that contribute to climate change, with methane being the more powerful of the two, trapping 21 times more heat than carbon dioxide. The trash sector is expected to account for around 3% of worldwide GHG emissions, with the same figure applying to the UK. Food waste is identified as a priority waste stream because it accounts for nearly half of all CO₂ emissions linked with trash in the UK. (Papargyropoulou & al. 2014)

According to the European Commission, the European Union wastes 88 million tonnes of food each year. This equals to around 143 billion euros and 3.3 gigatonnes of CO₂ emissions. (Negulescu 2017). To support this argument, the United Nations Food and Agriculture Organization (FAO 2011) cites that the carbon footprint caused by food waste was approximately 3.6 Gt CO₂, excluding land use change. When this amount is multiplied by 0.8 Gt CO₂ from deforestation and managed organic soils, the overall yearly effect reaches 4.4 Gt CO₂, or nearly 8% of global human GHG emissions. This quantity is

nearly equivalent to international road transport emissions in terms of exacerbating global warming. The following figure depicts the top 20 nations in terms of GHG emissions relative to food waste, demonstrating the substantial environmental damage caused by food waste.

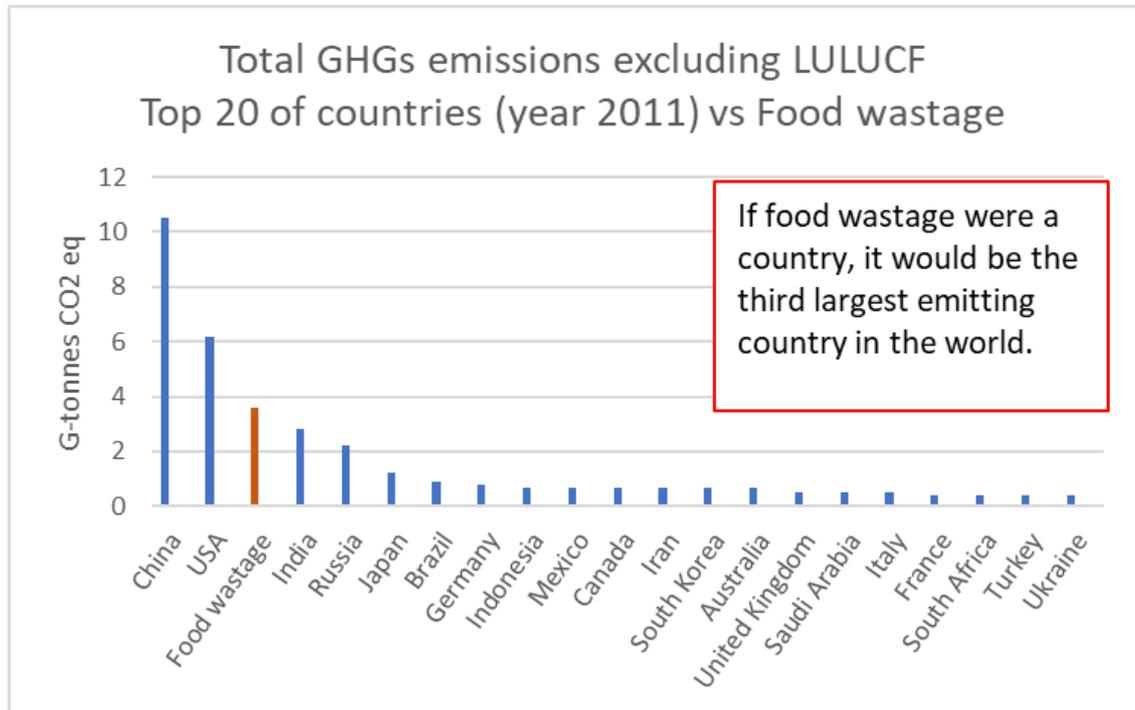


Figure 4: Top 20 countries rank according to their greenhouse emission VS Food waste. In this figure, it is clear to see that if food waste were to be listed, with the United States and China, in terms of greenhouse gas emissions, it would come in third place. (updated from FAO 2015)

In an academic study about Food waste system in Finland, Katajajuuri (2013) demonstrated that the total climate impact of food waste, including households, retailers, restaurants, and the food industry, was approximately 1000 million kg of CO₂-equivalent per year in Finland. The proportion of households attributed was 36% of total climate impact. Therefore, the entire climatic effect of household food waste per year was estimated to be 350 million kg of CO₂-equivalent. In Finland, an approximate estimate for the food wasted yearly by families was equal to the annual carbon dioxide emissions of 100,000 cars when converted into greenhouse gases.

Other environmental impacts of food waste include depletion of natural resources (such as soil nutrients, water, and energy), disruption of the biogenic cycles of nitrogen and phosphorus used in agriculture as fertilizers, and the potential for environmental pollution throughout the FSC but especially during waste disposal. Today, to increase productivity in the cultivation process, for instance, boost the number of fruits harvested, higher quality

of products, chemicals such as pesticides, fertilizers are used. It is undoubtable that a side effect of it is contaminating water sources and soil erosion. (Papargyropoulou & al. 2014)

Food that is created and then goes uneaten, whether it is meat or cakes, wastes the water, fertilizers, pesticides, seed, fuel, and land required for its production. (Cuglin & al. 2017). More than simply food is thrown away when edible foods are discarded. Consider all the resources needed to get food from the farm to customers' plate: Water for irrigation, land for planting, fuel for harvesting, and transportation vehicles. As an illustration, 125 litres of water are needed to produce one apple, 15400 litres for one kilo of beef (Depta 2018)

2.3.2 Economics impacts of food waste

Food waste not only dramatically affect to environment cost, but it also has significant economic impacts (Papargyropoulou & al. 2014). In 2007, the economic cost of worldwide food waste was calculated to be USD 750 billion (FAO 2013).

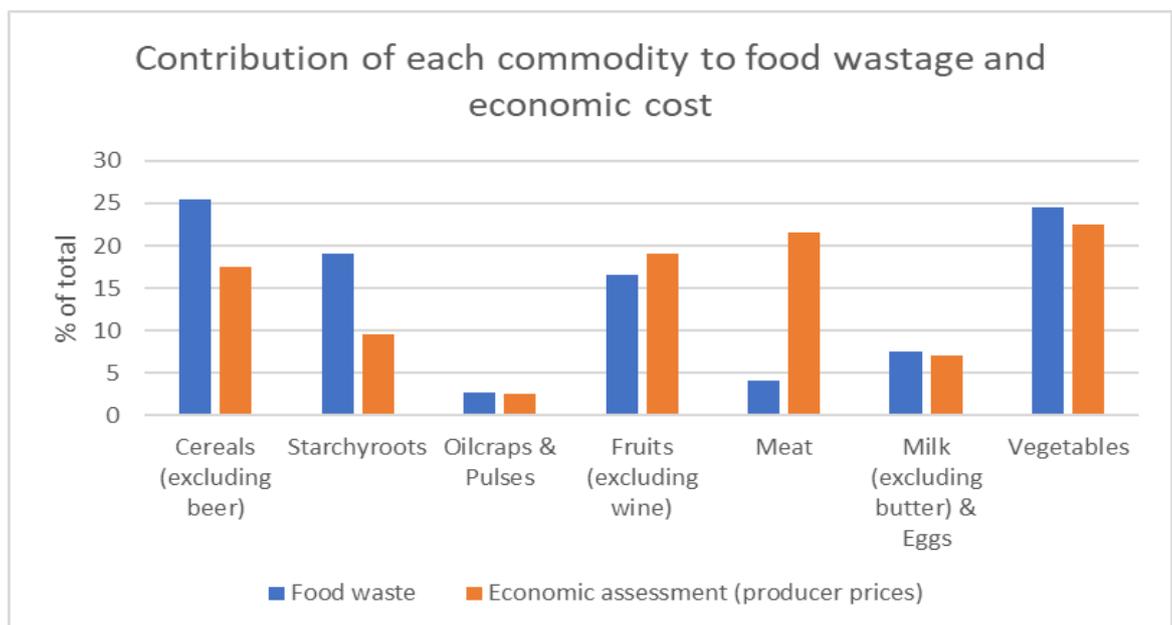


Figure 5: Contribution of each commodity to food waste and economic cost (adapted from FAO 2013)

Figure 4 demonstrates that vegetables are the largest contributors to the economic cost of food loss and waste (23 percent of total cost), followed by meat (21%), fruits (19%), and grains (3%). (18 percent). Meat contributes significantly to the total cost of food waste due to its high producer cost per kilogram. Indeed, meat accounts for around 4% of overall food waste, but accounts for approximately 20% of the entire economic losses of this waste. Cereals' contribution to total cost, on the other hand, is mostly driven by large food

waste volumes. Prices and volumes have a balanced contribution for fruits and vegetables, although it indicates that average producer prices are greater for fruits. (FAO 2013)

Papargyropoulou (2014) cites that food waste costs UK restaurants between 2 and 3% of their total revenue. Avoidable food losses have a direct and negative influence on both farmers' and consumers' income. A reduction in food losses might have an immediate and considerable impact on the lives of smallholders living in the suburbs of food insecurity. The objective for food-insecure customers is to have access to nutritional, safe, and cheap food products. The economic advantages of resource efficiency and waste reduction, claiming that reducing resource consumption, waste, and other emissions has the potential to save money, find new business opportunities, and improve employment and competitiveness.

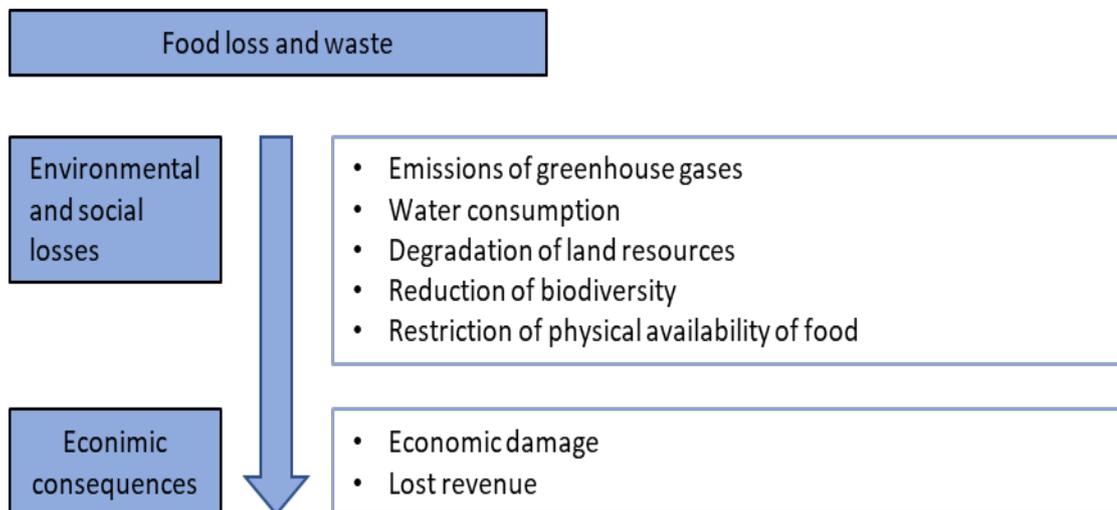


Figure 6: Food loss and waste consequences (adapted from Kotykova & Babych 2019)

Regarding environmental and social losses of food waste, there are five main categories related, including: emissions of greenhouse gases, water consumption, degradation of land resources, reduction of biodiversity and restriction of physical availability of food. While economic harm and income loss is the economic result from food loss and waste.

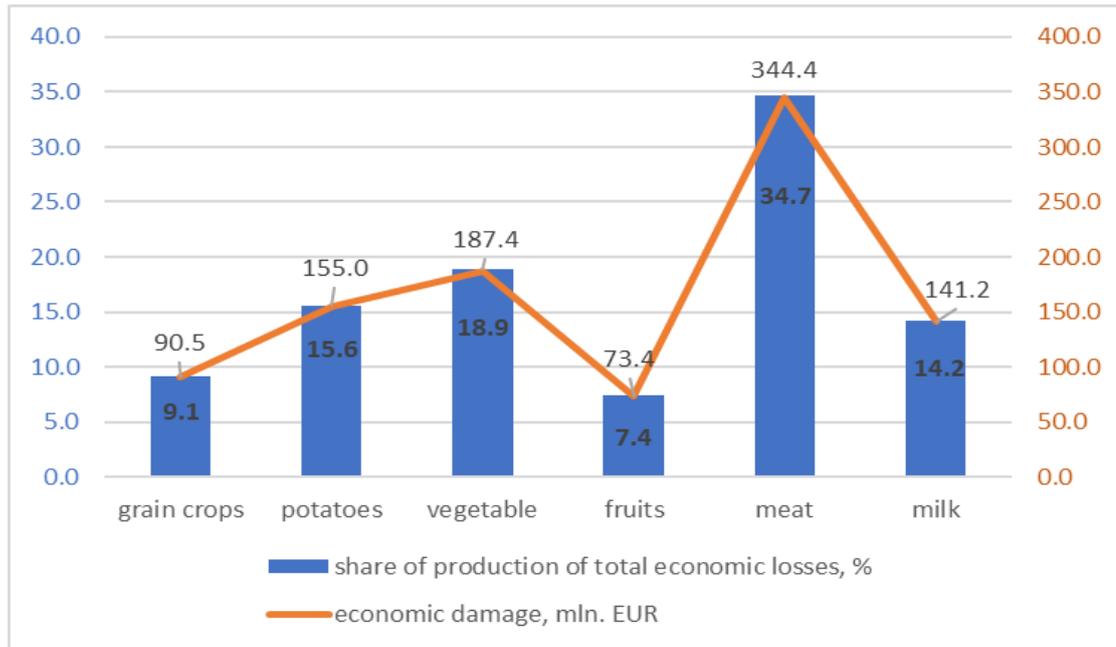


Figure 7: The contribution of each type of product to economic losses as a result of food loss and waste in Ukraine in 2016 (Source: own calculations based on State Statistics Service of Ukraine (2016)).

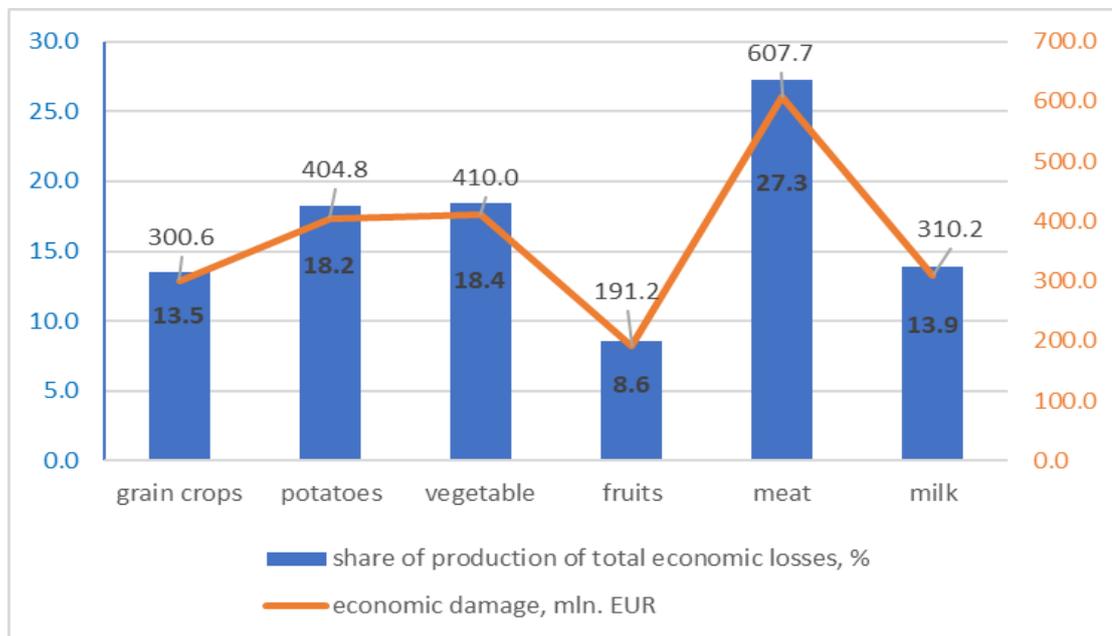


Figure 8: The contribution of each type of product to lost revenue as a result of food loss and waste in Ukraine in 2016 (Source: own calculations based on State Statistics Service of Ukraine (2016)).

In the Ukraine study about economic damage and lost revenue as a result of food loss and waste in 2016, the figures have showed that meat accounted for the greatest part of both revenue loss and economic loss, with 344.4 million EUR and 607.7 million EUR,

respectively, followed by vegetables, which accounted for 187.4 million EUR in economic loss and million EUR, in revenue loss. Meanwhile, the lowest figure is seen in fruits, In 2016, the economic harm and income lost as a result of food loss and fruit waste in Ukraine amounted to 73.4 million EUR and 191.2 million EUR respectively. Ukraine's economic losses were around 991.9 million EUR in 2016, equivalent for 2.8 percent of the country's budget in 2017 and a 2224.5 million EUR unfulfilled income. It has been demonstrated that assuring the physical and economic availability of food, as well as limiting food loss and waste, may dramatically alleviate poverty, give gender advantages, and lessen environmental and climatic pressures. Reducing food loss and waste can be one of those uncommon methods that has the most impact at the lowest cost. It should be realized that the potential benefits of reducing food waste and by-products are not confined to increased gross productivity and profitability. (Kotykova & Babych 2019)

2.4 Approaches and practices for food waste management in hospitality industry

The waste hierarchy concepts were brought into European policy as early as the 1970s, with the 1975 Waste Directive and the EU's Second Environment Action Program in 1977. In 1989, the Community Strategy for Waste Management fully outlined the waste hierarchy in European legislation (European Parliament Council 1989). Since then, the waste hierarchy has been widely accepted as the primary waste management system across the world. (Papargyropoulou & al. 2014)

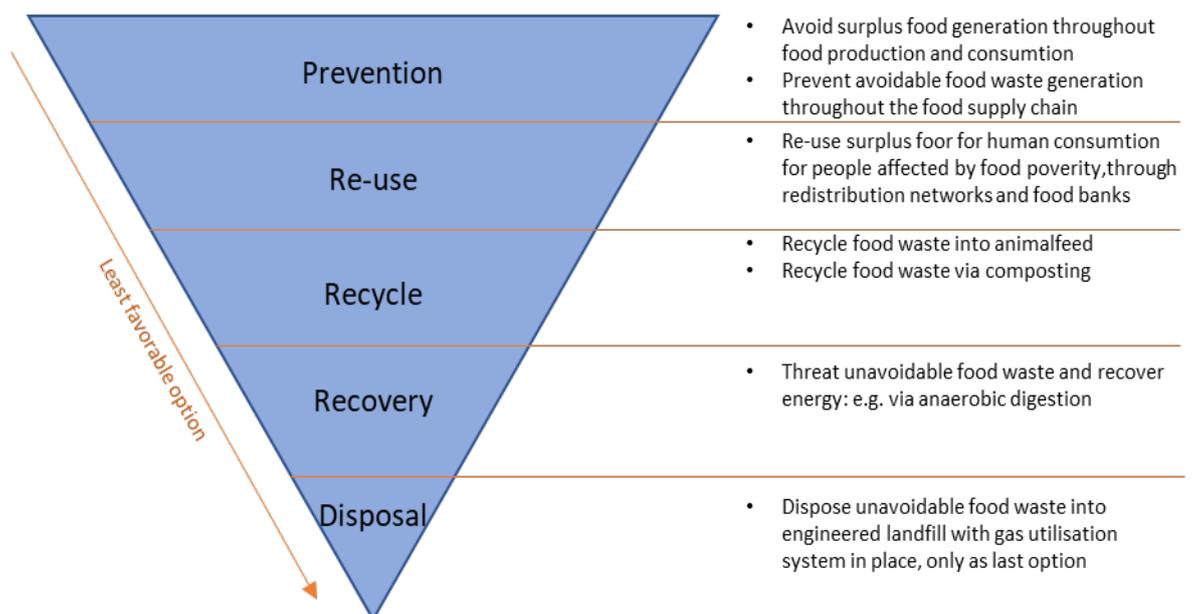


Figure 9: The waste hierarchy (adapted from Papargyropoulou & al. 2014)

The proposed food waste hierarchy seeks to challenge the current waste management approach to food waste, contribute to the debate about waste management and food security, and influence current academic thinking and policies on waste and food in order to support more sustainable and holistic solutions. As seen in figure 8, the most advantageous choice is 'prevention,' whereas the least advantageous alternative is 'disposal' at the bottom of the inverted pyramid. According to the hierarchy, reducing food waste is the preferred option since it may prevent the negative effects associated with waste. The collaboration in the supply chain can reduce food surplus food generation through food production and consumption, for example standard creation for date labelling on production, better consumer planning when purchasing and preparing food, and technical advancements in packaging and perishable food shelf life. Another way of food prevention is avoiding waste of raw materials, ingredients and product arising. The food is reused as the next step in the hierarchy. Food may be reused by collecting it for people affected by food poverty, through redistribution networks and food banks or reproducing it into various goods. Food that has been recycled can also be fed to the animals, however specific safety standards require that leftovers from customers be processed before being used as animal feed. Saving food may be used via composting. For example, because chicken eggshells are high in calcium and low in heavy metals, they may be used as a calcium enrichment component in cattle feed, whereas natural calcium carbonate sources may be contaminated with these elements. Food waste recovery comes as the fourth stage of the hierarchy. Food waste recovery can be used for anaerobic digestion for energy, is a closed process that generates methane and carbon dioxide from the fermentation of food. This process produces methane, which is used as an energy source, and the remaining solids, which can be used as soil additives. advantageous method of food waste disposal. This option is the last to be considered since it requires more resources to convey the waste and emits greenhouse emissions. GHGs (methane), which are harmful to the environment. (Papargyropoulou & al. 2014)

In same study Papargyropoulou & al.(2014) also detail the food surplus and waste framework base on food waste hierarchy as illustrate below. The suggested framework interprets and applies the waste hierarchy in the context of food waste, as well as proposes and prioritizes solutions for dealing with food surplus, avoidable and unavoidable food waste. Starting with the unwanted food surplus, the objective is to prevent overproduction and overstock of food beyond human nutritional needs at all phases of the FSC. In agriculture and food production, this entails producing only the amount of food required to meet world nutritional demands and ensure food security. Food surplus prevention at retail and consuming stages, such as the food service sector and homes, comprises supplying only what is needed, right portion size, and addressing unsustainable consumption behaviors. The option of redistributing surplus food to populations impacted by food poverty

is advocated for surplus food that has not been consumed, providing food safety can be assured. When an excess of food becomes inappropriate for human consumption, it constitutes food waste. At that point, the distinction between preventable and unavoidable food waste becomes critical in determining the best waste management choices. Once all preventative strategies have been attempted (to the greatest extent practicable), it is advised that avoidable food waste be recycled into animal feed, with composting as a second alternative if recycling into animal feed is not possible. After recycling attempts have been tried, the treatment of food waste with energy recovery, such as anaerobic digestion, is the recommended next alternative. And final step is seen as disposal unavoidable food waste into landfill

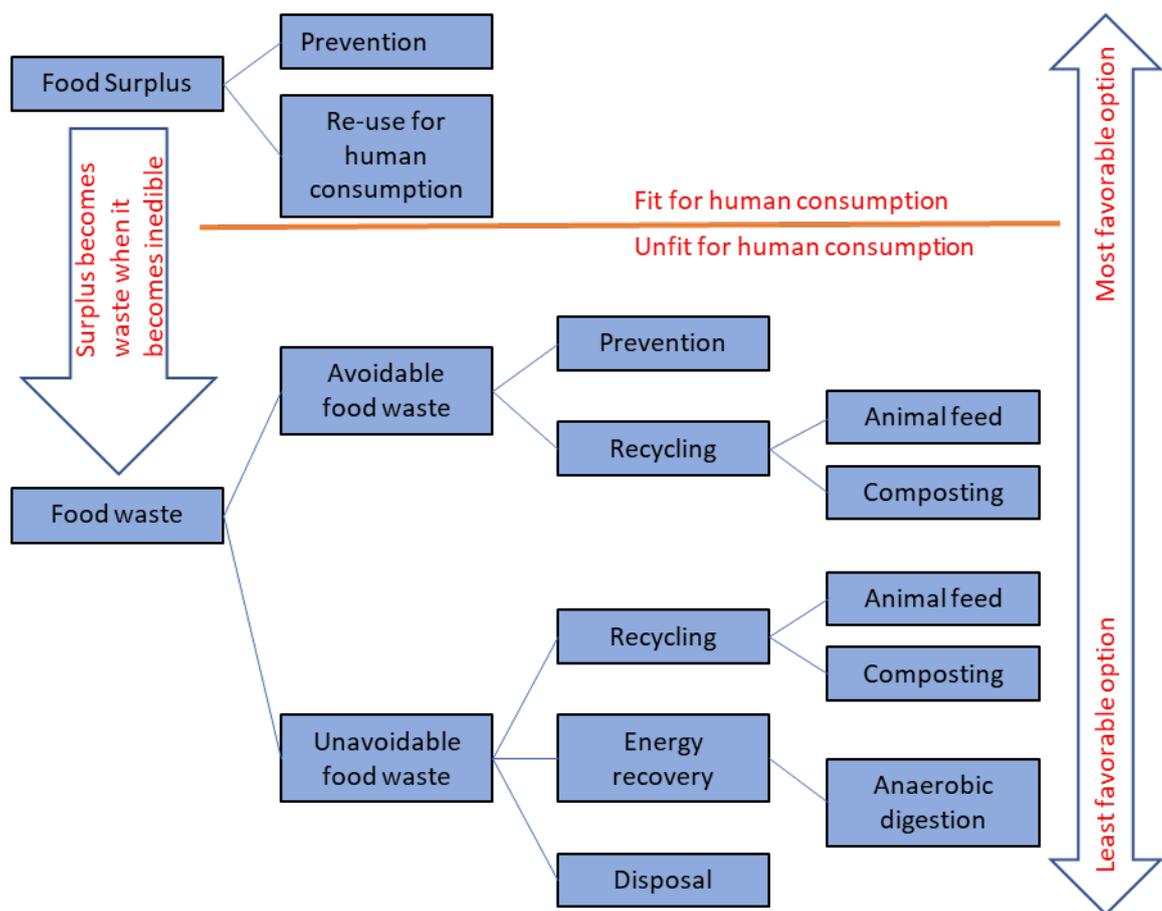


Figure 10: Food surplus and waste framework (adapted from Papargyropoulou & al. 2014)

So, how could food service providers use this form of food waste hierarchy in their operations? Food waste prevention and minimization should be prioritized as a top priority.

In figure 10 below would show practices to prevent and reduce food waste at food service providers

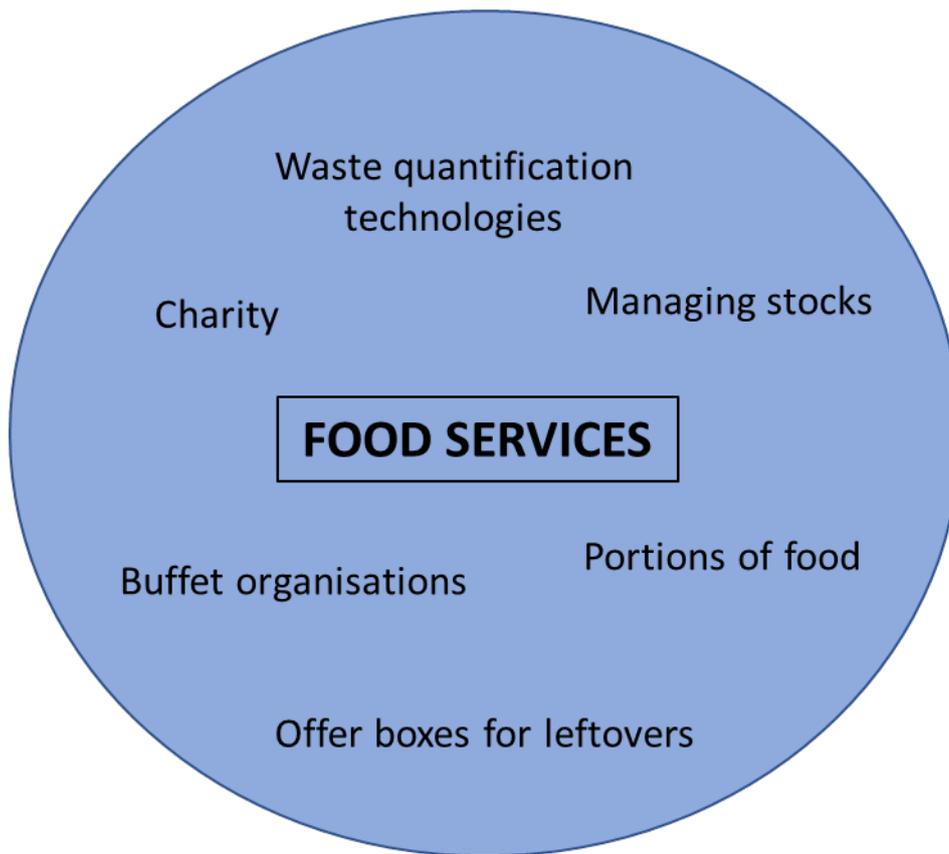


Figure 11: Measures to prevent and reduce food waste and losses at food service (adapted from Nicastro & Carillo 2021)

Food service organizers should improve their food service quantity planning. Menus with larger portion sizes should be available at food service establishments. When a customer wishes to order anything, the staff should communicate efficiently with customers to find out what is suitable menu for guests to minimize food waste. The less plate residue generated in the end if the consumer can obtain the food according to their taste and eating abilities. Buffets are the leading source of waste in hotels owing to the presentation of vast quantities of food. So, effective waste-reduction techniques may include delivering higher-value goods à la carte, serving single amounts rather than platters of food, or even selling leftovers from the buffet later. (Nicastro & Carillo 2021)

Food waste is produced in large quantities at the level of food services, and many are initiatives to decrease food waste. Clients are offered standard-sized meals that are frequently too large for the individual's needs; hence, one option may be to lower portion sizes or provide boxes for leftovers. To minimize over-consumption, services might serve only what is still available at the end of the day or cook only on request. (Nicastro & Carillo 2021)

In addition, in the Toolkit- reducing the food wastage footprint published by FAO (2013), regarding to managing stock step, it is essential to improve communication along the

supply chain to match the demand and supply of food. In case of restaurants or hotel industries, manager would estimate roughly the number of guests would come to have service in order to order from suppliers the quantity of food needed. Through technologized devices, such as mobile phone, email, they can communicate to each other in case of updating information so unavoidable over-stocking can be diminished. During food production and preparation, food waste is generated significantly. This occurs mostly during trimming, which cuts both edible (e.g., skin, fat, peels, end pieces) and inedible (e.g., bones, pits) aspects of food. Overproduction, product and packing defects, as well as technological failures, can all result in processing losses, which can be difficult to avoid. Trimming enhancement during the processing step, may be more efficient in terms of amount wasted and potential use of scrap by-products waste in some situations. (FAO 2013)

Even if the provided food is left over after the service, it can be treated such that it is still edible. Food that is in good shape can be utilized for staff lunches, and some leftovers can be used for different food production. Bread, for example, may be transformed into toasts, while vegetables can be turned into soups, bouillon, mashes, and so on. (Nicastro & Carillo 2021)

Otherwise, high end technologies can be applied as consider for another effective solution to prevent food wastage in food providing premises. For example, a smart measuring container has created that measures the kind, amount, and economic worth of food waste. A touchscreen tablet is offered in kitchens to identify what is thrown away, and an automated scale records the weight. Each morning, cooks and managers receive a report outlining where food waste has happened as well as the expected cost to assist quantify what is being thrown away and raise awareness of where and how to take action to decrease potential waste. (Nicastro & Carillo 2021)

As said by the food waste hierarchy, prevention should take precedence, hence action should be performed upstream by avoiding excess food production. Where food surpluses are unavoidable, it is critical to prioritize redistribution for human consumption through measures to collect food that has not been sold but is still edible. In reality, by giving food, it is feasible not only to combat food poverty, but also to prevent excess food from being exploited for industrial reasons or disposed of in landfills. (Nicastro & Carillo 2021)

3 Methodology

This chapter introduces the author's research technique. The key characteristics of the research approach are discussed, followed by an explanation of why it was chosen. The why and how of a qualitative research strategy, such as a topic interview, observation form will be addressed. This chapter also provides an overview of the data collecting and analysis processes.

3.1 Qualitative research

The term "qualitative research" refers to a wide range of methodologies and methods for studying natural social life. The information or data gathered and analyzed is principally nonquantitative in nature, consisting of textual materials such as interview transcripts, fieldnotes, and documents, as well as visual materials such as artifacts, photographs, video recordings, and Internet sites, which document human experiences about others in social action and reflexive states. (Saldana 2011). The goal of qualitative research is to "describe and comprehend a phenomenon and provide a plausible explanation for it." (Saldana 2011)

When there is no prior knowledge, hypotheses, or research on the phenomena, and the phenomenon is new as an object of study, qualitative research is frequently used. Qualitative research is undertaken in and across a variety of sectors, including education, sociology, anthropology, psychology, communication, journalism, health care, social work, justice studies, business, and so on. (Saldana 2011).

It is demonstrated that qualitative research has three dimensions: description, analysis, and interpretation. "The description remains firmly embedded in the data to offer a factual account of the fieldwork observation to answer the question, "What is going on there?" Analysis is a methodical extension of description that finds essential components and their interactions to explain how things operate. Interpretation seeks insight or explanation beyond the scope of a certain topic to discover greater applicability and significance. (Saldana 2011)

The practical part of this thesis is being conducted using a qualitative research technique. When it is necessary to "explain and comprehend a phenomenon and offer it a logical interpretation," qualitative research is typically used. (Saldana 2011). The objective of this thesis is given out by a commissioner F6 hotel to create a guideline for F6 hotel to minimize its existing food waste by analyzing and assessing the hotel's operations and

procedures. Because there has never been a guideline developed for F6 hotel, a qualitative research technique is most suited in this circumstance.

3.2 Data collecting method

According to Saldana (2011), the three most important data collection methods for qualitative research are observation, topic interviews, and various documents. Observation, as the name indicates, is a method of gathering facts via observing. The researcher must immerse herself in the location where her respondents are while taking notes and/or recording, this data gathering approach is classed as a participatory study. Observation data gathering methods may include observing, listening, reading, touching, and documenting phenomena' behavior and attributes. A theme interview is used to gain a comprehensive knowledge of a phenomena or scenario in which information such as problem characterization, effectiveness evaluation, or results assessment is required. (Saldana 2011). The first two approaches used in this thesis are observation and topic interviews.

3.2.1 Observation

Researchers can benefit from observation methods in a number of ways. They enable researchers to assess nonverbal expression of sentiments, determine who interacts with whom, comprehend how participants communicate with one another, and assess how much time is spent on activities. The purpose of research design employing participant observation as a technique is to establish a comprehensive picture of the phenomena under investigation that is as objective and accurate as feasible given the method's constraints. (Saldana 2011)

Unstructured observation is carried out in an open and freeway, with no pre-determined variables or objectives. (Saldana 2011). As the author of this thesis is working at F6 hotel as breakfast host for certain amount of time, it is an opportunity for her to observe daily hotel operation as well as participate in kitchen's duties in the most comprehensive way. The author, also known as the observer, is capable of being F6 hotel in the natural environment where the phenomena occur. An organized observation form would be created in comprehensive aspects: Daily food waste tracking, inventory control, policies of hotel about food revolution, staff training and internal communication between kitchen staffs and hotel crews, external communication between staffs and customers.

Table 4: Observation form

OBSERVATION FORM			
No	Description	Yes	No
1	Hotel policy about food waste management		
	Explain :		
2	Keep record of food waste daily		
	Explain :		
3	Which food is most wasted from buffet		
	Explain :		
4	Inventory control		
	Explain :		
5	Regulations for staffs		
	Explain :		
6	Communication with guests		
	Explain :		

3.2.2 Theme interview

The theme interview is the thesis's second data collection approach. A theme interview is used to gain a comprehensive knowledge of a phenomenon or a scenario such as the source of a problem, find out practices or approaches of those problem, evaluate about an phenomenal occur (Saldana 2011). After all information is collected in the interview, thematic analysis is the process of identifying patterns or themes within qualitative data. The purpose of a thematic study is to discover themes and use those data to address or show as evidence for study. Finally, the guideline is made as result of this study.

The reason to choose theme interview is that beside the observations from the author, the opinions of the other staffs who work in kitchen are significantly important. It allows the author to have a thoroughview of the problem discussed in this thesis. At the same time, through data collection and analysis, it will help the author to come up with effective measures on a big scale. The theme structure is related to literature review. It consists of: the cause/ sources of food waste in F6, what are impacts of food waste, practices for food waste in F6.

The interview questions were developed and organized in the order of the theoretical sections. This will allow the author to have a broad and complete insight of the topic, in this case food waste management at F6 hotel. The answers of interviewees from the interview are differs based on their point of view, their positions in department with different years of experience. F6 hotel is boutique, family-owned business with less than 20 employees, the

kitchen of hotel only uses for breakfast purposes. Environmental coordinator is assigned out to make sure that the hotel and all the departments are following the routines and guidelines of NCH (Nordic choice hotels) sustainability policy. However, during the time author carry on this research, the environment coordinator is unavailable to access. Therefore, three staffs, including the author, are mainly involved to food waste managerial system at hotel. In this study, two employees from F6 hotel breakfast team are invited for individual interview. They are F&B manager, assistant F&B manager. The respondents were chosen because they have direct contact with food waste on a daily basis and they are aware of the present state of the hotel's food waste management system.

There are in total 10 distinctive questions divided into 4 themes related to theoretical part. To explore different views and ideas in many aspects of waste management, the interviews were held individually with different times to suit each interviewee. The content of the question is mentioned in the following table

Table 5: Theme interview structure

General questions	1. What is F6 hotel's policy about food safety and food waste ?
	2. How much food waste is produced per day at F6 hotel?
	3. Which food is the most wasted from the buffet in your opinion?
Causes of food waste	4. Where does the food waste come from ?
	5. Who is responsible in the food waste management?
Impacts of food waste	6. What are the consequences when food is thrown out?
Practices/ approaches for food waste	7. In inventory control, do you have any idea how to reduce food waste/ spoilage?
	8. What should we do to improve staff and customer awareness about food waste?
	9. What kind of method could be used daily to control the amount of food waste?

10. Do you have any other suggestion to reduce the food waste overall?

3.2.3 Analysis of the data

The author's working days at hotel F6 were observed from April 1, 2022 to April 30, 2022 in order to acquire the essential records for this study. Observation is based on objective criteria; the author observes everyday kitchen operations in order to offer evaluative comments on how the kitchen organisation works.

The criteria that are monitored and recorded daily included:

- . The amount of food waste discharged after buffet
- . What food is thrown out the most at the buffet?
- . What is the cause?

In addition, the author will monitor and update the awareness and daily actions of hotel staff as well as customers related to this issue.

The interview took place in April 2022. The interview has been conducted in English and on an individual scale, recorded, then transcribed into materials to be analyzed. To obtain the answers' viewpoints, the interviews were conducted as in-depth and face-to-face interviews. Because the questions were open-ended, the interviewees were able to express their own personal opinions and beliefs.

Because the author worked at the F6 hotel for a long period, it was simple to contact the interviewees. The author requested permission to participate in the study and supplied the necessary data. The table below provides a summary of the interviews, including the date of the interviews, the names of the interviewees, their positions at their employer, and their primary tasks at work.

Table 6: Interview timetable

Date of conducting interview	Position of interviewees	Duties of interviewees
25.4.2022	F&B manager	In charge of all kitchen operation. Responsible for kitchen expenses. Training staffs

19.4.2022	Assistant F&B manager	Taking care kitchen on duty. Assisting F& manager on regular duties
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The transcripts were then carefully reviewed to reveal the important ideas, facts, and insights. Because the interview questions were previously categorized into topics based on the theories, the collected materials should be compared to the theoretical themes as well. To make it easier to understand, the gathered answers were explained with figures and drawings.

4 Results

According to the issues outlined in the literature study, the research seeks to provide reliable insights into food waste management at the F6 hotel. The purpose is to propose a food waste guideline based on research into three major topics: the causes, the impacts, and the current techniques to dealing with food waste at the hotel. It is critical to observe the disparities in personal perspectives of author with interviewees from various professions and duties at hotels who are involved with food waste on a regular basis. The following chapters contain the findings of the observations as well as the analyzed responses from the theme interviews. The answers were merged and compared with facts provided in earlier hypotheses, resulting in the same order as the listed theories.

4.1 Results of the observations

The restaurant at Hotel F6 is only available for breakfast with capacity of 125 guests. Breakfast is made in an open kitchen and features traditional Finnish cuisine - consists mainly of organic local ingredients: handmade Karelian pies, slow cooked organic porridge, cheese and cold cut. Breakfast at Hotel F6 may be eaten on the outside patio throughout the summer. Breakfast is provided from 7:00 a.m. to 10:00 a.m. on weekdays and from 8.00 a.m. to 11:30 a.m. on weekends.



Figure 12: Breakfast at F6 hotel (Hotelf6.fi n.d.)

F6 hotel is a part of Nordic Hotels & Resort which committed to environment work, therefore, hotel F6 follows to certain Food Revolution policies of Nordic choice hotels. To be more specific, it includes:

- . Offer organic replacements at the breakfast buffet (example organic coffee, organic eggs)
- . Green food options (more fruits and vegetables on the buffet)
- . Promote good animal welfare and provide decent working conditions for those who generate the raw ingredients.

Nordic Choices hotels have study to waste less food and advocate for sustainable natural resource management. Firstly, all Nordic choice hotels agree to reduce the food waste "by decreasing the plates by a few centimeters and putting up a sign with a prompt to finish the food, food waste was reduced by 20%" (Nordicchoicehotels.com n.d.). Furthermore, Nordic Choice Hotels created its own red list using the WWF's fish guide (red listing is intended to analyze and judge the situations of species in nature). The result is a red list that is used to determine which meat and fish items should be avoided. All hotels must adhere to the red list because they demand the food which they serve not originate from a producer renowned for animal mistreatment, putting workers in risk, or harming the environment in any manner. For instance, eggs are committed to be organic, which are produced by hens being free to move, be able to move in and out all year, and have greater room to move. And specially there is no bad palm oil products at Nordic choice hotels. They have gradually eliminated the toxic palm oil from their food, which means that the rainforest will not be torn down to make way for palm oil plants. Eradicating rain forests is one of today's most pressing environmental issues, particularly in Indonesia and Malaysia, which account for 85 percent of the world's palm oil production. (Nordicchoicehotels.com n.d.)

Currently, F6 hotel adheres to Nordic Choice hotels' sustainability regulations, which include the Food waste issue and a variety of ways to decrease food waste tossing into the environment (which will be covered in detail in the Finding below subchapter). However, these approaches have not been systematized into detailed guides, and no one is in charge of doing in-depth study on this subject. Furthermore, an impartial evaluation of this issue at F6 hotel found that, while the staff is aware of their responsibility to protect the environment by limiting the scenario of food spoilage or rotting, it still needs to be investigated in detail to boost productivity and efficiency. Also, identifying the most promising measures for food waste prevention is completely considered.

The target group of this study is the employees, managers and owners of F6, especially the breakfast crew, who work directly with food and are primarily responsible for food safety. The goal of this study was to analyze the patterns and causes of food waste creation in the F6 hotel in order to find the most promising food waste control solutions.

At the moment, F6 hotel has a keep track of daily food waste amount after breakfast operation. To be more precise, after daily buffet close, the weight of bio trash is recorded before send them to trash collecting point in basement of hotel. As observed and calculated, in weekdays the average food waste is roughly 6-15 kg, weekend from 18-25 kg. The pax amount has significant impact on the amount of food waste tossed away. There are many causes of food waste at hotel such as food trimming, overstocking, customers perception about food waste, food safety policy. In food preparation , mainly food waste generates from trimming (peel, skin, seed, persiserble salad leave) as well as coffee ground. However, overstocking is considers as a lead reason of food waste. Too much stocking in storage will make some perishable products such as fruits, salad leaves unused for a long time and thrown away before reaching customers. During the post customer stage, most of the leftovers on the plates were thrown away because of the misconception about the "all you can eat" buffet concept. Some customers don't like the food they take or take more food than they need which end up all left over food will be tossed out. The last reason can be mentioned because of the food safety policy. Food served on buffet counter must not exceed 3 hours from the time of presentation.

About inventory control, the FIFO method is implemented in storage along with temperature checks that are performed regularly to promptly detect errors and abnormalities. Inventory is conducted 4 times in a year by kitchen manager.

Details of the observation form can be found at appendix 1.

4.2 Results of the interview

Based on the documents collected in interviews with employees in different professions with different duties in the hotel who related to the handling of food waste in daily life, the data was recorded and transcribed follow the categories in theoretical study. Four main sections are analyzed including cause of food waste, impacts of food waste, current approaches, and practices for food waste management at F6 hotel.

4.2.1 Causes of food waste

"In my perspective, fruit makes up a large proportion of the amount of food waste discharged from the buffet. The inedible parts of fruits like peel, skins are quite heavy, also counting coffee grounds. Furthermore, as I observed, tomatoes and cold cuts (like ham, turkey) plays big parts of food waste, especially on weekends. We serve different kinds of breads, but customers do not use the ending, which end up tossing out" - according to interviewee 1. Interviewee 2, in other hand, believes that perishable goods like salad leaves, tomatoes, and cucumbers are the key components of buffet waste. Because the

staff will limit refilling pricey items at the end of the hour to prevent waste after closing the buffet, ham or turkey are not frequently thrown away. While discussing liquids that do not count when weighing, milk, particularly full fat milk, can be included. Milk is not only utilized at buffets, but it is also used in coffee machines. Milk will be discarded when the buffet ends.

While interviewee 1 think food waste be derived from three key elements: food preparation, food decorating, and buffet. In which the inefficient production procedures plays a critical role in the quantity of food garbage discarded. For example, many salad leaves, perishable vegetables are thrown away before coming to customers as a reason of spoiled, rotten in storage process. Also, untrimming skill of staff is considered why many edible parts are tossed away when cutting fruits, vegetable. Those contributes to the rise of food waste generation. The wrong estimation of the amount of food preparation, according to the interviewee 2, is the source of most of the food waste. Sometimes, kitchen prepare much more than the real number of foods needed, which is in turn need to throw out because of food safety policy.

4.2.2 Impacts of food waste

The first is the environmental impact, which includes contamination and increases the greenhouse effect. Furthermore, increasing the quantity of food waste would raise the hotel's business expense, also known as the economic cost. Not only does the cost of raw materials rise, but so does the cost of waste disposal. The F6 hotel does not compost garbage, but instead works with a garbage pickup company to collect domestic waste at the hotel. The higher the amount of trash, the more expensive waste collection will be.

Interviewee 1 further said that it is also tied to moral society. Many people throughout the world are presently suffering from food scarcity. The fact that food is thrown away adds to societal disparity.

4.2.3 Current approaches and practices for food waste management at F6 hotel

a. Inventory control

It is believed that doing inventory is one of the greatest solutions. Currently, the inventory is done quarterly by the manager or the assistant manager to report the inventory status in the kitchen. Quality, price, and expiration date are all inventoried. She can give analyses relevant to the present scenario. It is possible, for example, to detect damaged, useless, or expired items. At the same time, the research can figure out food usage by personnel

and client consumption. It is also trusted that quantity should be kept as minimal as possible. Furthermore, everyday employees must inspect all commodities in storage for odd products such as broken or rotting products. Molded items must be discarded quickly to avoid contamination of fresh food. Inventory is organized and cycled in a FIFO-compliant kitchen such that the oldest items in kitchen are used first, decreasing food waste due to spoiling. The measures are summarized by the following figure:

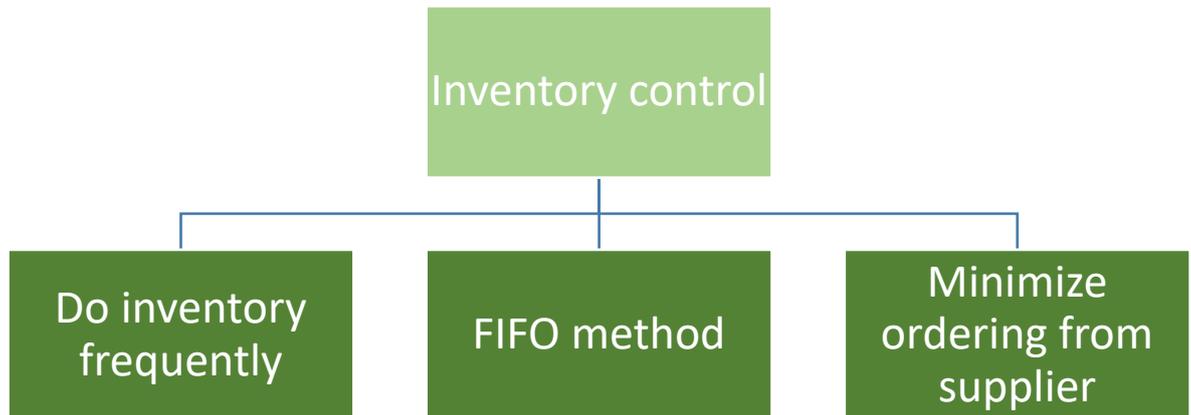


Figure 13: Inventory control

b. Raise staffs and customer awareness

While the interviewee 1 feels it is important to tell employees about the circulation system, including trash classification such as bio, mixed garbage, carton, and plastic. Instructions might be implemented verbally or by signage at the rubbish pickup location. For customers, communication is extremely important. Staff constantly stands on the buffet to assist customers about the buffet foods, as well as to inform customers about the hotel's principles: reduce food waste, quality is better than quantity. Also, avoid refilling too much in the past hour. Training, according to the interviewee 2, is crucial for workers. To prevent food waste, workers must be taught how to estimate the amount of food to be prepared and the amount of food provided at the buffet counter. Avoid replenishing too much food during buffet hour to avoid having leftovers.

Raise staff's awareness

- Inform about circulation system
- Staff training about food estimation
- Avoid refill too much in last hour

Raise customers awareness

- Inform guests of food waste reducing principal of hotel
- Highlight : Quality is better than quantity

Figure 14: Communication measures

- c. Control the amount of food waste in regular operation

Every day, it is vital to keep track of how much food waste is thrown out after the buffet closes. Staff will have an objective perspective of the amount of food that is not being utilized by weighting the bio waste in order to determine the cause, whether it is related to food preparation or the post-customer stage.

Avoid putting more food on the buffet surface than is absolutely required, since this will reduce the amount of food left over when the buffet is closed.

Food recycling is encouraged for any leftovers. For example, instead of discarding away adorned food, use it to make new dishes. Encourage creativity in finding applicable recipes that can be recycled for the rest of the food in the buffet

4.3 Guideline to food waste management at hotel F6

According to the Cambridge dictionary, guideline is defined as "information intended to advise people on how something should be done or what something should be". In this thesis, the author will provide systematic instructions on how to minimize food waste in F6 hotel based on observations and interviews with the F6 hotel's kitchen management team in four distinctive categories: daily food waste tracking, inventory control, staff training and raise customer awareness

4.3.1 Daily food waste tracking

There is no way to properly tell how much food waste in hotel is wasting as a result of its operations and what potential cost reductions exist unless hotel do daily tracking. As previously stated, the hotel's kitchen primarily offers breakfast buffet; nevertheless, if a client needs to order meals during their stay at the hotel, the hotel partners with Finnish-based food delivery Wolt. As a result, it is primarily the responsibility of kitchen employees to track food waste on a regular basis. Based on the author's observations and the materials collected, food waste is tracked down on a daily basis.

After breakfast opening hour, weekdays from 7.00-10.00 and weekends from 8.00-11.30, food waste is sorted and collected by staffs. Once everything has been sorted, kitchen staffs weigh each of the piles on a scale and record their weights in a spreadsheet. The amount of food wasted depends on the number of guests. In general, food waste is lower on weekdays than on weekends. While the quantity of food waste reported throughout the weekdays ranges from 6 to 15 kg, the amount of food waste towards the end of the week rises dramatically to around 18 to 25 kg. According to the author's assessment, the amount of food waste generated is relatively large and many of it is preventable. This sub/chapter will discuss many approaches to minimize the food waste, such as how prep cooks should know how to accurately chop, clean, trim, and portion food, servers should always inquire about client preferences and allergies up front to avoid refires.

F6 hotel classifies waste according on its features, including biowaste, paper, cardboard and paperboard, glass, and small metal objects and general garbage. Garbage collection point is located in the basement of the hotel and is cleaned in schedule. To guarantee air hygiene, the waste collecting point provides an effective ventilation system. Schedule of waste management service is illustrated in figure.

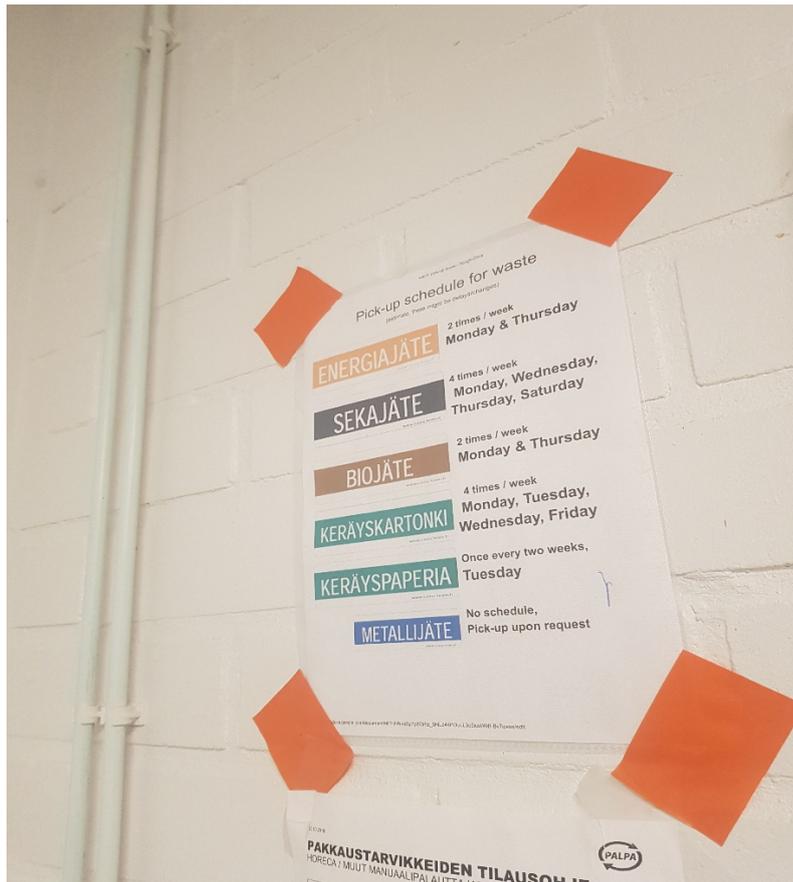


Figure 15: Pick-up schedule for waste at F6 hotel



Figure 16: Waste collecting point at F6 hotel

There are two type of food waste based on its original, including pre-customer food waste and post-customer food waste. Separate measurements should be taken for both steps producing food waste. It will provide a chance for workers to better identify the reasons of food waste and propose relevant solutions for each issue. However, currently F6 hotel's kitchen has had practices to measure separately. With medium size kitchen, it is not necessary to require complicate technique to measure exact both of them.

A simple spreadsheet is created in the pre-consumer step to keep track of the amount of food waste generated during the food production process. The main items mentioned in the spreadsheet include: name of item, reason for food waste (could be due to trimming, spoilage, or damage), quantity, and discard date. Sample for spreadsheet is mentioned below. The spreadsheet should be put near the food trash and before storage for convenience of recording and monitoring. The manager is in charge of all recording and tracking. Employees, on the other hand, should be included in the tracking process to boost efficiency. For example, if an employee generates food waste, he or she is responsible for updating the spreadsheet. The goal is to promote food waste awareness among all staff members.

Table 7: Food waste tracking spreadsheet

Month:				
Date	Food type	Loss reason	Quantity	Recorded by

4.3.2 Inventory control

Inventory control applies the FIFO (First In First Out) and FEFO (First Expired First Out) techniques. In a FIFO-compliant kitchen, inventory is ordered and cycled such that the oldest things in your kitchen are consumed first, reducing food loss due to spoilage. For example, a fish with the first expired date would be put in front of or on top of a fish with a later expired date. When new vegetables are delivered, employees must ensure that they always use the earliest delivery so that the old vegetables may be consumed first. Following the FIFO technique may cause shipments to take a little longer to unload but bringing older goods to the front of the shelves and new stock behind it will ensure that we are not wasting excellent product and tossing out leftover food merely because of our sequence of consumption.

The stock is supplied to the F6 hotel twice a week. When a delivery arrives, at least one kitchen staff member is always in charge of inspecting all of the parcels to detect if flaws in the delivery procedur. Receipts is kept in the kitchen file for convenience of checking or inventorying.

However there are still few points that need to be improved. F6 hotel should creating uniform spaces for similar items helps everyone because it is easier to find what they are looking for quickly. But even with the best of intentions, this type of organization can drift over time. For example, shelf tags or label are considered to mark the different areas. This can help workers not only know what they should expect to find there, but they will know what NOT to put in that area as well.



Figure 17: Sample of shelf tags (WebstaurantStore 2020)

Inventory should be made monthly by the manager to help adjust the quantities of their orders properly, thus they are able to avoid overstocking and produce less waste. One thing to keep in mind is to place orders depending on par levels. Par levels are the minimum amount of inventory needed to maintain demand while including a small margin of error to account for changes in daily demand. Refer to the hotel's pax list data to anticipate the par levels. Every day, the hotel's receptionist updates the pax list for the kitchen, and based on that information, the manager can roughly estimate the amount of inventory that needs be ordered, avoiding ordering too much or vegetable rotting.

Another practice that kitchen staff should keep in mind is checking temperature. This is very important during food preservation. If the temperature is too high, it will damage

vegetables and fruits faster, or the unstable temperature will make food easily spoiled. The optimal temperature for a dry goods storage is between 50- and 70-degrees Fahrenheit. (WebstaurantStore 2020)The hotter the environment, the sooner the items, particularly canned products, may deteriorate. It's a good idea to maintain a thermometer in the dry storage so staffs can always monitor the temperature and avoid rotting. Checking temperature should be done weekly and assigned to a staff member in charge. Regular temperature checks will help to promptly fix if any problems. Checking temperature should be kept track in writing and kept in a file in the kitchen.

4.3.3 Staff training

According to real observations and interviews with the F6 kitchen management team, one of the most significant aspects that plays a crucial role in the objective of minimizing food waste is the personnel. The method will fail if the personnel does not put forth the necessary effort and is unaware of the need of eliminating food waste. In other words, it is difficult to successfully minimize food waste in the restaurant industry without the participation of employees. As a result, employee training is critical for increasing staff awareness and enhancing professional abilities.

Staff training should be held on a regular basis, not just for new workers but also to for long-term staff. The content in the staff training includes the following priorities:

- Staff on stand, must determine when to provide extra food. This has a significant impact on minimizing food waste. 1 hour before the buffet ends, employees can avoid putting too much food on the counter and reducing the amount of leftover food.
- Concerning the food safety guideline, which states that no food should be left on the buffet for more than 4 hours, staff can determine which dishes are more likely to become dangerous based on their components, cooking process, and storage method on a case-by-case basis. Dishes with a higher risk of contamination can thus be withdrawn from the buffet earlier than food products with a longer shelf life. Regarding to leftover food at the buffet that is safe for humans; motivates employees to develop food recipes to reuse food for the following sitting in order to limit the quantity of food tossed out. Berries, for example, can be used as an ingredient in smoothies.
- Manager should encourage employees by observing and providing feedback, s which food items are always left on the plate and which buffet dishes require frequent replenishing. Thereby offering appropriate solutions to increase food

efficiency in accordance with the needs of customers and minimize the amount of food left over

- Most of the food waste is generated during the preparation of the buffet, such as cutting and trimming fruits. When chopping and cleaning food, many peels, skins, and seeds are discarded. Furthermore, a large proportion of salad leaves are discarded as a result of damage during delivery from the supplier or during storage. It is necessary to teach kitchen workers proper cutting and trimming skills, adapt a new technique to decrease unnecessary food waste, particularly of fruits and vegetables. Each month, observe and reward the best 'cutters' each month to encourage staffs
- It is good idea to post posters in the kitchen illustrating both positive and negative instances of food waste avoidance.

Table 8: Environment routine at F6 kitchen

Area	Routine	Target
Water	<ul style="list-style-type: none"> . Avoid rinsing food under running water . Contact reception/technician if water tap is dripping . Wash only full trays in the dish washer 	Reduce water usage with 2%
Waste	<ul style="list-style-type: none"> . Sort according to instruction: Paper, cardboard, ordinary waste and food are sorted separately 	Reduce food waste with 5%
Chemicals	<ul style="list-style-type: none"> . Dose according to instructions . Read corresponding security -data-document for risk marked chemicals . Only use chemicals of approved list 	Reduce volume of chemical use
Energy	<ul style="list-style-type: none"> . If possible always use lid when boiling . Always keep refrigerator and freezers doors closed . Turn off oven and stove when not in use . Turn off light in rooms not in use 	Reduce energy usage with 5%

	. Turn off light and air-conditional in conference after guest	
Transport	. Coordinate purchase with other departments . Minimize deliveries, larger order at a time	Reduce no.of transports with 4 per month

Aside from enhancing one's own abilities, this problem might be solved through effective teamwork and internal communication. F6's kitchen is a multi-cultural atmosphere. Communication is critical in reducing needless conflict and improving workplace effectiveness. An annual meeting should be organized to allow personnel to raise their voices if something unfortunate occurs. Managers should encourage employees to discuss ways to enhance buffet quality and the working environment.

During working hours, it is vital to establish a duty list and allocate responsibilities to each employee. It can assist all employees in comprehending the nature of their work and their allotted role. During rush hour, task assignment assists staff in better completing their jobs, allowing work to flow more easily, and avoiding task duplication. The manager or duty manager assigns tasks to the employees prior to the start of the shift. Furthermore, F6 kitchen now implements duty list paper, which describes the responsibilities in the kitchen. It not only simplifies administration, also assists new employees in visualizing the nature of their task.

To guarantee a successful working system, communication between kitchen personnel and front-of-house employees is required. The hotel may enhance its booking system by checking numbers the day before, updating kitchen staffs if something unusual occurs, and thus preparation is made to tackle the situation.

4.3.4 Raise customers awareness

Raising consumer awareness about food waste is a critical component of F6 kitchen's food waste reduction approach. One of the most successful strategies, according to the manager interview, is to communicate with consumers. One method of redirecting the customer's concentration and attention is to promote the quality of the cuisine rather than the number of things on the menu. This may be accomplished through the restaurant's marketing materials, for example, by emphasizing the chefs' culinary expertise, the originality of the cuisine, and the quality ingredients rather than merely the amount of food items on the menu". All the food in the buffet has been carefully chosen to guarantee

features such as environmental friendliness, organic food, support for local producers, and items of well-known origin. For example, Karelian pie used in hotels, is handcrafted by a small enterprise in Nurmes- central Finland or buffalo mozzarella is an Italian mozzarella made from the milk of a Mediterranean buffalo. It is a dairy product manufactured in Campania, namely in the Caserta and Salerno areas. Simultaneously, it helps consumers realize that the hotel's purpose is to reduce food waste. The staff will attempt not to refill too much food in the last half hour before the buffet closes if it is not absolutely required.

Another suggestion is to cut serving sizes to prevent plate waste. According to (Juvan,, et al., 2018) plate waste is reduced by 22% when plate size is reduced by three millimeters; waste is reduced by 7% when plate size is reduced by one centimeter. People tend to overserve on bigger plates and underserve on smaller plates because the identical servings on larger plates are perceived as insufficient while they are perceived as excessive on smaller plates. Furthermore, persons who use larger dishes assume they have eaten less than those who use smaller plates. For this reason, author suggest that reducing plate size has the ability to decrease food waste while maintaining customer satisfaction. In addition, restaurant employees should constantly be stationed near the buffet to put the food onto the guests' plates, explain the dishes and ingredients, and provide recommendations on which foods compliment each other . It will help to avoid that customer does not like a dish they takes.

Use 'nudging' strategies to encourage food waste reduction, such as displaying signs encouraging customers to come back to the buffet and help themselves more than one time, rather than take a lot of food on their plate all at once. In an experimental study conducted specifically in the context of food waste was mentioned by (Juvan & al. 2018), " the use of a table sign encouraging hotel guests with the following word: "Welcome back! Again! And again! Visit our buffet many times. That's better than taking a lot once". The aim of this sign is to prevent people from feeling embarrassed by serving themselves multiple times". The result show that Food waste is reduced by 21% as a result of the social norms intervention.

Moreover, the installation of small signage near the food display will assist in reminding guests to reduce food waste. Its purpose is to support guests in making rational choices about what to place on their plates as well as to reduce the amount of food that remains on their plates.



Figure 18: Food waste sign example (WebstaurantStore 2020)

5 Discussion

Food waste remains a problem in the food industry since it is caused by a variety of sources and is difficult to eliminate it in food production. Food waste is becoming more widespread in developed countries as people's living standards rise. It has both economic and environmental consequences for the issue. There are obstacles for food providers when it comes to food waste management.

This thesis has been researched with the goal of developing guidelines for food waste reduction at the Commissioner F6 hotel through determining the patterns and causes of food waste generation in F6 hotel. The objective of thesis is met with theoretical parts, including the causes of food waste, the impacts of food waste on economics and the environment, and the current practices when it comes to food waste prevention. In the finding, through observation and theme interviews with employees, who are directly responsible to this issue, causes of food thrown away include inefficient food production process, incorrect forecasting of the amount of food to be prepared, customers and food safety policy. In food production, the amount of salad, vegetables damaged by the preservation process, fruits peel or coffee ground accounts for a large amount of food waste. One of the suggestions given in the guidelines is to check storage temperatures regularly, use the FIFO method, or improve staffs cutting and trimming skills. The coordination between departments is extremely necessary to improve the prediction of the number of guests coming. Limiting too much food to be refilled within one hour before closing will reduce the amount of food waste being tossed away. For customers, in order to raise customers' awareness about food waste, it is necessary to put small signs near to buffet counters to remind customers about avoiding food waste.

Food waste has a significant impact on the environment and the economy. When it comes to environment, food waste will increase the amount of CO₂ released into the environment. It takes up land, natural resources (such as soil nutrients, water, and energy) for production. In addition, food waste will do economic damage and reduce revenue. For F6 hotel, the increased amount of food waste will increase the cost of waste treatment, which in turn reduces the profit of the business. On the customer side, due to the increase in operating costs, a part will directly affect the room rate, increasing the burden of accommodation expense for customers.

The aim of the thesis was achieved since through analyzing data collection from observation and theme interviews with managers, a guideline for food waste management is made. It is provided in the comprehensive aspects of daily food waste tracking, inventory control, staff training, and raise customers awareness. The results have itself necessity, usability, and high applicability in practice. The guideline is in line with the requirements of

Nordic choice sustainability regulations, improving and developing from existing measures at the hotel, adding potential measures to increase effectiveness. The guideline of food waste management is written in text, with pictures and figures illustrating detailed categories in the two main phases of food waste generation, food production and food consumption.

One of the most significant limitations of the thesis project was the lack of an implementation strategy for F6 hotel. Due to time constraints, the thesis does not contain the step of putting the guidelines into practice and monitoring the results. Further studies can be done later when F6 hotel implements the guideline of food waste reduction. The next step of the implementation plan is to keep track the record of the amount of food waste in each category of the guidelines for a fixed period. Based on the provided data, other researchers will analyze and evaluate the pro and cons, performance of the measures in guideline to add modifications for efficiency improvement.

One of the most challenging parts of the study was to access to documents related to hotel policy about environment and sustainable development goal. Because during the time this thesis carrying on, environmental coordinator of hotel is not available for author to contact. Some of the documents are confidential that are not publicly available, making it difficult to find and analyze. Moreover, due to the recent pandemic that has severely affected the economy in general and hotels in particular, some implementations have been interrupted temporarily.

For the author, the thesis project was a good learning experience. The research was a hands-on initiative that provided a chance to improve interpersonal skills. Planning, time management, personal organization, and communication abilities, all of which are highly valuable to the author, were effectively practiced and obtained. Regarding to thesis topic, author evaluated that it is a highly practical and applicable topic that is likely to develop in the future. Because the author was interested in food waste, she was inspired to work on the project consistently to get more knowledge on the problem.

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Appendices

Appendix 1. Results for observation form

OBSERVATION FORM			
No	Description	Yes	No
1	Hotel policy about food waste management	x	
	Explain: F6 hotel follow . ISO 14001 family environment management policy . Nordic Choice Hotels sustainability regulations . We-care Nordic Choice guideline . Toolkit. How to reduce the food waste in hotels		
2	Keep record of food waste daily	x	
	Explain: .After daily buffet close, the weight of bio trash is recorded before sending them to trash collecting point in basement of hotel. As observed and calculated, in weekdays the average food waste is roughly 6-15 kg, weekend from 18-25 kg. The pax amount has significant impact on the amount of food waste tossed away . Reasons of food waste at hotel: Mainly from trimming (peel, skin, seed, perishable salad leave), as well as coffee ground. However, overstocking is considering as a lead reason of food waste. Regarding post-customer, leftover food from plates counts significantly in the amount of food waste		
3	Which food is most wasted from buffet		
	Explain: . Salad leaves . Milk, juice . Breads, croissant		
4	Inventory control	x	
	Explain: . Follow FIFO method . Temperature check . Inventory 4 Times/ year		
5	Regulations for staffs	x	
	Explain: . Duty list for staffs is stored in folder		

	<ul style="list-style-type: none"> . No trimming training . No staff meeting frequently . Guideline about circulation system is put next to trash bin 		
6	Communication with guests	x	x
	<p>Explain:</p> <p>Staffs stand at point to help customers if needed, communication is implemented smoothly during hour, however if rush hour, the communication might be missing between guests and staffs.</p>		