



**EVALUATION OF  
CUSTOMER-PRODUCED WASTE IN  
PIRKANMAA REGION RAX BUFFET  
RESTAURANTS**

Mia Lepaus

Bachelor's thesis  
May 2012  
Environmental Engineering

TAMPEREEN AMMATTIKORKEAKOULU  
Tampere University of Applied Sciences

## TIIVISTELMÄ

Tampereen ammattikorkeakoulu  
Ympäristötekniikan koulutusohjelma

MIA LEPAUS:

Asiakkaiden tuottaman jätteen arvioiminen Pirkanmaan Rax Buffet -ravintoloissa

Opinnäytetyö 37 sivua, josta liitteitä 2 sivua  
Toukokuu 2012

---

Tämä opinnäytetyö arvioi asiakkaiden tuottaman jätteen määrää ja laatua Pirkanmaan Rax Buffet -ravintoloissa. Ravintoloita on Pirkanmaalla kolme; Hämeenkadulla, Koskikeskuksessa ja Ideaparkissa. Rax Buffetissa asiakkaat saavat syödä ja juoda niin paljon kuin haluavat ja täten myös heittää pois niin paljon kuin haluavat. Ruoka haetaan buffetpöydästä ja astiat sekä ruoantähteet palautetaan ruokailun jälkeen palautuspisteeseen.

Työn tarkoitus oli tutkia asiakkaiden tuottamaa jätettä lajittelemalla paikan päällä. Jäte lajiteltiin ruoka- ja jätelajeittain kolmeentoista ryhmään ja punnittiin jätekoostumuksen ja määrän selvittämiseksi. Vertailua kolmen ravintolan välillä tehtiin mahdollisten erojen löytämiseksi. Lajittelun tulokset esitetään grammoina per asiakas. Todellisia myyntilukuja ja asiakasmääriä ei julkaista tässä työssä, ainoastaan verrannolliset asiakasmäärät.

Opinnäytetyön tulosten mukaan asiakkaat tuottavat keskimäärin noin 80 grammaa jätettä ravintolakäyntinsä aikana. Jätteestä 70 grammaa on biojätettä ja 10 grammaa sekajätettä. 40 grammaa eli puolet asiakkaan tuottaman jätteen määrästä on syömäkelpoista.

Noin 90 % kaikesta poisheitetystä sekajätteestä lajitellaan lajitteluohjeen mukaan sekajäteastiaan kaikissa kolmessa ravintolassa. Biojätteen erottelussa todettiin ravintolakoh-  
taisia eroja. 87 % biojätteestä lajitellaan oikein Hämeenkadulla, 75 % Ideaparkissa ja 71 % Koskikeskuksessa.

## ABSTRACT

Tampereen ammattikorkeakoulu  
Tampere University of Applied Sciences  
Environmental Engineering

MIA LEPAUS:

Evaluation of Customer-Produced Waste in Pirkanmaa Region Rax Buffet Restaurants

Bachelor's thesis 37 pages, appendices 2 pages

May 2012

---

This thesis surveys the waste produced by customers of Rax Buffet restaurants in the Pirkanmaa region. There are three Rax Buffet restaurants in Pirkanmaa; Hämeenkatu, Koskikeskus and Ideapark. At Rax Buffet, customers may eat and drink as much as they want, and essentially throw away as much as they want. Customers take food from a buffet table and when they have finished eating, they take leftovers and dishes are taken to a collection point.

The aim of this work was to study customer-produced waste. Waste was sorted by hand and weighed to find out the mass and composition of the customer-produced waste. A comparison between the three restaurants was made to see if there is any difference.

The results are presented as grams of waste per customer. The total number of customers and amount of waste are not published.

On average, customers produce about 80 grams of waste each visit to a Rax Buffet restaurant. Of this, 70 grams is bio waste and the remaining 10 grams is mixed waste. 40 grams of the discarded waste is edible.

Around 90 % of all the mixed waste thrown away is correctly deposited in the mixed waste bin in all three restaurants. Where the correct sorting of bio waste is concerned, there are some differences between the restaurants: 87% is correctly sorted in Hämeenkatu, 75% in Ideapark and 71% in Koskikeskus.

---

Key words: restaurant, bio waste, customer, source separation

## CONTENTS

1	INTRODUCTION .....	6
2	RAX BUFFET .....	7
3	WASTE LEGISLATION .....	10
3.1	Directive 2008/98/EC of the European Parliament and of the Council.....	10
3.1.1	Waste Hierarchy .....	11
3.2	Finnish Waste Act 2011/646.....	12
3.3	Tampere and Lempäälä general waste management regulations.....	13
4	STUDY OF WASTE SEPARATION .....	15
4.1	Landfill sites .....	15
4.2	Rax Buffet.....	16
4.2.1	Methods.....	16
4.2.2	Waste types .....	18
4.2.3	Non-preventable waste.....	20
4.2.4	Calculations.....	20
4.2.5	Error .....	21
5	RESULTS.....	23
5.1	Total masses of waste per customer .....	23
5.2	Sorting the waste according to their origin.....	24
5.3	Correctly separated waste .....	27
5.4	Mass of edible waste.....	28
6	FACTORS THAT AFFECT CUSTOMER-PRODUCED WASTE .....	30
6.1	Food quality .....	30
6.2	Customer behavior.....	31
6.3	Staff.....	32
7	DISCUSSION .....	33
	REFERENCES.....	35
	APPENDICES .....	36
	Appendix 1. Waste types collected in Rax Buffet restaurants. ....	36
	Appendix 2. Suggestion for waste separation instructions for customers.....	37

## ABBREVIATIONS AND TERMS

Collection point	Sorting point for customers to return and sort their dishes, leftovers and other waste.
HSY	Helsingin seudun ympäristöpalvelut, Helsinki Region Environmental Services Authority.
Recycle	Reprocessing waste materials into products, materials of substances for the original or other purposes.
Re-use	Using products or their components again for the same purpose for which they were conceived.
YTV	Pääkaupunkiseudun yhteistyövaltuuskunta, Capital region's cooperation delegation until 2010

## 1 INTRODUCTION

Waste management is an important part of operations for any restaurant. Waste is generated both by staff and customers in the form of packaging materials, waste from the cooking process, leftovers and products used. Waste management is especially important for all-you-can-eat restaurants where customers may eat and drink as much as they want – and thus throw away as much as they want. Pizza is the most known product of the Rax Buffet concept. The name of the chain was changed in spring 2012 from Golden Rax Pizzabuffet to Rax Buffet.

This thesis focuses on the waste produced by customers in Pirkanmaa region Rax Buffet restaurants. Relevant legislation is explained as well as the concept of waste hierarchy and the possibilities to follow it in Rax Buffet restaurants. The main part of the thesis studies the composition of waste produced by customers and analyses if the waste masses could be reduced.

References used are mostly concerning waste legislation and from similar studies done. Most of the practical examples concerning Rax Buffet are based on the author's know-how and experience from working for the restaurant chain for several years.

Total amounts of waste and total number of customers are not published in this thesis.

## 2 RAX BUFFET

Rax Buffet was established in 1994. It is a Finnish chain of all-you-can-eat buffet restaurants. All Rax Buffet restaurants are owned by the chain and each is run by an accountable restaurant manager. See Figure 1 for the organizational diagram of Rax Buffet. In 2012, there are 26 Rax restaurants around Finland. The scientific part of this thesis concerns Pirkanmaa region restaurants. There are two in Tampere, one on Hämeenkatu and one in Koskikeskus and one in Lempäälä, Ideapark.

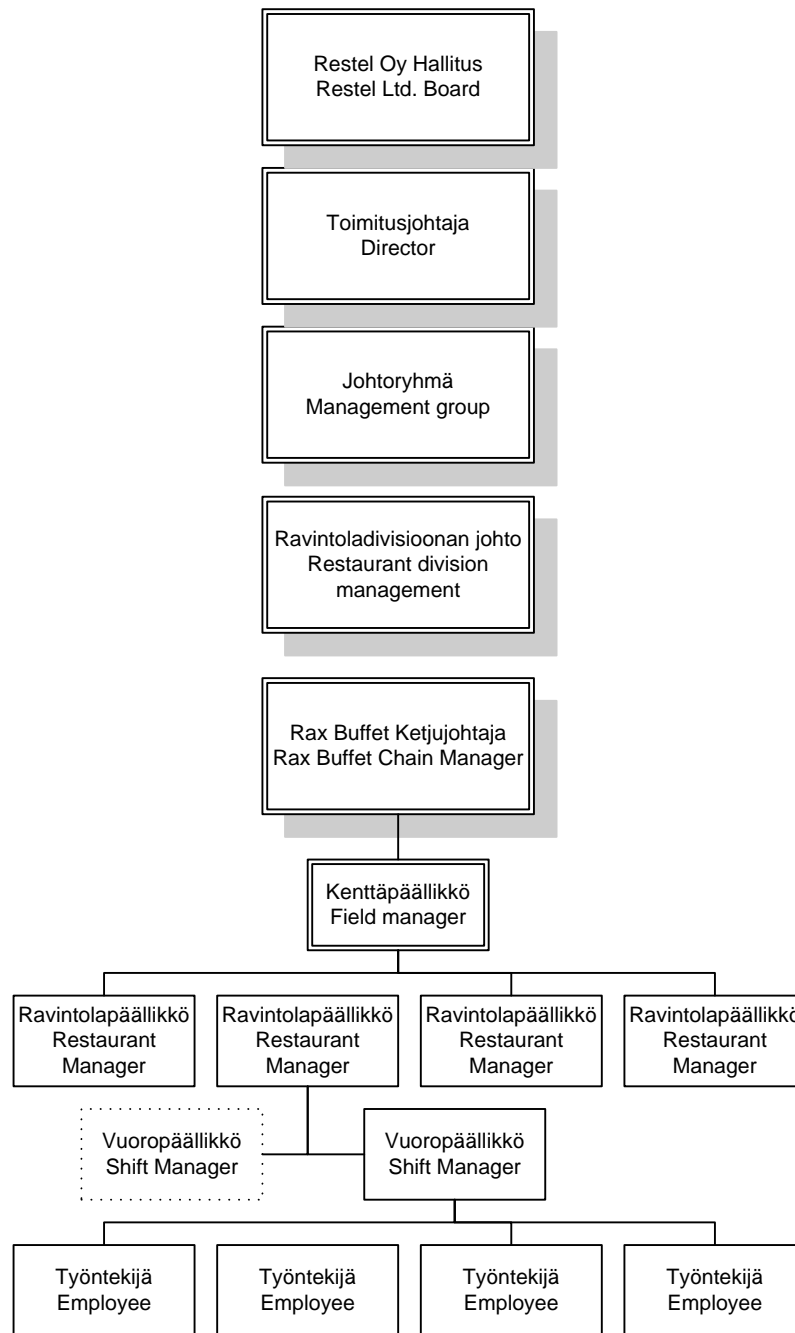
For an affordable price, customers may eat and drink as much as they want for the duration of their stay. Food products include pizza, lasagna, cream potato casserole, wieners, meat balls, onion rings, chicken wings, bread, soup and a broad salad table consisting of 23 vegetables, dressings and other salad ingredients. Soft drinks, water, milk, a selection of coffees and ice-cream are served.

A restaurant visit of a customer is mostly self-served. When entering, customers pay for their meal and drinks and choose a table for themselves. They then proceed to choosing food and drink from respective tables and stands. Customers eat and drink as much as they like for the duration of their stay. By the end of their visit, customers are expected to take their plates, cups, leftovers and other waste produced to a collection point.

The collection points in every restaurant are different. In Hämeenkatu there are two collection points, both with two containers for mixed waste and one for bio waste.

Koskikeskus used to have one bio and one mixed waste and now they have one bio and one mixed waste container and one extra container for hand towels but it is commonly mistaken for a mixed waste container. Ideapark has one mixed and one bio waste container.

Rax is a part of Restel. Restel Consolidated is the leading hotel and restaurant business in Finland. Restel owns over 200 hotels and restaurants and has a staff of about 5000 employees. Restel is a part of the cooperative group Tradeka. Figure 2 presents the organizational diagram of Restel. (Restel, 2012)



**FIGURE 1 Organizational diagram of Rax Buffet**



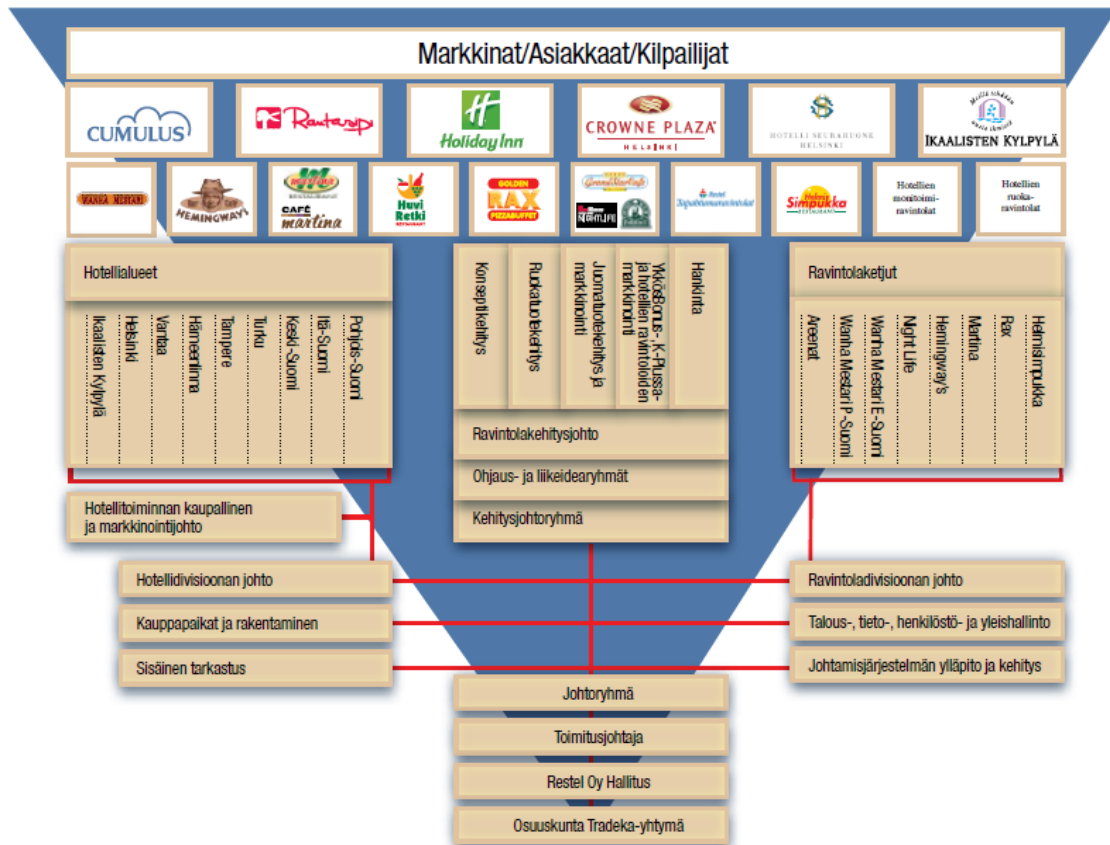


FIGURE 2 The organizational diagram of Restel (Restel, 2010)

### 3 WASTE LEGISLATION

Waste management plays an important role in any restaurant's operations. Waste in a restaurant can be roughly categorized to two parts: waste produced by customers and waste produced by staff.

Depending on the type of restaurant, customers produce different kinds of waste. In Rax Buffet, customers generate bio waste in the form of food leftovers and napkins. In addition to that, disposable cups, plastic spoons, straws and lids are waste, as well as receipts. Customers may also throw away waste that does not originate in the restaurants, such as candy wrappers, plastic bags and bubble gum.

Staff produces amounts of waste during each shift. Bio waste is generated when food products are thrown away because of lack in quality, e.g. when products have gone bad, fallen on the floor or have been served on the buffet table for too long. Due to continuous hand washing, a lot of hand towel waste is produced. Despite hand washing, tens of disposable gloves are thrown away daily. Products from distributors are packed in cardboard or plastic and are waste after opening.

Waste management is especially vital for Rax Buffet restaurants since customers may eat and drink as much as they want – and essentially throw away as much as they want. This kind of waste production is to be discouraged and some measures have already been taken, but still due to large waste masses, more instructions are needed, such as improved sorting instructions for customer waste separation.

#### 3.1 Directive 2008/98/EC of the European Parliament and of the Council

EU directives are guidelines or goals put up by the European Parliament and the Council. They may concern one or more member states. Member states are obliged to adapt their own laws in order to meet the goals set by the directives. A time frame is given during which the national laws must be adapted. Therefore directives are not laws *per se* but they do set the goals to be reached. (European Commission departments, 2011)

Directive 2008/98/EC on waste was issued December 12<sup>th</sup> 2008 and was given a transition period of two years, until December 12<sup>th</sup> 2010. As stated by the first article of the directive:

This Directive lays down measures to protect the environment and human health by preventing or reducing the adverse impacts of the generation and management of waste and by reducing overall impacts of resource use and improving the efficiency of such use. (2008/98/EC)

Directive 2008/98/EC is not the only EU legislation related to waste, though it is the only one discussed in this work. Directive 2008/98/EC provides the framework for waste management and is the most relevant one considering the waste management practices of a restaurant like Rax Buffet.

### **3.1.1 Waste Hierarchy**

According to the Directive 2008/98/EC of the European Parliament and of the Council, the so called waste hierarchy should be followed when making waste management legislation and policy. The hierarchy shows in which order measures should be taken in waste management. (2008/98/EC)

The priority in waste management and legislation should lie in preventing the production of waste. If waste is produced, it should in first hand be re-used and on second hand recycled. If this is not possible, the waste should be recovered. This usually means the waste is used as an energy source. Only in the case of none of the mentioned options being viable should the waste be disposed of. (2008/98/EC)

However, the Directive states that it is of importance to look at the overall environmental benefits gained from following the waste hierarchy. Life-cycle thinking is encouraged and if necessary, member states may depart from following the waste hierarchy. (2008/98/EC)

Figure 3 presents the waste hierarchy in the form of a triangle. The top-most priority, and the biggest area in the triangle, lies in waste prevention. The last resort and the smallest area in the triangle are for waste disposal. (2008/98/EC)



**FIGURE 3 Waste hierarchy (European Commission departments)**

### 3.2 Finnish Waste Act 2011/646

On June 17<sup>th</sup> 2011 the new Waste Act 646/2011 was accepted by Finnish Parliament and the President. It repeals the former Waste Act 1072/1993 and Waste Decree 1390/1993. The new act will come into force May 1<sup>st</sup> 2012. (2011/646)

The new waste act was made in order to update the law to current standards, such as pressure from environmental and political viewpoints and to implement the requirements set in EU directive 2008/98/EC. (Levinen) In addition to the waste act, nearly 30 decrees or government decisions will come into effect during the year 2012 and 2013. (Ympäristöministeriö)

Another reason for the need for an update is that the amount of waste produced in Finland has not decreased as expected and the reuse and recycling of materials has not met the set targets. (Ympäristöministeriö)

The new waste act introduces some changes compared to previous waste legislation. More emphasis is put on following the waste hierarchy. Those working within waste management will be more closely supervised and tracked, as well as having their responsibilities specified. Some waste related terms are submitted to change, such as ‘hazardous waste’ (*ongelmajäte*) now being called ‘dangerous waste’ (*vaarallinen jäte*). Recycling requirements will be stricter and disposal in landfills will be restricted. Producer responsibility will be expanded. (Ympäristöministeriö)

About 30-40% of municipal waste comes from industry that is not a part of the public sector. It is the traders' responsibility to manage their waste. If no other service provider exists, it is the municipalities' responsibility to offer waste management services to industry. (Ympäristöministeriö)

In previous waste legislation producer responsibility is only partial. Producers were obliged to utilize their packaging waste used in industry. The new waste act expands that responsibility to include also consumer packaging waste. Until now, the municipalities were responsible for managing consumer packages and funded this activity through municipal waste fees. Producers will fund their utilization by raising package prices. Producers must make sure that 61% of packaging waste is utilized and that targets set with decrees are met. (Ympäristöministeriö)

By updating the waste legislation, the following targets are hoped to be met by 2016: improved material efficiency and less waste; Finnish waste management to be on the level of the most advanced countries in EU; to have a versatile selection of waste treatment options; at least 50% of municipal waste is recycled or biologically treated; unrecyclable waste is recovered for energy purposes; and only small amounts of waste are disposed of in landfills. (Ympäristöministeriö)

### **3.3 Tampere and Lempäälä general waste management regulations**

Municipalities give regulations based on the waste act 2011/646. The regulations are mostly similar to each other though regional differences do occur. The regulations specify for example what colored waste bins to use for each waste type, how often to empty the bins and where the waste is treated. (Tampereen Kaupunginvaltuusto, 2005)

Tampere and Lempäälä have the same regulations concerning what waste types need to be sorted and collected at properties. For properties that are not households, such as office, business or industrial properties waste separation and collection must be arranged for card board, glass, metals and bio waste if they exceed 20 kilograms in a

week. Also other waste types must be collected if authorities require it. Mixed waste must always be collected. (Tampereen Kaupunginvaltuusto, 2005)

According to the Waste Act 2011/646 the responsibility of organizing waste management lies with the person or organization in possession of waste. Municipalities are responsible for organizing the waste management itself, i.e. transport and treatment while households and businesses must take care of delivering their waste to designated bins. Businesses handling waste that is not classified as municipal waste are responsible for organizing waste management for such waste. (Suomen Yrittäjät) Rax Buffet waste is classified as municipal waste.

## 4 STUDY OF WASTE SEPARATION

The main point of the thesis process was to investigate customer-produced waste. The aim was to find the mass and quality of waste customers generate as well as seeing how waste separation is implemented. It was also of interest to see how much waste is unnecessary, i.e. edible. Based on the results the restaurants learn about the composition and masses of customer-produced waste.

Waste sorting research done at landfill sites in around Finland were used as a sort of reference base for the research though this research was conducted in a smaller scale.

### 4.1 Landfill sites

Waste sorting research has been made at various landfill sites in Finland. Landfill sites research incoming waste in order to know the composition and masses of it. These types of research are done nearly yearly in Finnish landfill sites. (Jonsson, 2012) Source-separated waste research has been made in the following landfill sites to mention a few: Pirkanmaan jätehuolto Oy in 1998, 2008, 2010 and 2011, Metsäsairila Oy in 2009, Jätekkukko Oy in 2008 and YTV (HSY) in 2007 (Jonsson, 2012)

Common for the waste sorting studies mentioned above is that the waste researched is mixed waste mostly from households. Metsäsairila (2009) also studied energy waste. Batches from incoming loads were studied by first dumping the load and then taking 400-600 l batches that would represent the load as well as possible. The batches were sorted by hand into predetermined groups. The waste groups were weighed and results analyzed. (Jonsson, 2012)

Differences in the research are how many groups the waste was sorted into (varied from 17 to 33 groups). Also the choosing of loads differed. Some studies used random loads while others used loads coming from specific areas. Also the purpose of the studies varied; some land fill sites were interested in the metal content of mixed waste while others studied how different residential areas sorted their waste. (Jonsson, 2012)

## **4.2 Rax Buffet**

The waste sorting study was implemented by following the framework set by similar research done in landfills. Restaurants subject for the study were in Hämeenkatu, Koskikeskus and Ideapark. In the restaurant, the mixed waste and bio waste containers used by customers were examined to find out the amount and composition of customer-produced waste.

### **4.2.1 Methods**

Pirkanmaa region Rax Buffet restaurants were visited at randomly selected occasions. Mixed waste and bio waste containers were taken from the collection points and taken to the kitchen or back room for examination. The waste samples were mostly from about three hours of collection with the exception of a few batches from longer time periods. The mixed waste was emptied onto a large plastic bag to protect the floor. The waste was then divided into piles (Figure 4) based on predetermined group division (see Table 2). When all waste was sorted, it was weighed using a weighing scale (Figure 5) with 1g accuracy. Results were recorded on paper and later transferred to an Excel worksheet for further processing. The same was done for bio waste.

To make the weighing results comparable, they were calculated as grams of waste per customer. Every customer is only given one drinking cup. The number of customers was calculated using the number of cups in the waste sample.





**FIGURE 4 Bio waste sorting in Rax Buffet Hämeenkatu. In clock-wise order starting at bottom left: coffee cups, ice-cream waffles, chicken wings, pizza, napkins, products from heating table, products from cooling table, bread, cups, spoons.**



**FIGURE 5 Weighing scale**

#### 4.2.2 Waste types

Each Rax Buffet restaurant has different kinds of waste management regulations, depending on the property. Nearly all restaurant spaces are rented though a few are owned by Restel (e.g. Rax Hämeenkatu property). Typically tenants have less say in property matters than owners.

All Rax Buffet restaurants collect mixed waste, bio waste and cardboard. In addition to that, some restaurants collect paper, metals, and glass and energy waste. Waste collection information was gained through emails and phone calls to respective restaurants. (Appendix 1)

Though several types of waste are collected in the restaurants, customers do not have the chance to sort into more than two types; mixed waste and bio waste. The only exception is Lahti Pizza Buffet where customers sort their waste into bio waste and energy waste. Though also other restaurants collect energy waste, only staff may sort it. Customers sort into mixed waste because the restaurants cannot ensure that the waste is purely energy waste (Setälä, 2012) In addition to the waste types mentioned, restaurants dispose of drink leftovers into the sewer.

Waste produced by customers includes food leftovers, napkins, cups and possibly straws, lids and receipts. In addition to that, customers may have waste of their own with them such as candy wrappers.

The waste was sorted into groups depending on the type or origin of the waste. Most waste was sorted by type, meaning that it was the only waste in that group. Some waste was sorted according to the origin of the waste, meaning that all waste coming from a certain place was grouped together. These types of waste were waste from the cooling table and waste from the warming table. The waste groups and their respective waste types are presented in Table 2.

All Rax Buffet restaurants generate roughly the same types of waste. Minor differences may be due to e.g. special food products served.

Table 2 presents waste types that customers produce. All waste products are grouped separately except food products from the heating table (warm products) and cooling

table (cold products). Ice-cream waffles include the waffle and possible ice-cream leftovers. Figure 6 shows chicken wings and Figure 7 cold products.

**TABLE 1 Groups into which waste was sorted and corresponding waste types**

<i>Groups</i>	<i>Type of waste</i>
Bread	Bio waste
Warm products*	Bio waste
Pizza	Bio waste
Cold products**	Bio waste
Napkins	Bio waste
Chicken wings	Bio waste
Tee bags	Bio waste
Ice cream waffle	Bio waste
Coffee cups	Mixed waste
Lids	Mixed waste
Cups	Mixed waste
Straws	Mixed waste
Disposable spoons	Mixed waste

\*Warm products mean products from the heating table (onion rings, meat balls, wieners, lasagna and cream potato casserole) excluding chicken wings and soup. During 2.-29.4 warm products also include tortillas, tacos, criss cuts and minced meat-bean mix.

\*\*Cold products mean products from the salad table (a variety of 23 vegetables, fruits, dressings and other toppings).



**FIGURE 6 Chicken wings**



**FIGURE 7 Cold products**

### 4.2.3 Non-preventable waste

Some waste is bound to be produced. Disposable products include cups, coffee cups, straws, lids, spoons, tooth picks and napkins. Not every customer uses all products mentioned but typically at least a few are used.

Concerning food waste, chicken wing bones are non-edible but otherwise a zero waste policy is possible in theory. However, some food waste is still bound to be produced. Customers may throw away food because they do not like it, if they are full or simply because they can.

### 4.2.4 Calculations

Results were calculated as total amounts of bio waste found in both bio waste and mixed waste containers, and likewise for mixed waste. The total amounts were divided by number of customers. The number of customers was defined by how many cups there were present in each sample.

*Total bio waste:*

$$\frac{\text{bio waste in bio waste container}(g) + \text{bio waste in mixed waste container}(g)}{\text{number of customers}}$$

*Total mixed waste:*

$$\frac{\text{mixed waste in bio waste container}(g) + \text{mixed waste in mixed waste container}(g)}{\text{number of customers}}$$

The composition of waste is calculated as mass of waste type divided by the number of customers.

The mass percentage of correctly separated waste was also calculated. It is calculated separately for bio waste and mixed waste and shows how many percent of both waste types were correctly separated, meaning according to Table 2.

$$\text{Correctly sorted waste} = \frac{\text{Mass of correctly separated waste}}{\text{Total mass of waste}} \times 100\%$$

To calculate edible waste, the mass of all food products excluding chicken wing bones were divided by the number of customers.

$$\text{Edible waste} = \frac{\text{Food waste} - (\text{chicken wings} \times 5\%)}{\text{number of customers}}$$

Waste that does not originate in the restaurant, such as candy wrappers, was left out of the calculations.

#### **4.2.5 Error**

There is a possibility of error in the calculations. The number of customers may not be exact due to not all cups being present in the batches. Customers may have taken their cups with them when leaving the restaurant, or customers may have taken some waste to the bins before finishing their meal and throwing their cups away. It is assumed that this type of customer behavior is somewhat similar in all Rax Buffet restaurants and therefore the results are reliable enough and comparable. The results are roughly rounded due to this possibility of error.

Another small factor that might affect the results is staff. In case of customers not sorting their waste but instead leaving everything on the table, it is the staff's job to clean up. Staff either takes dishes and leftovers to the kitchen to be sorted into staff waste containers or to the collection points where everything is sorted into the customer bins.

In order to avoid these types of errors, a whole day's batch of waste should have been needed to weigh at the end of each day and compare with how many meals had been sold during the day. This type of data gathering would have demanded a lot of resources. It was decided that results gained from the simpler method are comparable with each other and reliable enough.

Also to reach even more reliable results it would have been necessary to take samples throughout the year. In this study, samples from a time period of about a month were used.

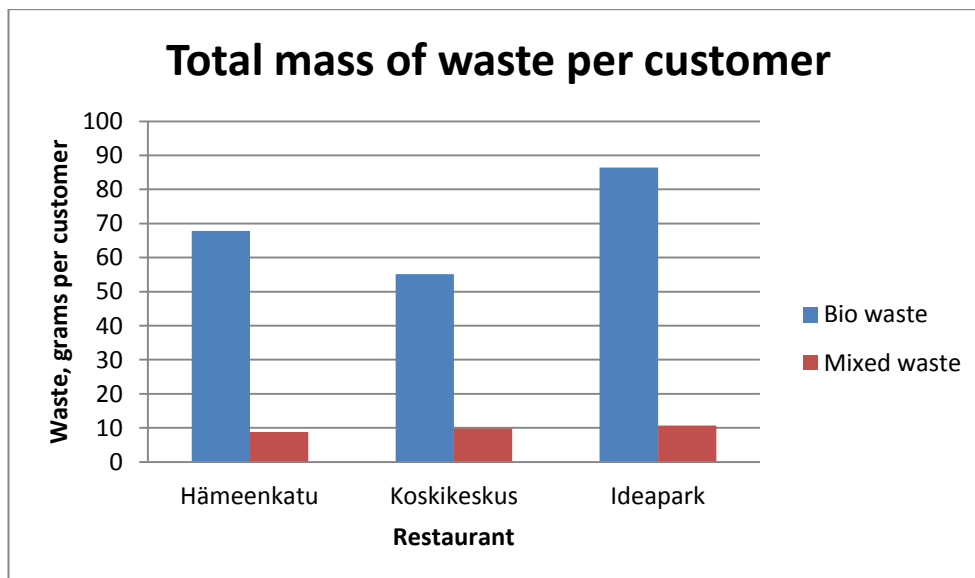
## 5 RESULTS

Results obtained in the sorting study are presented in this section. Total waste masses and number of customers are not published. Results are presented as waste composition and as grams of waste per customer.

### 5.1 Total masses of waste per customer

As seen in Graph 1, customers produce more bio waste than mixed waste in all Pirkanmaa Rax Buffet restaurants. Roughly 10 grams of mixed waste per customer are produced in all three restaurants. Bio waste masses per customer vary more than mixed waste.

According to the study, Koskikeskus customers produce the least amount of bio waste, with 55 grams per customer. Hämeenkatu customers produce 68 grams per customer and Ideapark 86 grams per customer.



**GRAPH 1 Total mass of waste produced per customer in Pirkanmaa region Rax Buffet restaurants**

A significantly larger amount of bio waste is being produced than mixed waste. It should be kept in mind, when comparing units in grams of waste produced per custom-

er the masses are expressed by fresh mass content, not the dry mass content, therefore bio waste tends to weigh more than mixed waste due to the water content.

The results of mixed waste produced do not vary very much between the different restaurants. This can be explained by the limited availability of mixed waste products. Customers are only given one drinking cup per meal purchased. The number of coffee cups, lids, straws and plastic spoons for customers is not restricted. According to the results of the study, the total mass of mixed waste is about the same, suggesting similar consumer patterns in all restaurants.

## 5.2 Sorting the waste according to their origin

The waste was sorted into groups depending on the type or origin of the waste. Table 3 presents how many grams of each waste group was produced per customer in respective restaurants.

**TABLE 2 Grams per waste group produced by customers in Rax Buffet restaurants in Pirkanmaa region**

<i>Waste groups</i>	<i>Hämeenkatu</i>	<i>Koskikeskus</i>	<i>Ideapark</i>	<i>Average</i>
Chicken wings	21,86	19,48	24,67	22
Pizza	18,44	12,41	31,31	20,72
Napkins	9,03	10,53	7,73	9,1
Cold products	8,64	5,6	12,4	8,88
Cups	5,95	7,23	7,22	6,8
Warm products	6,91	3,82	6,22	5,65
Ice-cream waffles	1,72	2,73	2,55	2,33
Coffee cups	2,09	1,64	1,21	1,65
Spoons	0,57	0,75	2,04	1,12
Bread	1,08	0,46	1,6	1,04
Lids	0,07	0,13	0,14	0,11
Tee bags	0,09	0,09	0	0,06
Straws	0,08	0,05	0,03	0,05
Receipts	0,04	0,05	0	0,03
Total	76,57	64,97	97,12	79,54



According to results of the study, only small masses (less than one gram per customer) of lids, receipts, straws and tea bags are produced.

Lids and straws are given to small children when parents pay for the meal. For other customers, they are only available upon request. This minimum use of straws and lids probably contributes to the small amount of them ending up as waste. Their small mass also explains why such a small mass is presented in Table 3.

The small mass of receipts is explained by receipts given to customers ending up in other places. Some customers do not want a receipt, in which case it ends in the bin staff uses by the cash desk. Other customers place receipt in their pockets or wallets and the rest ends up in the collect points.

The small mass of tea bags presented can be explained by tea simply being a less popular beverage than the coffee selection.

The waste types which an average customer produces more than one gram of are presented in Graph 2. As seen in Graph 2, pizza and chicken wings are clearly the dominant waste groups produced by customers.

Over 30 grams of pizza per customer are produced in Ideapark, around 18 grams in Hämeenkatu and 13 grams in Koskikeskus. On average one pizza slice weighs about 50 grams. Mostly the pizzas sorted were only the outer edges of a pizza though some whole slices were present as well. Pizza is the most known of the Rax Buffet concept. The name of the chain was changed in spring 2012 from Golden Rax Pizzabuffet to Rax Buffet.

On average, the mass of one pizza slice is about 65 grams. According to the study, Ideapark customers throw away about half a slice of pizza while Hämeenkatu and Koskikeskus customers throw away a bit less.

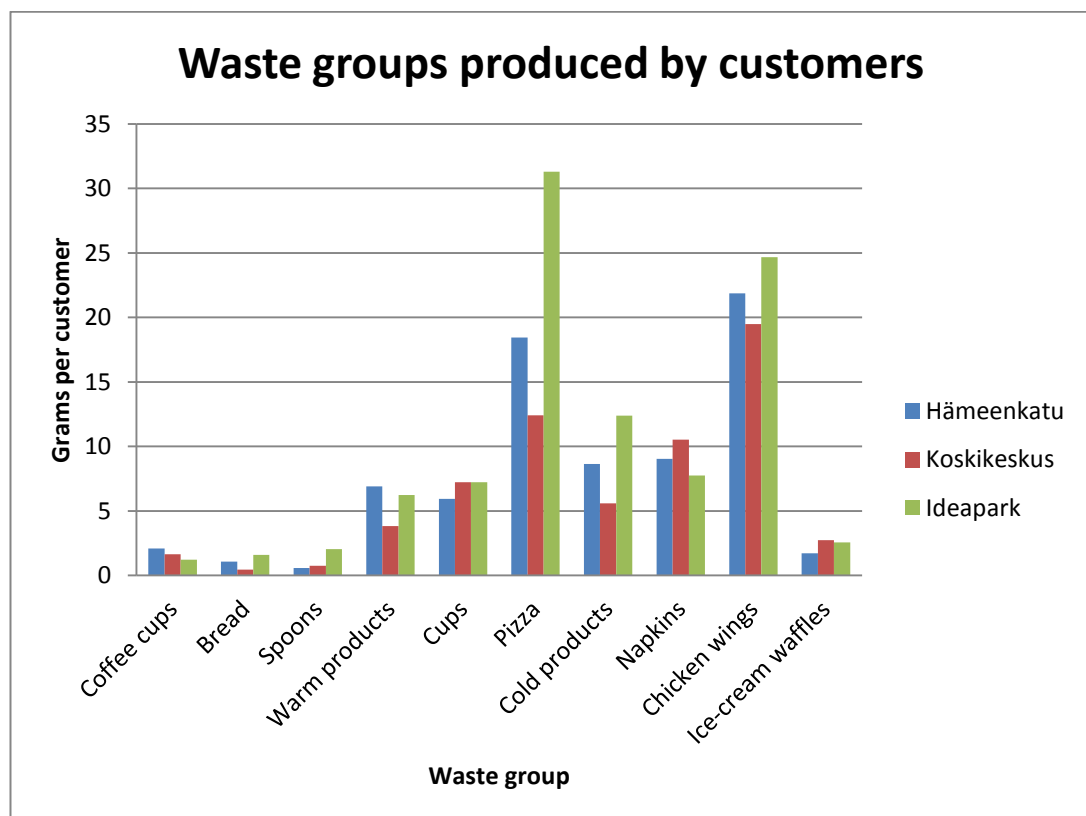
Chicken wings account for about the same amount of waste as pizza. By mass, chicken wings are mostly bone and partly meat. This leads to a large amount of waste caused by the wings. During the study it was found that part of the wings thrown away were meatless while most still had meat on them or had not been eaten from at all.

On average 9 grams of napkins are produced per customer. The mass presented might be somewhat misleading due to the fact that napkins absorb moisture, increasing their mass.

Cold products are a combination of all food products originating in the cooling table (a variety of 23 vegetables, fruits, dressings and other toppings). They account for about 9 grams per customer.

Warm products account for around 5 grams of waste created per customer.

The variety between ice-cream waffles in different restaurants is not significant. The waffle is edible but all customers do not like its taste and may throw it away. Some customers may take the waffle with them which cannot be prevented though it is not allowed. These factors may affect the mass of waffles in the waste batches.



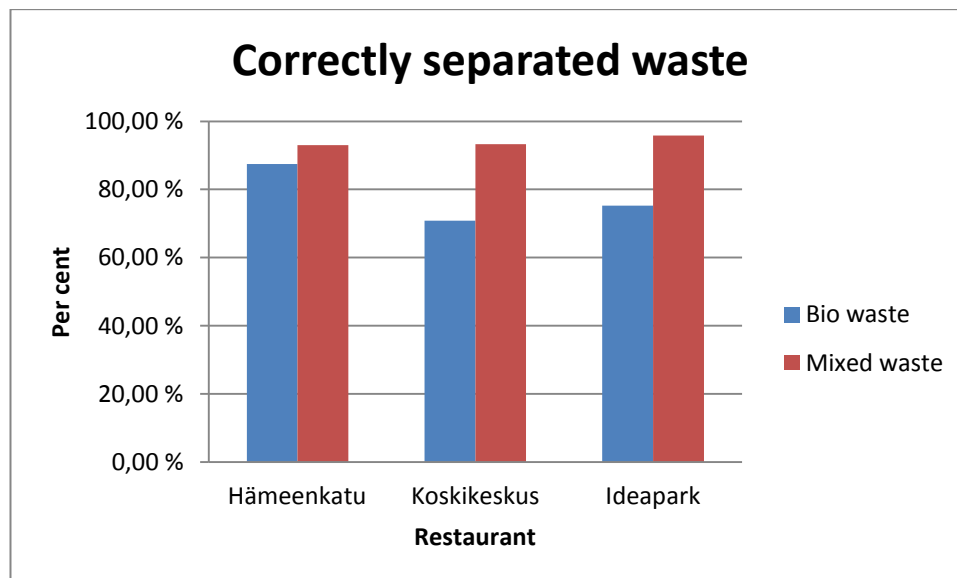
**GRAPH 2 Grams per waste group produced by customers in Rax Buffet restaurants in Pirkanmaa region**

### 5.3 Correctly separated waste

One of the aims of the thesis was to find out how efficiently customers separate their waste. As mentioned, Rax restaurants have collection points for dishes, beverages, mixed waste and bio waste. The amount of bio waste found in bio waste containers was divided by the total amount of bio waste in both bio and mixed waste containers. The same was done for mixed waste.

Graph 3 presents how successfully customers separate their waste considering the waste sorting instructions. The percentage of mixed waste correctly sorted is around 90% for all restaurants. The results suggest that nearly all mixed waste produced ends up in the appropriate container.

Bio waste is not as appropriately sorted as mixed waste. Hämeenkatu customers seem to be more careful sorters concerning bio waste. 87% of all bio waste disposed of ends up in the right container. 75% of the bio waste customers produce in Ideapark is correctly sorted while the rate is 71% in Koskikeskus.

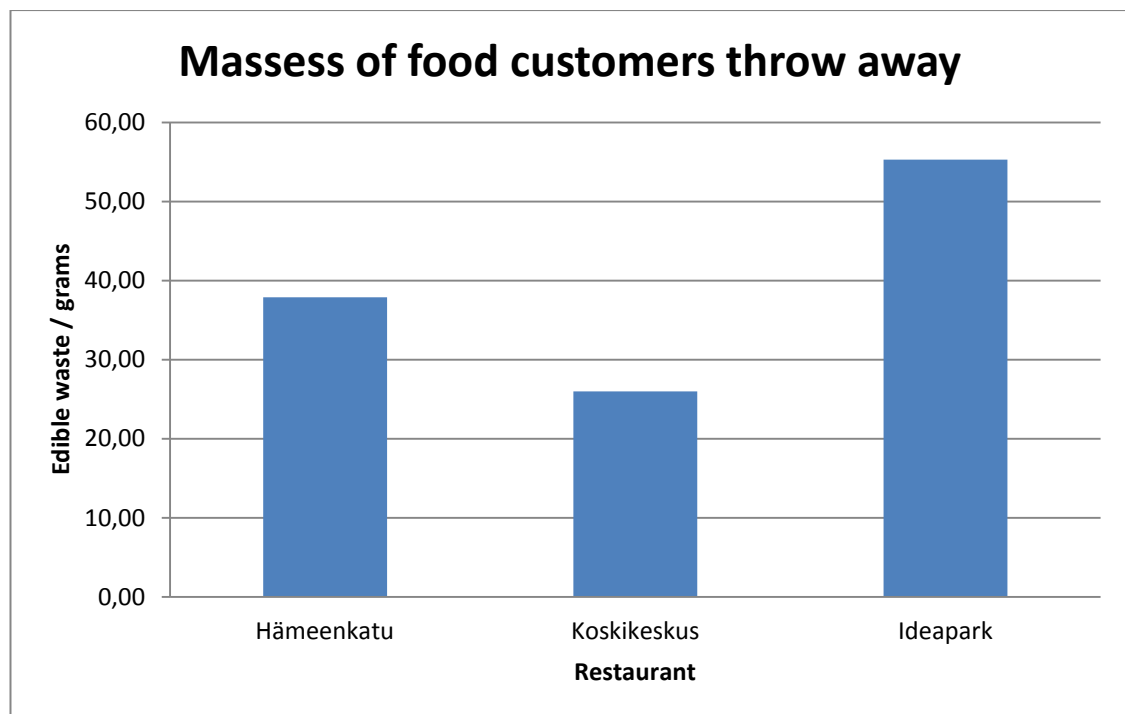


**GRAPH 3 Correctly separated waste, mass percentage**

#### 5.4 Mass of edible waste

One of the targets of this work was to find out how much unnecessary, in this case edible, waste is generated by customers.

In this study, edible waste was calculated as the mass of all food waste thrown away, with the exception of chicken wings. When sorting and weighing the waste it was observed that the chicken wings mostly were eaten from but most still had some meat on them and some had not been eaten from at all. Some of the chicken wings had been fully eaten so that only bone was left. On average, chicken wings served at Rax Buffet is 30% meat and 70% bone (Mattsson, 2012). The bones and meat were not separately weighed during the study. It was estimated that out of the total weight of chicken wings, 5% was edible.



**GRAPH 4** Masses of food customers throw away

As seen in Graph 4, tens of grams of food are thrown away per customer. According to the study, the least amount of food waste, 26 grams, is generated in Koskikeskus. Respectively 38 grams are generated in Hämeenkatu and 55 grams in Ideapark. On a yearly level this means several hundred kilograms of food wasted. Assuming that similar amounts of food are thrown away in all Rax Buffet restaurants this sums up to tens of thousands of kilograms of food thrown away. From an environmental viewpoint this

means unnecessary transportation emissions, packaging materials and food. Not to mention all resources used in the production of the foods.

## 6 FACTORS THAT AFFECT CUSTOMER-PRODUCED WASTE

There are several factors which affect the rate of waste being produced by customers, both the type of waste being produced and the mass of it.

### 6.1 Food quality

Food quality is of great importance when judging which factors affect the amount of food ending up in customer waste bins.

Quality can be defined in many different ways. Basu explains quality as such:

If you were to ask quality experts to define 'quality', it is likely that you would receive many different answers, although you would elicit a set of common or comparable themes, such as 'Fitness for purpose', 'Right first time', 'What the customer wants', 'Conformance to standards', 'Value for money', 'Right think at the right time' and so on. (Basu, 2009)

In short, quality can be explained as what a customer expects to receive for his money.

In Rax Buffet, quality is roughly measured through a customer's perception of customer service, food, drinks and cleanliness. Mystery shoppers test the restaurants several times a year and award points on how the quality targets have been met. The aim of the quality targets is to ensure that customers enjoy themselves and that the restaurants can operate effectively.

One part of the quality targets is food. To ensure good quality, all food should be fresh and made according to instructions. When instructions are followed, the waste produced by customers should be as little as possible. For example, pizza instructions are such that the end result is a pizza from which customers will want to eat the whole slice and not leave the edges. Hot and warm table temperatures are constantly measured to ensure that warm and cold enough food are served at proper temperatures, thus ensuring that customers will not throw away e.g. cool lasagna or room temperature salad. Other quality instructions include ensuring proper taste and making portion sizes small enough for preventing unnecessary waste.

## 6.2 Customer behavior

Customer behavior is a key factor in affecting the amount of waste produced. Based on several years of observation and conversations with other Rax Buffet workers typical stereotypes can be identified.

Lunch customers are often working people who visit the restaurants regularly during their lunch break. It is typical for them to take a few plates of food and return their dishes and relatively small amounts of waste to the collection points.

The behavior of teenagers varies, but often when in a group, teenagers tend to take a lot more food than they eat to play with the food. It is not uncommon to find a table which teenagers have left filled with whole slices of pizza, food pyramids or other creations. This type of behavior creates a lot of waste.

How families consume depends very much on the upbringing. Often parents help especially small children to collect food from the buffet and comments such as “You can start with this and we will get more later if you like it” are heard often. This kind of behavior is the kind that Rax Buffet restaurants try to encourage as it is encouraging to minimize the unnecessary waste. However, there are also other types of families which act in an opposite manner, and comments such as “We have paid for this, take more and throw it away if you do not like it” are heard. This kind of comments encourage for creating large amounts of unnecessary waste.

Elderly typically only take as much food as they actually eat. This might be due to their attitudes towards food supplies; in their youth, food was not necessarily easily available.

Rush hour affects customer behavior. When a large group of people suddenly arrive, they tend to empty the buffet from any food that is there. It takes some minutes to cook new food and perhaps customers think that they will be left out, taking whatever they can even if they do not like it and then, later on separating it to the waste. This kind of behavior may affect on creating more waste.

The duration of a customer's stay also affects how much waste they produce. A customer, who only comes to eat and then continues on, produces less waste than a customer who stays for several hours and uses for example a dozen coffee cups.

### **6.3 Staff**

Restaurant staff includes a restaurant manager, one or two shift managers and several employees. One staff member is appointed responsible for environmental issues.

According to shift schedules of respective restaurants, the amount of staff present varies in the restaurants. In Hämeenkatu weekdays are run with one person per shift during weekdays while more staff is present on busy weekends. Koskikeskus and Ideapark are usually busier and tend to have more staff working at the same time.

New staff is trained upon arrival and whenever a new task is introduced. Normally, it takes a few weeks for a new staff member to learn all tasks and be able to work fully alone, responsible for the whole restaurant. The amount of time each staff member has been working for each restaurant varies, as well as the turnover of staff. Work tasks roughly include customer service at the cash desk, preparing and cooking food and cleaning. In addition there is some office work.

Rax Buffet restaurants aim to minimize the amount of food waste produced, both by staff and customers. Food waste is seen as a waste as it essentially is; money, time and environmental resources thrown away. It is important that all members of staff gain an understanding of this.



## 7 DISCUSSION

Being an all-you-can-eat restaurant a zero waste policy is unfortunately not likely to be achieved. However, the amount of waste being produced can be reduced.

As seen in the results, the amount of mixed waste produced is quite constant in all restaurants. It can be assumed that this waste group cannot be significantly reduced, at least with the products used. To reduce the amount of mixed waste being produced disposable products could be replaced by longer lasting ones, such as real cups and spoons. However, the restaurants settings would also need to be altered in that case to fit the increased amount of dishes to be washed, dried and stored.

It would be interesting to compare the waste composition in all Rax Buffet restaurants. It would be very resource consuming for one person to do this and therefore the task could be delegated e.g. to the persons responsible for environmental issues.

Another suggestion for further study is to compare the waste types and their amounts with monthly reports which show how much of each product is used per customer. This way restaurants could compare how much of each product customers actually consume and how much ends up in waste bins.

As mentioned previously, not only customers produce waste. Waste is also produced by staff. Part of this waste cannot be prevented, such as packaging materials. The mass or quality of them can however be impacted by demanding producers to take waste amounts into consideration.

Food waste is also produced by staff. Products that do not meet quality standards are not served to customers but thrown away. Examples of such waste are products which are burnt, have expired or which have been served for too long. In the end of the day, products which cannot be served the following day are thrown away. All employees have received training and are constantly reminded about the importance of keeping waste amounts at a minimum.

To take this work one step further, the waste produced by staff could be studied. This would give valuable information on what kind of waste is produced by staff and how

much of it is unnecessary. Especially the amounts of edible waste and means to reduce it could save costs. Recycling habits would also be interesting to examine.

During informal conversations with Rax Buffet employees it was noticed that most employees do think environmental issues are important and would like to have them implemented more in their work. It was mentioned however that due to a hectic work environment the priority does not lie in these concerns. Some employees were interested in the results of this study. Employees wondered about the huge amounts of food thrown away by some customers, and mentioned their own willingness to recycle more if only there was a possibility for it. For example, several employees said they could easily recycle metals if only the property had metal collection. It was also mentioned that due to hectic work, the priority does not lie in proper recycling.

In order to try to reduce the amount of food being thrown away, the attitudes of customers will try to be influenced by distributing leaflets to restaurants to place in stands on tables. The suggested leaflets provide simple instructions about how customers should sort their waste and encouragements to only fill their plates with as much food as they actually eat. The restaurants may choose if they want to use the leaflets or not. To see if the leaflets work, a similar study should be carried out later on. The aim of the leaflets is that at least some customers would stop to think about how much food they are wasting. (Appendix 2)

Hopefully this thesis topic will be paving the way for continuum with implementing additional studies and improvements within the sector of restaurant waste management.

## REFERENCES

Basu, R. 2009. Implementing Six Sigma and Lean: A Practical Guide to Tools and Techniques. UK: Elsevier

Directive 2008/98/EC of the European Parliament and of the Council

European Commission departments. Directive 2008/98/EC on waste (Waste Framework Directive) Updated 19.3.2012. Read 3.4.2012

European Commission departments. What are EU directives? Updated 17.8.2011. Read 3.4.2012. [http://ec.europa.eu/eu\\_law/introduction/what\\_directive\\_en.htm](http://ec.europa.eu/eu_law/introduction/what_directive_en.htm)  
<http://ec.europa.eu/environment/waste/framework/index.htm>

Jonsson, T. 2011. Pirkanmaan alueen jätelajittelututkimus 2011. Tampere University of Applied Sciences. Bachelor's thesis

Jätelaki 21.6.2011 2011/646

Lempäälän kunnan jätehuoltomääräykset 1.1.2009

Levinen, R. Jätealan lainsäädännön kokonaisuudistus. Read 3.4.2012.  
<http://www.ymparisto.fi/default.asp?contentid=406973&lan=FI>

Mattsson, Jenni. Restaurant manager. 2012. Interview April 2012. Interviewed by Mia Lepaus. Rax Buffet Hämeenkatu

Restel, 2011. Vuosikertomus 2010. Read 3.4.2012  
[www.restel.fi/restelinfo/fi\\_FI/info/\\_files/83181478241523194/default/Vuosikertomus\\_2010.pdf+restel+vuosikertomus+2011&hl=en&gl=fi&pid=bl&srcid=ADGEESgh5o0GSE1w7pRHESPFGDFANAKA9H8KM9dJYc2OqKnRvGaIP2nHoNtss04MAW8HFCL9vFvDsGGYQ2lhGk7NNNI8Y3gTWIU2rwWoFYru372Yhdst9T0VgyN7tTnOVXxMIo92j&sig=AHIEtbScBfQ34CeZr2Wolc\\_Ps8IZvwCKJQ](http://www.restel.fi/restelinfo/fi_FI/info/_files/83181478241523194/default/Vuosikertomus_2010.pdf+restel+vuosikertomus+2011&hl=en&gl=fi&pid=bl&srcid=ADGEESgh5o0GSE1w7pRHESPFGDFANAKA9H8KM9dJYc2OqKnRvGaIP2nHoNtss04MAW8HFCL9vFvDsGGYQ2lhGk7NNNI8Y3gTWIU2rwWoFYru372Yhdst9T0VgyN7tTnOVXxMIo92j&sig=AHIEtbScBfQ34CeZr2Wolc_Ps8IZvwCKJQ)

Restel, 2012. Vuosikertomus 2011. Read 3.4.2012  
[http://restel.smartpage.fi/fi/vuosikertomus\\_2011/](http://restel.smartpage.fi/fi/vuosikertomus_2011/)

Setälä, Hanna. Restaurant manager. 2012. Interview 13.4.2012. Interviewed by Mia Lepaus. Rax Buffet Koskikeskus

Suomen Yrittäjät. Read 3.4.2012. <http://www.yrittajat.fi/fi-FI/yritystoiminnanabc/jatehuolto/>

Tampereen Kaupunginvaltuusto, 2005. Tampereen kaupungin yleiset jätehuoltomääräykset

Tampereen kaupungin yleiset jätehuoltomääräykset 14.12.2005

Ympäristöministeriö. Jätealan lainsäädännön uudistus pähkinänkuoressa. Read 19.4.2012. <http://www.ymparisto.fi/download.asp?contentid=133723&lan=FI>

## APPENDICES

## Appendix 1. Waste types collected in Rax Buffet restaurants.

	<i>Mixed waste</i>	<i>Bio waste</i>	<i>Card-board</i>	<i>Paper</i>	<i>Metal</i>	<i>Glass</i>	<i>Energy</i>
Espoo	X	X	X	X	X		
Helsinki Aikatalo	X	X	X				
Helsinki Forum	X	X	X				
Helsinki Itäkeskus	X	X	X		X		
Hämeenlinna	X	X	X		X		
Joensuu	X	X	X	X	X	X	X*
Jyväskylä	X	X	X		X		
Kokkola	X	X	X		X	X	
Kotka	X	X	X		X		
Kuopio	X	X	X				
Lahti	X	X	X	X		X	X
Lappeenranta	X	X	X		X		
Lempäälä	X	X	X	X	X	X	
Oulu Isokatu	X	X	X				
Oulu Linnanmaa	X	X	X				
Pori	X	X	X	X	X		
Porvoo	X	X	X			X	
Rovaniemi	X	X	X				
Tampere Hämeenkatu	X	X	X				
Tampere Koskikeskus	X	X	X		X	X	X
Tornio	X	X	X		X		
Turku keskusta	X	X	X	X			
Turku Skanssi	X	X	X		X		
Vaasa	X	X	X		X	X	
Vantaa Myyrmäki	X	X	X				
Vantaa Tikkurila	X	X	X	X	X		X

\*Rax Buffet Joensuu is located in Iso Myy shopping centre which has recently started to collect energy waste. The restaurant will in the near future start sorting their waste into energy waste.

**Appendix 2. Suggestion for waste separation instructions for customers****Paljonko ruokaa Sinä heität roskeen?**

Keväällä 2012 tehtyjen tutkimusten mukaan satoja kiloja syömäkelpoista ruokaa menee roskeen tässä ravintolassa vuosittain.

Syö ja juo niin paljon kuin haluat – jaksathan?  
Auta meitä vähentämään ympäristökuormitustamme!

**Osaathan lajitella oikein?**

Biojätteeseen kaikki ruoantähteet sekä servietit ja teepussit  
Sekajätteeseen mukit, kertakäyttölusikat, pillit ja kannet

**Ilmoitathan henkilökunnalle jätteisiin tippuneista ruokailuvälineistä**