

Czech University of Life Sciences Prague

**Faculty of Economics and Management
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The Economy of Recycling in the Czech Republic

Bachelor Thesis

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BACHELOR THESIS ASSIGNMENT

Jiří Švorc

Economics and Management

Thesis title

The Economy of Recycling in the Czech Republic

Objectives of thesis

The aim of thesis will be to perform an analysis of the company (FCC Regios, a.s.) and to compare selected years of the waste sorting.

Methodology

The thesis will be divided to two parts theoretical part and practical part. The thesis will contain descriptive, comparative methods and logical inference methods.

The proposed extent of the thesis

40 – 60 pages

Keywords

Recycling, FCC, Czech Republic, Waste Sorting,

Recommended information sources

- GRODA, B. – MENDELOVA ZEMĚDĚLSKÁ A LESNICKÁ UNIVERZITA. AGRONOMICKÁ FAKULTA. *Technika zpracování odpadů II*. Brno: Mendelova zemědělská a lesnická univerzita, 1997. ISBN 80-7157-264-0.
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Declaration

I declare that I have worked on my diploma thesis " The Economy of Recycling in the Czech Republic" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the diploma thesis, I declare that the thesis does not break copyrights of any third person.

In Prague, March 5, 2017

.....

Jiří Švorc

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The Economy of Recycling in the Czech Republic

Ekonomika recyklace v České republice

The Economy of Recycling in the Czech Republic

Summary

This bachelor thesis deals with the analysis waste management and the economy of recycling in the Czech Republic. The theoretical part, describes the procedures of recycling and of modern life. Further the thesis analyze of the Czech company EKO-KOM and describes the data and information from the viewpoint the quantity of sorted waste and the waste management methods. The practical part describes the company FCC Regios Inc. Úholičky, overall operations of the company. Examines the results achieved in 2015 and the results arising suggestions for improvement in future implementation.

Key words: Recycling, waste, economy, the Czech Republic, FCC Regios a.s.

Ekonomika recyklace v České republice

Abstrakt

Tato bakalářská práce je zaměřena na problematiku odpadového hospodářství a ekonomiku recyklace v České republice. Teoretická část popisuje postup recyklace a moderního života. Dále práce analyzuje Českou společnost EKO-KOM, popisuje data a informace z hlediska množství vyříděných odpadů, tak i ve způsobech nakládání s nimi. Praktická část popisuje společnost FCC Regios a.s. Úholičky, celkový chod společnosti. Zkoumá dosažené výsledky za rok 2015 a z výsledků plynou návrhy ke zlepšení v budoucí implementaci.

Klíčová slova: Recyklace, odpady, ekonomika, Česká republika, FCC Regios a.s

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1. Introduction

Waste production is globally enormous, and how human civilization becomes more "civilized", the volume of waste continues to increase. Unfortunately, what each subject of our life now require is a waste, as well as a computer with a monitor on which is this work you are reading written, or the paper on which it is printed, regardless of the the waste that had to be created through activities that all of these tools have helped create. Waste simply belongs to a modern way of life, is a byproduct of human existence and it is almost impossible to prevent its occurrence. The bachelor thesis deals with the sorting of waste and its subsequent utilization. The aim is to separate waste characterization and production. This thesis also deals with related concepts such as waste management and great attention is also paid to recycling in the Czech Republic. The practical part will focus the company FCC Regios Inc. Úholičky. Where is thoroughly dismantled the company's history, certain recycling processes of various kinds of materials and overall operations of the company. The obtained data were used to analyze the dependence of selected events on the recycling and estimated future development of sorted waste in future years.

2. Objectives

The aim is to familiarize with different variants of waste sorting and recycling in the Czech Republic. In the theoretical part there are explained the basic terms related to waste and waste management. There are various methods of waste management. The aim is to introduce the waste and the possibility of its use, specifically describes the process of recycling paper, plastic and glass products, the process of landfill and other waste management options. The practical part is focused on data from the company FCC. The first part of the practical part presents the results for 2015, the sorting hall Úholičky. All data are clearly shown and described in graphs and tables. The second part of the practical part is focused on calculations of data from the FCC Regios Inc. Úholičky. From the information obtained calculate annual profits of the company according to materials from 2015.

3. Literature review

3.1. Recycling

Recycling of waste, in accordance with the Law on Waste, means any activity which leads to the repeated or cyclical putting materials back into the production cycle. Recycling does not cover energy recovery or treatment to products that have already been fueled in other services. Previously, it was the understanding of recycling conceived in two planes; internal distinguished recycling and external recycling.^[1]

Below an internal return the product to the same process in which originally it was, but this has not always been technically and economically possible. This method is called reuse. In contrast, external recycling means that the product could also be used in any process and for any purpose other than for which it was originally intended. This method is called next recovery. At present, the differences between the two are now blurring. It is essential to meet this criterion double positive effect on the environment, leading to savings on the input side in like natural resources and reduce the impact on the output side, i.e. the impact on the environment, ie. reduce consumption of raw materials and energy while limiting the environmental impact. Actual principle of recycling is nowadays nothing new. Recycling paper from old paper and a piece of cloth was used in the 19th century. Similarly, the '70s has experienced a boom in recycling of glass, aluminum and steel.

M. Kuraš in his publication about recycling of iron and steel equates to a savings of 74% energy and a reduction by 86% on air pollution. For other secondary raw materials, an energy saving of 95% for aluminum, 85% for copper, 65% for lead, 60% for zinc, 64% for paper and over 80% for plastics.^[2] It also states that, every year the world produces over 280 million tons of new paper and paperboard products, of which more than 45% consists of recycled paper. Glass achieves a recycling quota to 80% of total production. For plastics, such quota is about 22% in the production of 100 tons per year.

One great disadvantage of recycling to be considered maybe its expensiveness. Combustion is in many cases more economical, despite the costs associated with a landfill. Yet landfills are in short supply and expensive to operate. Recycling is quite a difficult process involving

the separation of waste, their collection and re-sorting. All these entails costs - for technology, for machines, labor etc. Recycling does not constitute an environmentally friendly activity, as it is a sort of "last resort" because it is both energy consuming and in the actual process, an additional waste and in some cases dangerous waste. From this perspective, the most effective and economical waste in general is not to create, but as already said in the introduction, nowadays not possible.^[2]

Gralla's ideas about when to recycle commented: "Recycling is an activity in which everyone can be involved from us. Almost every city is introduced to an obligatory or voluntary recycling program. Take the cans, glass, plastic and paper waste to a collection point or the waste, if you're lucky, leave on a predetermined day on the sidewalk, where it picks up garbage service. When you're so disciplined, you'll feel good and contribute to the world around you was cleaner."^[3]

3.1.2. The Three R's [Reuse, Reduce, Recycle]

Before the recycling process, which is essential not to be confused with the sorting of waste which preceded it, are still on the imaginary ladder two uses. "Reuse" and "Reduce."

REUSE means that old useless things people devote or sell to others can still and may be used. In this sense working for example: bazaars and second hands items. REDUCE means reducing total consumption, based on the idea to use its life, by only using the required quantity, which refers to a saving of both energy and raw materials. However, in this case the consumer encounters the problem of life. And at the end of this ranking is RECYCLE or recycling.^[4]

3.1.3. Upcyclisation

New idea and term is upcyclisation, which is being built on the other side downcyclace. While downcyclace, the transforming of existing materials with new materials, but of lower quality, upcyclisation is the transformation into materials / products having a higher added value.

Therefore, the result of technological process down cyclisation is qualitatively worse than recycling. Unlike recycling, downcyclace requires a carefully culled single-material. Downcyclace can process materials (waste) of different species, but logically related material. Among them, it also produces a much lower quality of recycled material.

Perhaps we should review the renovation of old things, such as old cars for example. An old product that gets an added value. While it is often negligible, in principle, we can say that anything that adds things otherwise destined for liquidation, or sentenced to a further deterioration on value is upcyclisation.^[5]

3.2. Ecolabels, Eco-signs and Recycling Symbols

Consumers are currently looking on products and their packaging to see if they can be recycled, only to be met with many confusing graphic and nonverbal signs. Their significance can be in many cases deceiving, misleading or completely unknown. Some of these brands, however, have a major impact on the environment. Respectively, if the packaging or product is not handled according to these instructions, can threatened human health. Most brands use rather informative and recommended characters, as it should be, with the packaging or product after its useful life. Conforming to these guidelines as the product is loaded or under what circumstances the packaging / product may be originated. Below is a list of the most common brands, symbols and inscriptions on certain manner of waste and recycled materials, which is possible on the packaging / product may encounter.^[6]

3.2.1. Environmentally Friendly Products

The brand bestowed on the Ministry of Agriculture of the Czech Republic and testifies to the fact that the product in its category, may be environmentally more friendly than other similarly produced products. To the brand awarded assesses many criteria, eg. operation of the product, the amount of energy consumed, leakage of hazardous substances. Additional product life cycle, from what the product is made and how much was needed for the production of raw materials and energy, what will be its liquidation; and packaging, the demands on production size, disposal. It is an eco-label.^[7]

Figure #1: Environmentally Friendly Products



Source: <http://ekolist.cz/cz/zpravodajstvi/zpravy/ekoznacka-je-proti-klase-jen-chudy-pribuzny>

3.2.2. The Green Dot Symbol

It is frequently incorrectly considered one of the Ecolabels, but actually it is a trademark. It concerns only the packaging and denotes that manufacturers pay a fee to the national system for taking back packaging for recycling in the national territory - company EKO-KOM. It is essential to remember that the packaging will be recycled only if they will be thrown out into the correct container or handed in to collecting yard. If the container ends up in a mixed municipal waste recycled area, it does not. This system therefore does not guarantee 100% recycling of all packaging. Everything depends on the cooperation of citizens, cities and the organizations engaged in waste collection and waste collection.^[8]

Figure #2: Symbol Green Dot



Sources: <http://produkty.topkontakt.idnes.cz/p/zeleny-bod/331977/>

3.2.3. The Brand Natural Paper

Marked this way, products or packaging are guaranteed by the government that it contains at least 90% recycled paper. The brand is a guarantee of the Research Institute of Paper and can be considered credible.^[9]

Figure #3: The Brand Natural Paper



Source: <http://www.proprirodu.wz.cz/index.php?clanek=5>

3.2.4. "Flinging a Stick Figure"

This symbol is not among the Ecolabels and applies only to the packaging itself. Its meaning is very simple and perhaps unnecessary. It warns the consumers that packaging should be thrown into the trash, rather than on the ground, therefore encouraging him to take action, which should be obvious from an early childhood.^[10]

Figure #4: Symbol "Flinging a Stick Figure"



Sources: http://igelit.net/?mn_page=3

3.2.5. "Crossed-Out Bin"

This symbol again is not among the official labels. So labeled products are not to be put into mixed municipal wastebins. This includes various chemicals, dyes, toxic or otherwise irritating substances, and electrical equipment.^[10]

Figure #5: Symbol "Crossed-Out Bin"



Sources: http://igelit.net/?mn_page=3

3.2.6. Triangular Symbol

This symbol comes in two kinds, which can be distinguished by the simple arrowed lines or a hollow interior design. Symbol with simple lines, see (Fig. 6), the manufacturers before duty, having their products / packaging thus be labeled according to CSN 770052-2 at the base of the symbol. The amendment of the Packaging Act already notes this marking is not mandatory, but if the package has this symbol, it must be based in truth. While the products / packages that are marked by hollowed arrows, see (Fig. 7), are made from recycled materials. Below the arrow is then written or numerical code, or a combination of both, which marks the materials of which the product or packaging are made. With this identification, it is uniquely determined as to which container the consumer is to sort the material out.^[10]

Figure #6: Triangular Symbol A



Figure #7: Triangular Symbol B



and

Source: http://igelit.net/?mn_page=3

3.2.7. Others Symbols

Brands that have a major impact on human health and the environment are mostly situated on a variety of chemicals. Their symbol is always placed in a frame containing an orange base. They are listed in Figure number 8.^[10]

Figure #8: Others Symbols



Oxidizing



Flammable



Dangerous for the environment



Explosive



Toxic



Corrosive



Radioactive



Irritant



Biohazard

Source: http://igelit.net/?mn_page=3

3.2.8. The International Eco-Labels

Among the international eco-labels worth mentioning European eco-label "Flower" see Fig. 9, which is similar to the Czech "eco-friendly product." Awarded for example: Dishwashers, refrigerators, detergents, fluorescent lamps, toilet paper or towels. In granting to evaluate the entire product life cycle and its impact on the environment.^[9]

Figure # 9: "Flower"



Source: <http://www.proprirodu.wz.cz/index.php?clanek=5>

3.3. Waste Sorting

In the area of packaging waste management, the European Union sets the binding targets (60% recovery of packaging and recycling 55-80%, for specific materials: glass 60%, paper 60%, metals 50%, plastics and wood 22.5% to 15%). Targeting, Member States may customize or tighten up. In the Czech Republic they have currently set recycling targets to 70% for glass, 70% for paper, 37% for plastics, 50% metal and 15% for wood.

In the Czech Republic, most producers of packaging waste joining the collective system of enhanced accountability PRO, the operator (the company EKO-KOM, Inc.) packaging

producers also own and maintain control. This system has been working well in the Czech Republic since 1997. It participates with more than 20,000 companies which provide the collection of packaging waste through more than 250 thousand containers for recycling.

From the perspective of recycling officially Czech Republic is one of the most successful states. As the key attributes of the system are yet elevated to a transparent system settings, equal conditions for all partners of the system, sufficiently dense and accessible collection network sorting of packaging waste and the increasing willingness of consumers to sort waste.^[11]

3.3.1. Recycling of Plastics

In the Czech Republic, plastics are recycled similarly to the way paper or glass. They can be thrown into specially designed recycle containers. Here is an example of a yellow bin below.

Figure #10: Container of plastics



Source: Own processing

The EU now recycles only 24% of plastic waste, nearly 50% was landfilled, and the rest are herded into incinerators. This situation handling of plastic waste in the EU clearly shows that this is not just about recycling and combustion, but all efforts must be directed to the diversion of waste plastics, which are highly concentrated in landfills.^[12]

Kizlik (2012) report, normally for processing used PET bottle waste, sorted according to color and pressed into bales weighing between 50-250 kg. Workflow starts by washing and removing labels from the packaging, further on conveyor belt comes the complete separation of plastics. In another process, the waste is crushed in the presence of water. Flotation is used to remove the cap and, after drying, the material is packaged into large bags.^[13]

Most of today's waste can be recycled or reused, if it is properly sorted out in the respected colorful containers. Everyday we come into contact with products without realizing what they are composed of. Recycled PET bottles are a major component in other products. It is made of them eg. Fleece sweatshirt for its fabrication is needed 30 recyclable PET bottles, T-shirt there just 10 pieces. Furthermore, mixed plastics can still be used by manufacturers. For example: soundproof walls, curbs, sidewalks and even grass pavers.^[14]

3.3.2. Glass recycling

Glass generally belongs in the green colored containers. If they are next to each other, like a highbred green and white container, clear glass belongs in the white side, and colored glass is deposited into the green side of the bin. Glass recycling has a growing positive impact on today's environment.^[16]

Figure #11: Container of glass



Source: Own processing

Kizlink (2012) emphasizes recycling glass saves energy (can save energy, which is enough for a five-hour operation 60W bulbs). At the same time, glass recycling positively insures we can protect our climate. In 2002, recycling 2.5 million tons of glass helped to significantly reduce greenhouse our overall gas emissions.^[13]

Váňa et al. (2009) reported assembled en masse in shards sorts glassworks using a special magnetic separator. In the next process, it is crushed at the reflecting crusher, then screened on a mesh sheet using an air classifier to remove contaminants eg. Tinfoil and labels. Due to the frequent use of non-magnetic metals, it is important that the line separator detector be used to assist in sorting out these difficult metals. Some recycling lines may also have an optical sorting device for each color of the glass.^[15]

Glass can also be used as a packaging material. The Recifa Company manufactures a product from recycled glass that is an air foam glass. Refaglass again can also be totally recyclable. Multicellular or foam glass replaces thermal insulation materials (polystyrene, mineral and glass wool, pumice). Possibilities of use are different, multicellular or foam glass can be used as thermal insulation, drainage structures and drainage for relief and slopes in road construction and civil engineering. Multicellular or foam glass is produced from separating waste to the recycling line where it is cleaned and crushed. The raw material that emerges is is further adjusted into a fine glass powder. In another production process, after the addition of further additives, the glass powder is used to manufacture foam glass Refaglass.^[16]

3.3.3. Recycling of Paper

In the Czech Republic, the blue container is used for sorting paper.

Figure #12: Container of paper



Source: Own processing

Designed for households and businesses to sort out most newspapers, magazines, packaging materials, books and others. Collecting paper is often heavily polluted and contains impurities such as: A large amount of ink that destroys the wood fibers. One technology that this admixture removed consists in heating the printed paper in a dilute sodium hydroxide and soaps adding kaolin, which is used to capture the black on its surface. This treatment is more expensive, so the emphasis must be on sorting.^[17]

The centers sort out paper classified into the following categories (Váňa et al. 2009):

- cardboard
- bags of craft paper
- paper from computer technology
- newsprint

Váňa et al. (2009) points out, the least suitable for recycling are polished papers from color magazines and leaflets. From a theoretical perspective are all kinds of recyclable paper after removing inks and foreign matter and, after adding new cellulosic fibers. Recycled pulp

with a predominance of short cellulose fibers are processed to the tissue paper. Paper can also be processed to heat briquettes for building insulation materials. The Czech Republic has developed a technology for the processing of paper on alcohol.^[15]

Siegle (2010) mentions that the quality of paper can be increased by adding new paper into the already recycled. Of the directories and cardboard cartons are produced eggs, insulation and bedding for the animals. Office paper can be used again to produce office paper.^[18]

3.3.4. Metal Recycling

In recycling metal waste, it is important to use the sorting, cutting, pressing, briquetting, cryogenic grinding, and other procedures which lead to the homogenization and the mechanical treatment of waste metal. If it is necessary to separate the ferrous metal non-ferrous metals used ripping, burning, deposition rate, granulating or so Leaching. ^[15]

Metal waste is divided into (Vana et al., 2009):

- scrap iron
- scrap steel
- scrap of non-ferrous metals (copper, lead, aluminum, zinc and alloys)
- metal waste containing mercury
- scrap rare metals (with percentage of platinum, rhodium, gold and silver)

The separated metal waste is recycled in the ironworks, which it processed and used in the production of iron.^[19]

3.3.5. Recycling beverage cartons

We sort the beverage cartons in a container bin labeled in orange. Sometimes you can throw beverage cartons into containers labeled for paper. Elsewhere these recycling containers only are designed for plastic. ^[18]

Figure #13: Container of beverage cartons



Source: Own processing

As stated Kizlink (2012), such packages are made not only of plastic and paper, but also aluminum films in various combinations. Material recycling is difficult for the problems that lie in the large differences in processing temperatures of these individual components.

You can use the technology that Kizlink (2012) divides:

- 1) Packaging of the so-called. Laminated materials are pressed into bales and in the race, which is processed is crushed and separated by plastic, paper and metal parts that are further processed individually.
- 2) At about 170° C, the mixture was pressed into slabs, which can be used in construction or in the furniture. The packaging can be used in the manufacture of compost and biogas.

3) Tetra Pak (75% paper, 20% PE, 5% aluminum) is recycled for Tectane material which is suitable for the production of furniture. When combusted has a calorific value which can be compared with fuel oil or coal.^[13]

Beverage cartons after sorting compressed into bales, followed by their transport to the processing plant, where they are crushed and subsequently using a special reactor which separates aluminum and plastic foil from the paper component. Form an intermediate which is mixing the paper pulp with the cellulose from which is produced a new cardboard boxes vacuolated paper, liner board corrugated board. Plastic after the separation of metal components can be evaluated material or energy and aluminum can transform the presence of magnesium or zinc.^[17]

Bozek (2003) also mentions the used beverage cartons can be recycled without the individual components. Cartons are cut, washed, and then dried at 170° C, before being pressed onto plates. Thermoplastic that is present combined pressurized mixture of pulp fibers and aluminum grit into the flexible structure. These plates are used in construction or furniture manufacturing.^[17]

3.3.6. Recycling biodegradable waste

In the Czech Republic, the brown container is used for biodegradable waste.

Figure #14: Container of biodegradable waste



Source: Own processing

One way of recycling organic waste is composted or processed in a biogas.^[20]

In the process of biogas anaerobic digester in concrete or steel tanks that are heated and sealed. Proceeds are in the process of decomposition of organic matter. The tanks are equipped with mixing and pumping equipment, mixing is important here substrate.

Anaerobic decomposition of organic matter has 4 main stages Ust'ak et al. (2006):

- hydrolysis
- acidogenesis
- acetogeneze
- methanogenesis

As stated Ust'ak et al. (2006), the main product of anaerobic digestion BRO are:

- biogas - a mixture of methane, carbon dioxide, nitrogen, hydrogen and other gases, is capable of burning and thus is useful as an energy fuel.
- digestate - digested sludge, which can be used as organic fertilizer□percolate - ie. The

process liquid (cloudy water) is an essential nutrient for plants used in agriculture as liquid fertilizer.^[21]

3.3.7. Textiles Recycling

In recent years in many places in the Czech Republic there are special containers defined to collect old textiles. Into these containers include all textiles, starting and ending with old pants, shoes or curtains. Nowadays the indifference of this waste processors commodity. Containers for textiles are intended for secondary use textile materials. Raw materials derived from them may be offered to non-profit and charitable organizations. In the past collecting textile used to produce paper from which the bank notes produced.^[15]

Figure #15: Container of textiles



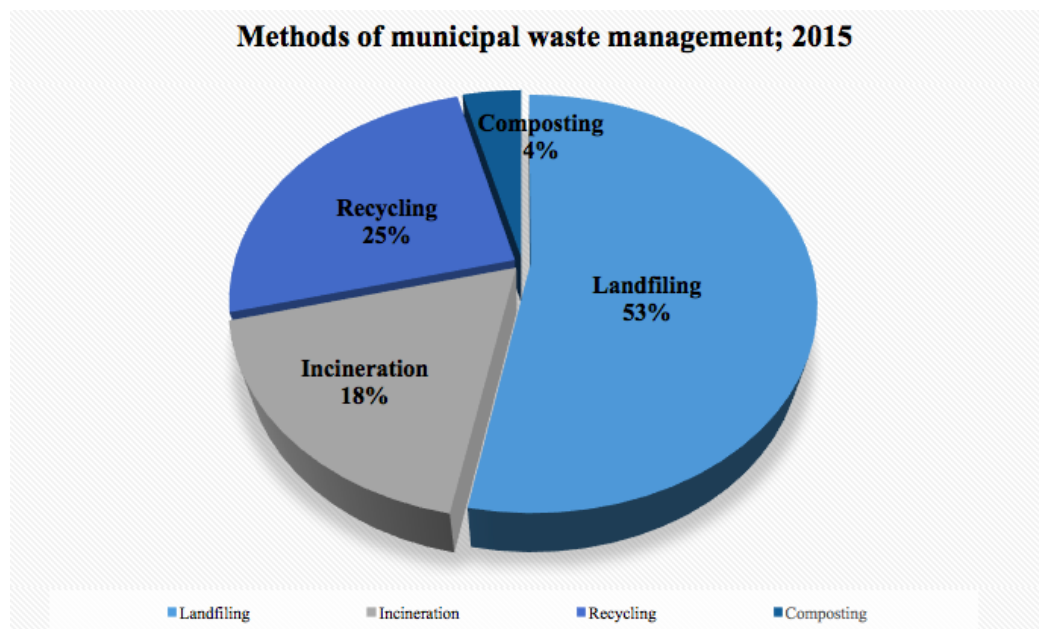
Source: Own processing

3.4. Municipal Waste Management

Waste management includes all activities related to waste. It is therefore a logical chain of activities, which began with the very existence of waste (waste production), continued removal and transportation of waste, various ways of waste treatment, recovery of waste into raw materials for further production or utilization of waste for energy production, to final disposal of waste during which the unusable waste landfilled or incinerated.^[22]

The most common methods of waste management in the Czech Republic in 2015 were included in the landfill, then followed by recycling, incineration and composting. The percentage is shown in figure. #16

Figure #16: Methods of municipal waste management 2015



Source: CZSO, 2015 Own processing

Table # 1: Municipal waste management

Tab. 7 Nakládání s komunálními odpady
Municipal waste management

	vt						Tonnes
	2006	2011	2012	2013	2014	2015	
Skládkování (D1-D7, D12)	2 043 289	2 167 041	1 827 868	1 815 103	1 826 974	1 755 438	MW landfilled
Spalování s využitím tepla (R1)	390 620	607 222	651 563	628 413	600 147	585 784	MW incinerated with energy recovery
Spalování bez využití tepla (D10)	1 607	2 618	2 834	2 696	4 008	4 012	MW incinerated without energy recovery
Recyklace (R2-R11)	200 603	495 695	665 279	685 920	736 022	850 907	MW recycled
Kompostování (N13)	23 104	73 762	85 099	96 101	93 429	141 194	MW composted

Source: <https://www.czso.cz/documents/10180/32782508/280020-1607.pdf/2e596b29-3a55-438d-ba6d-b9635a963534?version=1.0>

Table #2: Waste by selected method of management

Tab. 9 Odpady podle vybraného způsobu nakládání¹⁾*Waste by selected method of management¹⁾*

v t							Tonnes
Kód Code	Ukazatel	2002	2012	2013	2014	2015	Indicator
	Nakládání s odpady celkem¹⁾	24 200 036	30 237 544	28 994 027	30 876 896	34 205 451	Waste management, total¹⁾
	v tom:						
	nebezpečné odpady	1 056 448	2 053 153	1 725 276	1 758 332	1 699 711	Hazardous waste
	ostatní odpady	23 143 588	28 184 392	27 268 751	29 118 564	32 505 740	Non-hazardous waste
	z toho:						
R4, R5	recyklace	5 200 088	5 726 180	5 780 053	6 239 170	7 755 881	Recycling
	v tom:						
	nebezpečné odpady	105 582	147 225	78 190	79 076	127 287	Hazardous waste
	ostatní odpady	5 094 506	5 578 955	5 701 863	6 160 095	7 628 594	Non-hazardous waste
D1–D5	skládkování a ostatní způsoby ukládání v úrovni nebo pod úrovní terénu	5 821 718	3 668 271	3 608 189	3 433 885	3 516 118	Deposit into or onto land (e.g. landfill)
	v tom:						
	nebezpečné odpady	134 968	36 717	35 161	35 403	37 164	Hazardous waste
	ostatní odpady	5 686 750	3 631 554	3 573 027	3 398 483	3 478 954	Non-hazardous waste
R1, D10	spalování	774 848	1 035 220	1 018 640	1 095 544	1 138 157	Incineration
	v tom:						
	nebezpečné odpady	61 048	109 336	113 076	124 806	118 367	Hazardous waste
	ostatní odpady	713 800	925 883	905 564	970 738	1 019 790	Non-hazardous waste

¹⁾ zahrnuje veškeré odpady, se kterými bylo bylo ve sledovaném roce nakládáno, tj. vyprodukované, převzaté od jiných firem a odebrané ze skladu

¹⁾ Includes all waste managed in the reference year, i.e. generated, transferred from other companies, and taken from store.

¹⁾ zahrnuje odpady z podniků a obcí

¹⁾ Includes waste from enterprises and municipalities.

Source: <https://www.czso.cz/documents/10180/32782508/280020-1609.pdf/9a3d45dd-0462-4399-98cc-0d8afd9fe34e?version=1.0>

Landfilling of waste in the Czech Republic from 2011 decreased. When in 2011 there were 2,167,041 tons in 2015 and has about 1,755,438 tons. Incineration with energy recovery from 2011 gradually decreased from 607,222 tons to 585,784 tons in 2015. incineration without heat recovery, has also increased, which in 2011 amounted to the burning of 2,618 tons and in 2015, 4,012 tons. Recycling is nearly doubled since 2011, were 495,695 tons in 2015 and 850,907 tons. The same could be said of Composting in the year as it was about 73,762 tons in 2015 and 144,194 tons.

3.4.1. Waste Prevention

The most important principle in waste management is itself preventing waste from arising and danger. This principle is a package of measures which restrict

- the amount of waste produced.
- adverse impacts on the environment and human health.
- the content of harmful substances in materials and products.

Essence of waste prevention strategies is limited ways using technologies in production and consumption of produce waste that is no longer possible revert back into circulation. Preference is given to technological solutions, in which the proportion of waste back into the production process, which is not only implemented the principle of prevention, but at the same time there is also saving primary raw materials.^[24]

In manufacturing practice, it is mainly about the introduction of so-called. Low-waste and non-waste technologies, which are also sometimes called the common name of clean technologies and their implementation and operation aimed cleaner production measures.^[25]

In the case of waste management, according to this principle, it is rather an attempt to reduce the amount of waste going to landfills needlessly. The principle of waste prevention is a difficult process, whose success is determined by the level societal changes in thinking and behavior of people and businesses. In essence contributes to the saving of resources of non-renewable raw materials, energy saving and environmental protection.^[24]

3.4.2. Material Reuse of Waste

Material use of waste, or recycling, the use of any method in which unnecessary waste is reprocessed into products, materials or substances whether for the original or other purposes. Recycling is also meant reprocessing of organic material but not efficient energy recovery or reprocessing of waste fuel or filling material.^[24]

What is that recycling is mentioned in chapter 3.1.

3.4.4. Composting

Composting is an aerobic fermentation process performed under controlled conditions, using biodegradable waste to manufacture organic fertilizer, ie. Compost. The conversion of organic matter to waste nonhumus ingredient in composting cater primarily aerobic organisms. It is one of the most popular recycling technologies for processing organic waste. During composting leads to analogous processes as in the conversion of organic matter in the natural world.^[26]

The purpose of composting is the production of humic substance similar to humus soil dwelling, acquire plant nutrients and their use of land provided manufacturing hygienic product. composting is a biological process, and hence it is necessary to achieve these goals by biological means. Most biological waste contains a large number of microorganisms, which are mostly soil microorganisms foreign, and therefore unable to produce the desired humic substances. Composted waste from the reasons regulates soil microflora, thus soil.^[26]

To implement the process of biological waste treatment by composting on an industrial level, there is the so-called. Composting plants. The composting are processed by different types of biodegradable waste that is controlled combined in various proportions according to predetermined formulas, in order to achieve the best final product - compost. Decomposition of organic materials takes place in air, thus aerobically. Meeting, in which compost is created for this reason must reinvent regularly to ensure its supply. Degradation processes heaps of organic matter taking place for several weeks, and the material in these heated to 60° C. Thanks redone in a controlled process taking place proper mixing processes of decomposition in composting plants much faster than in a home compost. Upon completion of the composting process of separating the produced compost and composted ingredients alone compost with the help screens are sorted into finer and coarser fractions.^[27]

The best quality fraction of compost after mixing with the other components used in the production of horticultural substrates. Lower-quality compost ingredients are used for reclamation purposes.^[27]

3.4.5. Energy Recovery From Waste

One of the most recovery operations, a number of technological processes that are used in physical and chemical properties of the waste, the use of the energy potential of waste in incinerators to generate heat or electricity or both simultaneously.^[24]

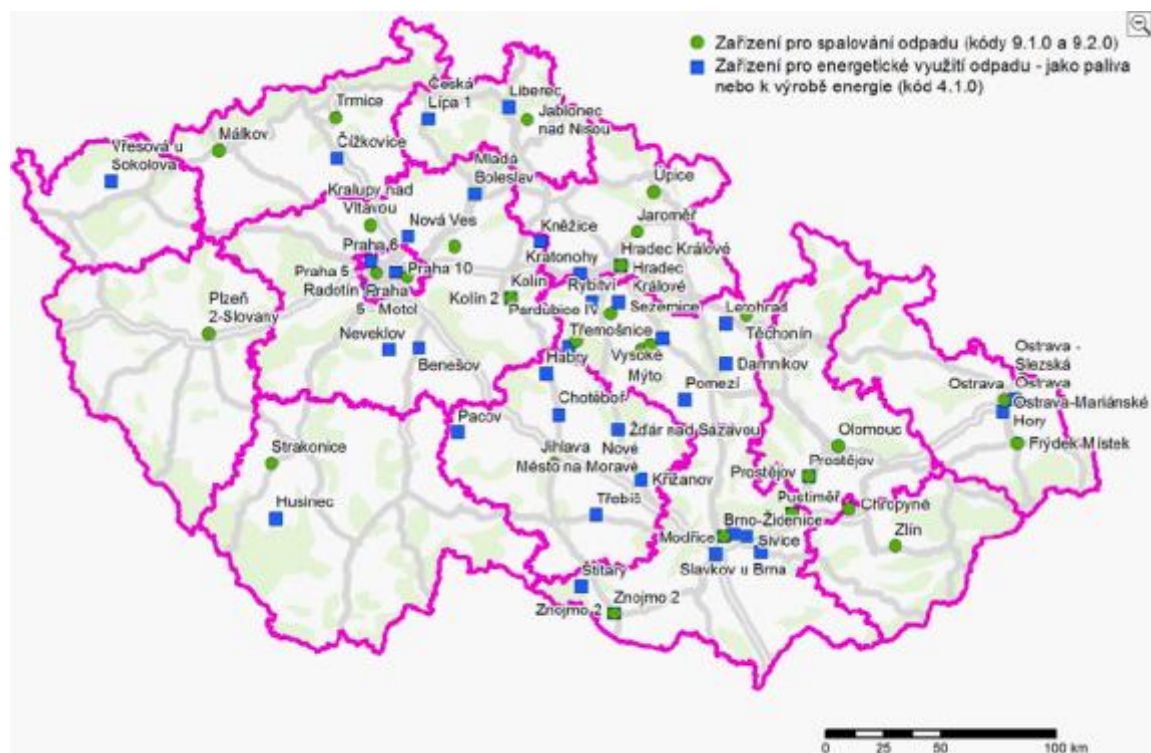
One of the possible methods of disposal or energy recovery of waste, by controlled thermal destruction of waste at high temperatures, the incineration of waste. Incineration of waste is carried out under strictly defined conditions in specially designated facilities, with possible production of thermal or electric energy. The principle of incineration is to remove pollutants and burn combustible components of the waste, in which at the same time there is a significant reduction in waste, on average, by about 80-90%. Disposal or recovery of waste incineration is suitable for almost all kinds of waste and state except for some specific wastes such as waste, explosive or radioactive. It therefore follows that incineration is a very appropriate way of handling waste with high energy potential.^[28]

Currently, it is already possible waste incineration be considered completely safe process use or disposal, which is thoroughly, consistently and continuously tracking and monitoring, especially in terms of the impact on air quality, so as to ensure the greatest possible safety of operations and minimize risks to the environment. Operation of technologies for waste incineration is controlled by very strict emission limits of concentration of harmful substances in the air. Waste generated by combustion processes, such as ashes, ashes and slags, are thoroughly analyzed, according to the content of harmful substances or pollutants mobility stabilized, and subsequently stored on secure landfills.^[28]

Incineration of waste is currently the world's developing waste processing technology. Even in comparison with the landfill of waste is the technology much more expensive, it increased in the last decade, worldwide capacity of waste incineration facilities from 160 million tons to about 240 million tons and is expected to further its ongoing growth. From the perspective of Europe in this respect is clearly the most advanced state-Switzerland, which has a network of more than 30 devices for energy recovery of waste, and where 45% of municipal waste processed material and 55% of energy used.^[28]

The Czech Republic currently operate 3 modern facilities such as incinerators for energy recovery of municipal waste that are constructed and operated so that the heat generated can be further exploited.^[24] These incinerators can we find in Prague, Brno and Liberec. In addition to municipal waste incinerators, energy recovery devides as waste in the Czech Republic is currently also operates 25 facilities for the thermal treatment of industrial and medical waste and 5 co-incineration of waste, whose layout is show in Fig #17.^[29]

Figure #17: Energy recovery from waste in Czech republic (2012)



Source: http://www.vitejtenazemi.cz/cenia/index.php?p=spalovny_odpadu&site=odpady

3.4.6. Landfill

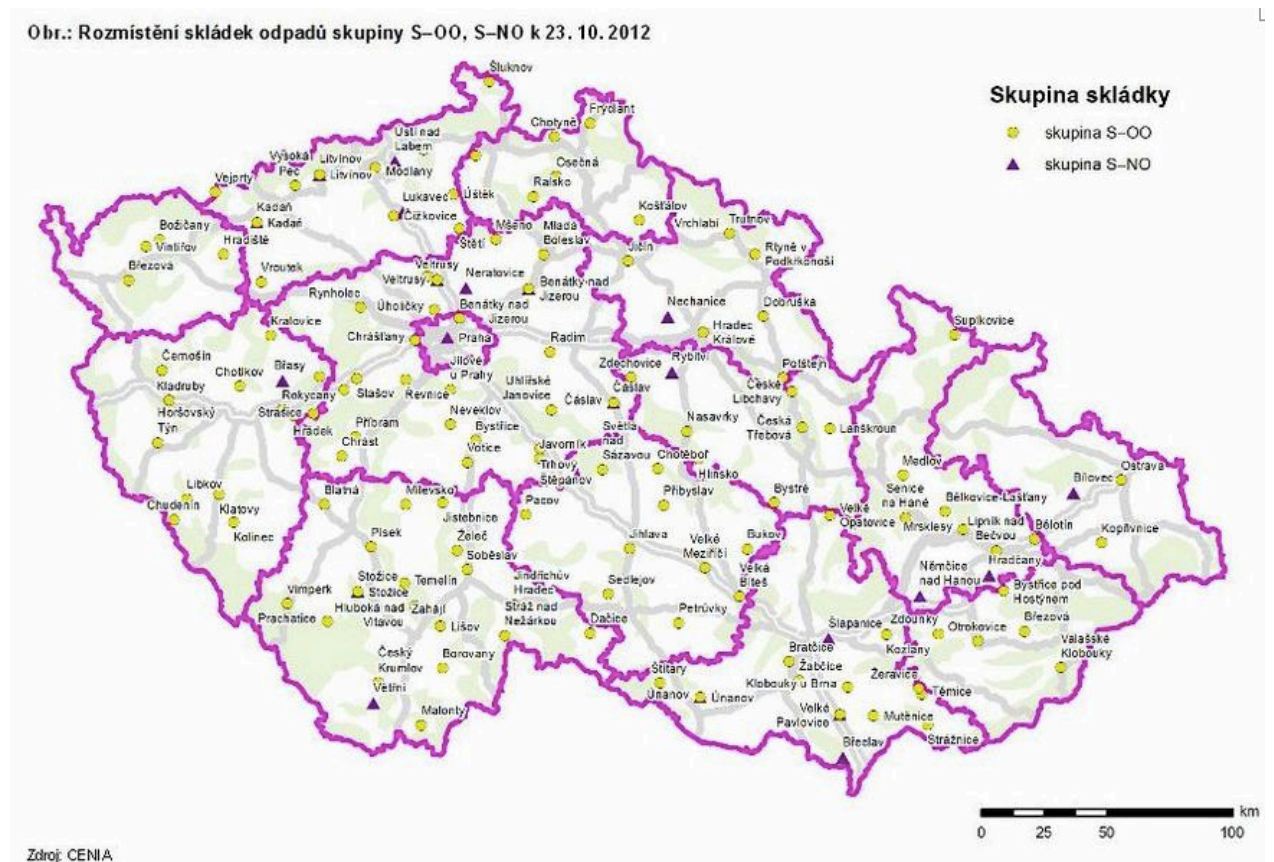
Waste disposal in landfills with waste management method, Which stands at the far end of the waste management hierarchy and Ideally it should be treated injured Only When They are exhausted all ways of waste management, Which was in the waste hierarchy predate or other disposal is not possible from a technological or economic terms.

In the Czech Republic, landfilling still Removes the bulk of the waste, although it gradually expanding new technologies for waste disposal. Despite the Fact That the landfill is Considered The Least Desirable form of waste disposal, it expects That in the near future in our country remains the most common way of removing (Necessary after treatment), if not significantly landfill Increase Costs.^[25]

Facilities for waste disposal in landfills, Which is the only complies with the standards of environmental protection, the controlled landfill. Controlled landfill is a technical device, under Which Strictly Defined technical, technological and operational conditions Used to store specific Types of waste the according to the purpose of the landfill. And Prerequisite of running any device of this type is the continuous monitoring of the impact of the conditions of operation of ITS on the environment. In order to minimize negative Impacts on the environment and human health must be regulated landfill Each equipped with hermetically sealed sealing system, Which is designed to Completely Separate the waste deposited in the landfill body from the environment. Other systems for environmental protection and the smooth operation of dumps include drainage drainage system with a device for collecting the contaminated leachate, equipment for receiving, compacting and treatment of waste, and a system for collecting landfill gas in combination with the device for Its use in Cases of landfills formation of landfill gases.^[30]

The Entire system is controlled principally the planned landfill dumping of waste disposal into Destined For pre-Designated areas, Which are Subsequently wastes using technical equipment bulldozing and compacted into Individual layers. This process takes place under precisely defined conditions with continuous and regular overlapping layer of inert materials, contributing to ensure homogeneity of the body dump. Inside the body dump-going biological, chemical and physical processes that lead to the decomposition of waste to produce gas and leachate. After the process of landfilling is the complete reclamation of landfill With its subsequent use for various purposes.^[25]

Figure #18: Landfills in Czech Republic (2012)



Source: <http://vitejtenazemi.cz/cenia/index.php?p=skladkovani&site=odpady>

4. Eko-kom

4.1. About Company

Eko-kom a. s. is authorized packaging company, which provides associated compliance of take-back and recovery of packaging waste. Its action takes place on two levels. From one side to conclude agreements with entities that in some way packaging placed on the market, and since they charge fees for that takes over their legal duty of recovery. On the other hand, enters into contracts with municipalities and entities authorized to handle waste and pays them based on the amount of sorted waste (according to the continuous waste records) funding, thereby contributing to their system of collecting, sorting and recovery of packaging

waste. This system is similar in other European countries.

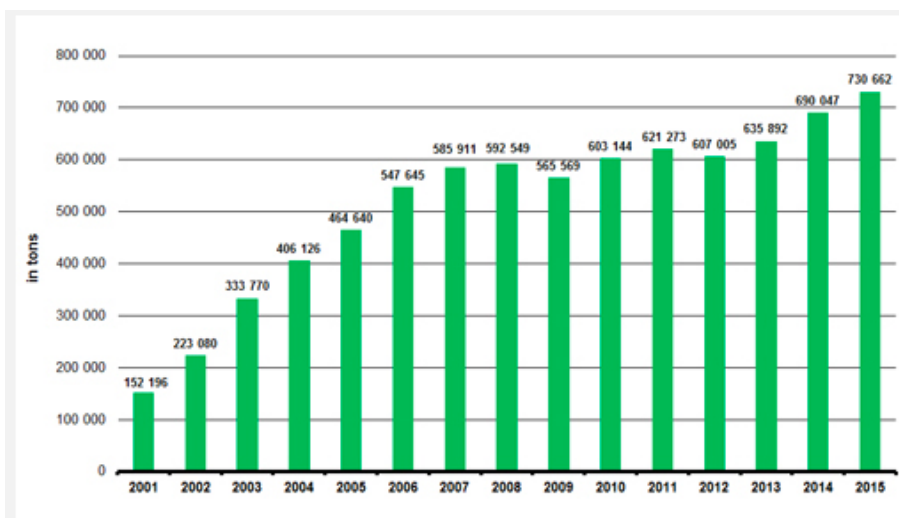
Their activities include the collection and recycling of plastic, glass, paper, beverage cartons, metal and other reusable materials. The total amount of sorted packaging in the Czech Republic has soared in 15 years to 8 million tons. After the whole country is already over 272,000 containers.

The company Eko-kom indicate on its website statistics, "How much was in 2015 indicated on the packaging market" "How many tonnes helped Eko-kom use and recycle" and "What was achieved by the recycling and recovery of packaging waste." All reported amounts are stated for clients Eko-kom. Clients of the EKO-KOM introduced on the market into circulation of more than 2,900,000 tons of packaging. [30]

4.2. Achievements

According to the figure #19 ensure the company Eko-kom behalf of their clients for the recovery and recycling 730,662 tons of packaging, as can be seen from the graph Every year a number of waste increases.

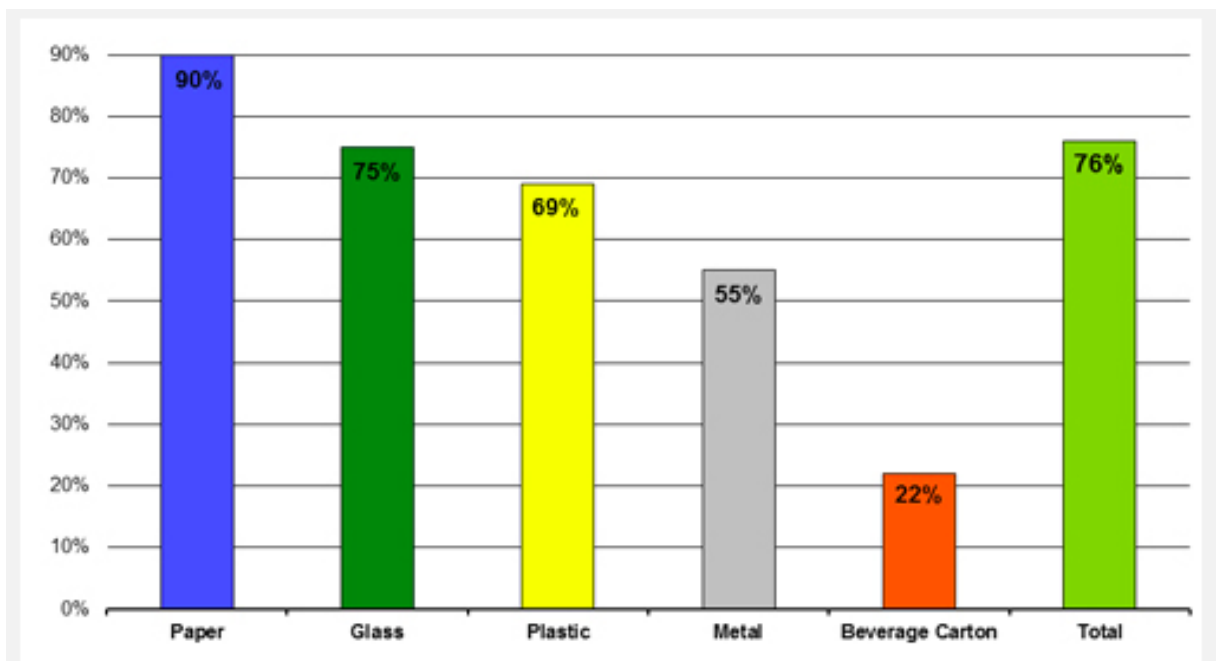
Figure #19: Total Quantity of Recovered Packaging Waste



Source: <http://www.ekokom.cz/en/other/system-results>

As can be seen from the figure #20 overall recycling rate packaging in the Czech Republic is 76%. Most recycled paper which reaches 90%. In second place is the glass with 75% and the third Plastic is 69%. compared to the previous year, we can say that in percentage terms it does not differ significantly.

Figure # 20: Attained level of recovery and recycling of packaging waste in 2015

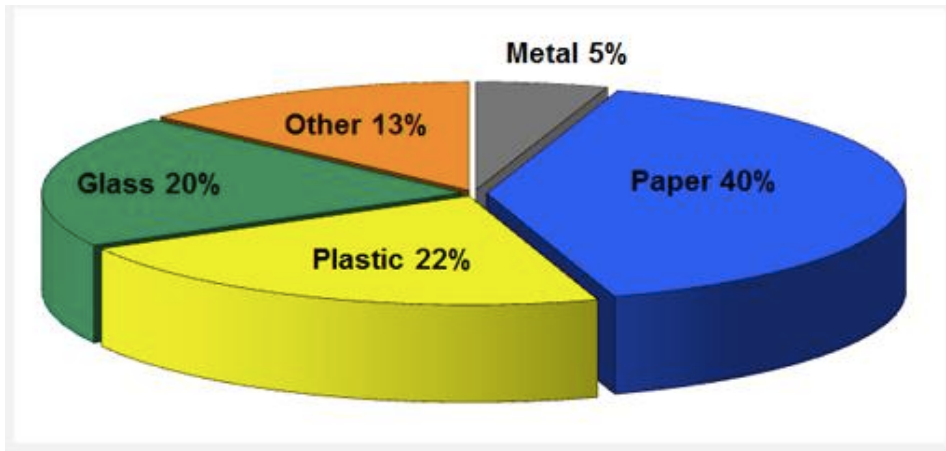


Source: <http://www.ekokom.cz/en/other/system-results>

The figure #21 indicated percentage of returnable packaging in the Czech market, respectively. packaging they use to package their products, clients of the company Eko-kom. It clearly shows that the most commonly used packaging material is traditionally paper, which holds a significant leadership for many years. Furthermore, frequently used packaging plastics and glass.

These values are somehow just does not change in just a few percents compared to previous years.^[31]

Figure #21: Structure of non-refundable packaging 2015



Source: <http://www.ekokom.cz/en/other/system-results>

5. Methodology

Methodically bachelor thesis is processed into two parts, into theoretical and practical part, which in some areas may overlap. The theoretical part represents a significant proportion of recycling and a Czech authorized packaging company EKO-KOM, dedicated to eco-labels and other labels on products and packaging, and analyzes the individual components of municipal waste, which can parse, from the perspective of the initial screening, the next final sorting and subsequent processing. The necessary information and data relating to the theoretical part, obtained from the scientific literature and journals, websites, publicly available questionnaires from the aforementioned CSO Eko-Kom, Eurostat, internal documents specific companies operating in the recycling and waste management in the Czech market.

The practical part analyzes system of FCC Regios, Inc. Úholičky. Where is thoroughly dismantled the company's history, certain recycling processes various kinds of materials and overall operations of the company. For information and data regarding this issue, I contacted the FCC employees of the company acting on the post of Assistant County Manager and you arrange a personal interview and a tour of the company. May 11, 2015 I made a personal meeting. Helpfully me was made after the company area and shown to explain any recycling

facilities and recycling methods. Furthermore I was allowed photo documentation during the interview various sorting and recycling lines, landfills etc. Lastly, I was allowed to look into internal documents of the company and based on the bachelor thesis I was provided with documents as well as data for 2015, which can be used in my work. This whole conversation was throughout the recording on voice recorder. Way of gathering information about the history of the FCC Regios, a.s. Úholičky were used from the company website.

6. Results

6.1. Practical part

The practical part contains a description comparative method and at the close the applied statistical analysis of waste production and waste management companies in Regios FCC Inc. Úholičky according to type of material. Based on a statistical analysis of the time period from 2015 determine the appropriate function. From all parts will be deduced the logical conclusion.

Separate chapters practical part contains a clear graphical comparison of the processed waste production and waste management within one year, according to the given month. Emphasized will be descriptive and economic aspects of FCC Regios Inc. Úholičky for the year 2015.

6.2. The company FCC Regios Inc. Úholičky

The company FCC Regios Úholičky provides services such as waste regulated landfill Úholičky traffic, municipal waste, separate collection, recycling production line for solid alternative fuel called TAP. Municipal waste is collected from the vicinity of Kladno, Slaný, Horoměřice and the surrounding villages.

In the first sequence, we will focus on waste removal, therefore, to the company FCC Regios Inc. Úholičky. Larger quantities of waste which can be found in the sorting hall is primarily plastics and paper. These materials are classified on different commodities.

All paper which is imported into the area of the company is largely sorted on earth.

Whereas plastic is induced directly into the sorter hall. After the waste is induced and prepared for further sorting process. Conveyor or with the help of loaders and dumped into the pit, where a longer conveyed to sort by commodity. The most frequently used manually sorting on the sorting line. It's enclosed spaces where workers and classes are appropriate or inappropriate material. Sorting materials are thrown into a box, where then they are ready for further treatment. The unused material is dumped in containers which are intended for further processing to TAP. Sorted waste by commodities, have further compressed into bales on a hydraulic press. The total weight per package is around 400 kg. The final product, the company further reselling to the secondary process.

Figure # 22: Sorting hall



Source: Own processing

Figure # 23: PET package



Source: Own processing

The remaining quantity of paper and plastic which is regarded as unusable are transported to the recycling line, which is called TAP. From the perspective clarified for the company is that the sub-treatable environmentally unfriendly waste is being stored in a landfill is, the use for other purposes. Solid alternative fuels (TAP) is considered to be secondary unusable product. For secondarily unusable material include objects such as cardboard, paper, wood, plastic, Etc. But not all plastics are appropriate to be utilized as a source for fuel. To this group belong e.g. PVC material as it contains high amounts of chlorine.

The first phase of processing waste is always the elimination of all the iron content using's magnetic separator. The waste then passes through the secondary crushing so as to cut material size. The final product is then called ASAPAL small fraction of the diameter of 2.5 cm. This small fraction is reselling, which can be used as fuel in cement production.

During the process, strictly guard the chlorine and calorific value. For the calorific value are used paper scraps, cardboard and others. Chlorine is guard the the grounds that has adverse consequences for bonding and damaging kilns in cement plants. Thus, there are big financial losses. Take in Areal The company is located closed landfills. On the basis of closed landfills

company draws energy to run the administration building. From the landfill lead chimneys where to leave the landfill gas. The interior of the landfill, the temperature ranges from about 70 ° C. Subsequent to that transforms the energy to run the company.

Figure # 24: TAP



Source: <http://www.fcc-group.eu/cs/Ceska-republika/Provozovny/FCC-Regios-a-s-provozovna-Uholicky/FCC-Regios-a-s-sluzby-poskytovane-pro-nase-zakazniky.html>

Figure # 25: Final product ASAPAL



Source: <http://www.fcc-group.eu/cs/Ceska-republika/Provozovny/FCC-Regios-a-s-provozovna-Uholicky/TAP-linka.html>

6.3. Analysis of total production sorting hall Úholičky 2015

Table 3 shows the development in the total production of paper and plastics and TAP in the sorting hall for 2015, according to the individual months. The analyzed data show that the total quantity of the waste management in the reporting period has a gradual rising trend. Between the initial and final month was slightly significant changes, and this has the consequence that in the first month signed a new cooperation agreement with of Pražské služby.

Table # 3: Data from Sorting hall Úholičky 2015

Dotřídovací hala Úholičky 2015															šlyetok 2014				
data z váhy																			
mésic	přijem odpadu (t %)												přijem t	výdej t	odpad t	přidáno na TAP t			
	papír		plast		plast svaz (t - celkem)						%								
	absol.	%	absol.	%	Regios	plast od	PS	plast od	troubo	absol.	%	absol.					%		
1	148	25,2	205,1	35,4	142,9	67	2,13	0	0	0	143	24,8	85,86	14,8	579,88	512,60	67,28	93,84	
2	117,8	20,0	200,1	34,9	120,9	62	1,95	48,98	24	2,04	170	28,9	100,3	17,7	585,08	440,84	144,20	147,20	
3	148,7	21,7	243,5	35,5	154,2	76	2,03	40,78	22	1,85	195	28,4	95,64	16,4	655,84	499,28	216,56	211,56	
4	142,1	17,4	255	31,2	175,4	73	2,4	166,1	72	2,31	342	41,7	79,86	9,9	818,48	413,16	405,32	300,00	
5	139,9	17,4	239	29,0	220,6	89	2,48	142,8	61	2,34	363	44,2	80,66	8,8	822,90	472,66	350,24	400,00	
6	161,7	19,2	274,9	32,7	198	83	2,39	147,4	63	2,34	345	41,8	59,82	7,7	841,77	488,06	353,71	400,00	
7	146,6	18,7	240,1	30,7	193,9	83	2,34	137	62	2,21	331	40,3	65,35	8,3	782,93	463,29	319,64	400,00	
8	140,2	16,4	238,3	31,3	190,3	77	2,47	137,2	62	2,21	327	39,8	55,72	7,3	761,73	415,34	346,39	290,00	
9	145,1	18,0	294,5	36,4	173,7	79	2,2	133,6	62	2,16	307	38,0	61,28	7,8	808,20	451,24	356,96	390,00	
10	127,7	16,4	292,7	31,3	168,3	80	2,1	117	57	2,05	265	32,6	74,38	8,5	780,64	554,22	226,42	230,00	
11	107,88	14,3	290,99	28,8	178,64	85	2,11	121,22	59	2,05	300	36,8	55,5	7,4	754,73	481,20	293,53	300,00	
12	163,24	21,8	329,74	38,4	166,87	87	1,91	123,73	60	2,02	290	36,6	76,14	9,3	749,72	453,56	296,16	198,82	
suma	1 687	18,3	2 995	32,4	2 043	941	2,2	1 316	604	2,18	3 309	37,0	884	10,0	8 074,32	4 284,13	3 790,19	3 272,97	
	211		374		260			219			490		179		690	82,4	37,6	787,69	
					794											%	%	sklad Schenck	
															příměr t	747,86	508,74	307,08	306,55
															příměr %	100	68,0	41,1	37,6

Source: FCC Regios Inc. Úholičky

6.3.1. Comparison of the papers

The development of the total handling the paper is therefore evident that the values in these months there not significantly different.

Table 4. compares the collection of paper according to the volume of container by Regios.

All the figures are in tones. Green data show collection bins and containers in the volume of 1100 l. The total value of the collection of paper into 1,100 liters' volume for 2015 was 1,687 tons of paper. Averaged over one month has been calculated by the arithmetic formula. The average value per month is 140.6 tons which is a percentage of 19%. Orange data are bulk containers from 9 m³, which the company provides. Total amount for 2015 is almost double and 2,995.4 tons i.e. 33.5%.

Table # 4: Comparison of the paper in individual mounts per tonnes

Month	Paper collection(t)	%	Paper transfer(t)	%
1	146	25,2	205,1	35,4
2	117,8	20	200,1	34
3	148,7	21,7	243,5	35,5
4	142,1	17,4	255	31,2
5	139,9	17	239	29
6	161,7	19,2	274,9	32,7
7	146,6	18,7	240,1	30,7
8	140,2	18,4	238,8	31,3
9	145,1	18	294,5	36,4
10	127,7	16,4	292,7	37,5
11	107,98	14,3	290,99	38,6
12	163,24	21,8	220,74	29,4
Sum	1687,02(t)	---	2995,43(t)	---

Source: FCC Regios Inc., own processing

Figure no. 25 shows the time series of collection of paper in the volume of 1100 liters per year in 2015. It can conclude that the value of paper collection is unstable. The average values of both per month is 140.59 tons of paper.

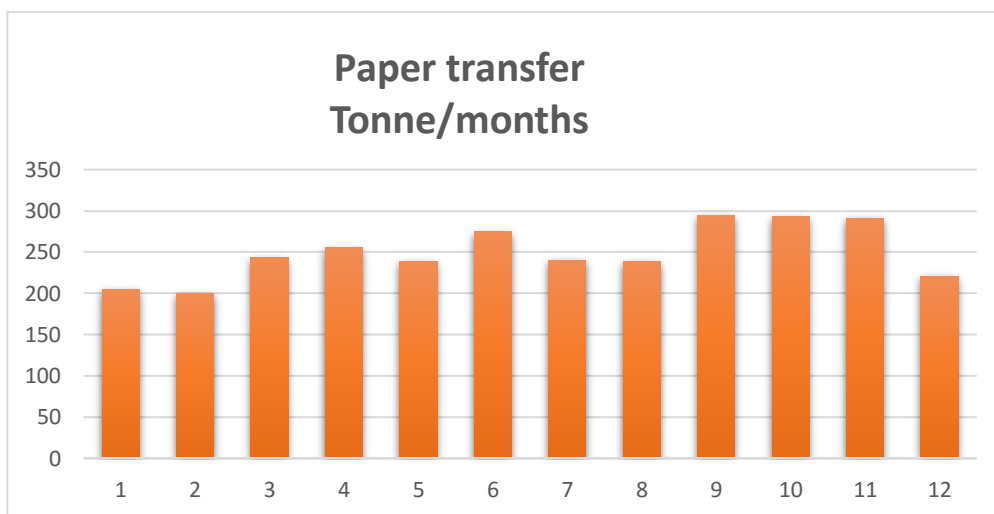
Figure #25: Paper collection in individual months(tonnes)



Source: FCC Regios Inc., own processing

Figure no.26 shows the number of tons of bulk containers of 9 m³. The average value is significantly higher 249.62 tons than which figure no. 25 show us.

Figure #26: Paper transfer in individual months(tonnes)



Source: FCC Regios Inc., own processing

6.3.2. Comparison of the plastic

In table 5, is captured analysis of collection of plastic Two different companies. The green fields are shown from the FCC and orange are the Prague service. Comparison of the total amount between companies is almost doubled. In the FCC is 2,083.1 tons and 1,315.8 tons by Prague service. That difference is justified by signing a contract in January 2015 when it was not brought in any quantity and in the next two months, the testing of materials and processing plants. The average weight per car is 2.1 tons. A total of Year 2015 was induced to Úholičky 4,293 tons of plastic.

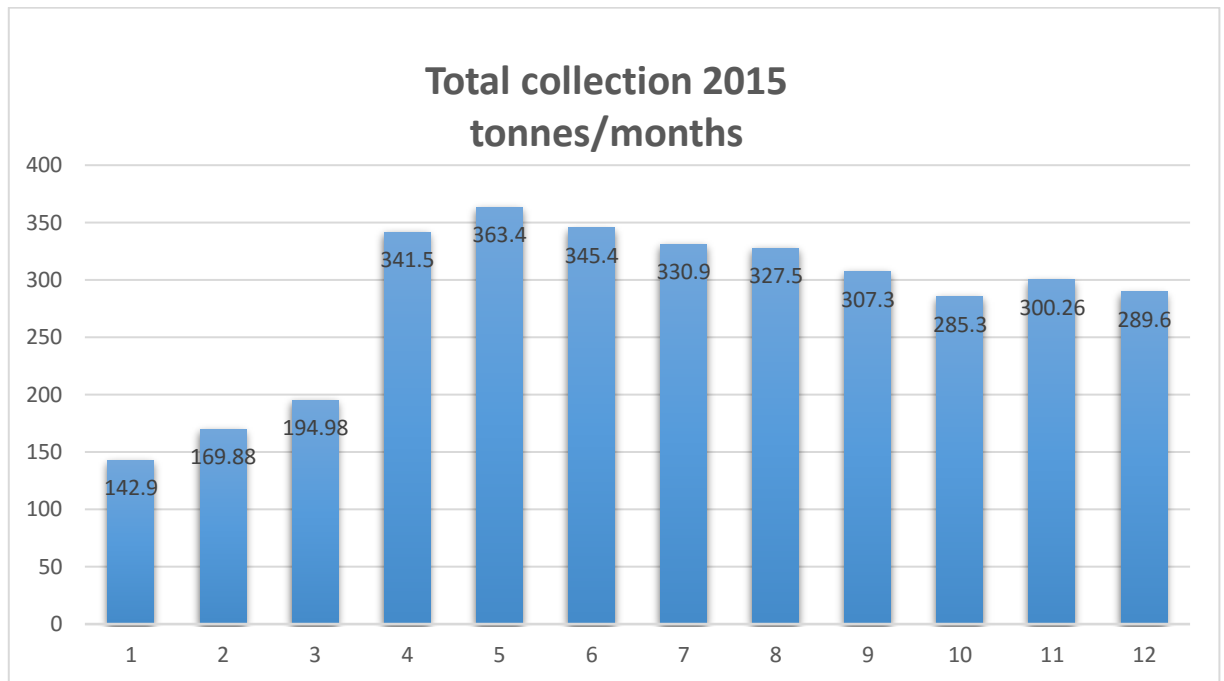
Table # 5: Comparison between Regios and Prague services.

Month	REGIOS (tonnes)	Numb of car	Tonne/ car	Prague Services	Numb of car	Tonne/ car	TOTAL (tonnes)
1	142,9	67	2,13	0	0	0	142,9
2	120,9	62	1,95	48,98	24	2,04	169,88
3	154,2	76	2,03	40,78	22	1,85	194,98
4	175,4	73	2,4	166,1	72	2,31	341,5
5	220,6	89	2,48	142,8	61	2,34	363,4
6	198	83	2,39	147,4	63	2,34	345,4
7	193,9	83	2,34	137	62	2,21	330,9
8	190,3	77	2,47	137,2	62	2,21	327,5
9	173,7	79	2,2	133,6	62	2,16	307,3
10	168,3	80	2,1	117	57	2,5	285,3
11	179,04	85	2,11	121,22	59	2,055	300,26
12	165,87	87	1,91	123,73	60	2,062	289,6
Sum	2083,1(t)	941	26,5(t)	1315,8(t)	604	24,07(t)	3398,92(t)

Source: FCC Regios Inc., own processing

Ignoring the first three months where it was tested the new material from the graph it is evident from the summer months, slightly prevailing before others who tend to decline slightly. This can result in the impact of the summer months to consume more plastic than others. The average value of the two company's 228.44 tons per month.

Figure #27: Total collection paper in tonnes



Source: FCC Regios Inc., own processing

6.3.3. Comparison of total values

From the data presented in Table 6, the total number of plastic and paper to the sorting hall for 2015 is 8,974.3 tons, ie 100%. Difference between at least induced months and most are 261.9 tons. The total oversold material has a total weight of 5,596.1 tons. Thus, it was oversold 62.4%. Waste left over which company produced was handed over to a recycling hall TAP making 3377.9 tons.

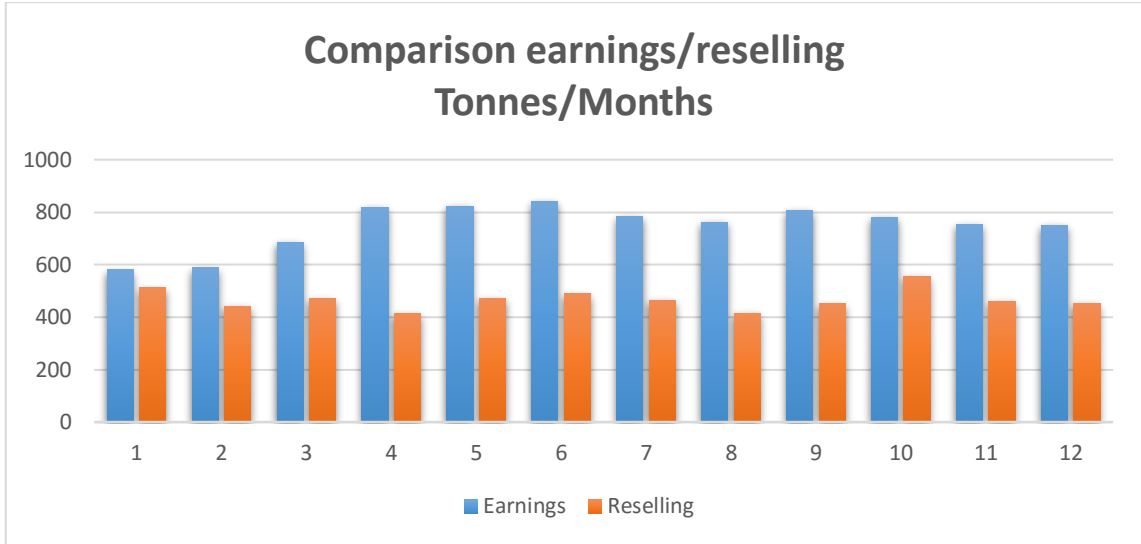
Table # 6: Total results from sorting hall Úholičky in tonnes

Month	Earnings(t)	Reselling(t)	Waste(t)	TAP(t)
1	579,88	512,6	67,28	65,84
2	588,08	440,84	147	147
3	685,84	469,28	216,56	216,56
4	818,48	413,16	405,32	300
5	822,9	472,66	350,24	400
6	841,77	488,66	353,11	400
7	782,93	463,29	319,64	400
8	761,73	415,34	346,39	250
9	808,2	451,24	356,96	350
10	780,04	554,22	225,82	220
11	754,73	461,3	293,43	300
12	749,72	453,56	296,16	166,82
Sum	8974,3(t)	5596,15(t)	3377,91(t)	3216,22(t)

Source: FCC Regios Inc., own processing

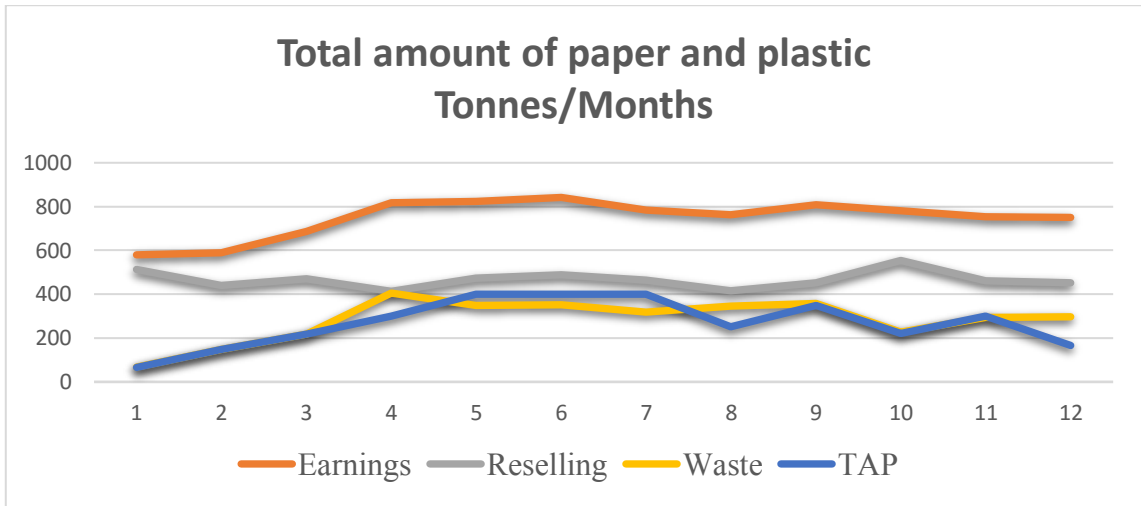
Figure # 28: clearly showing the earning plastic/paper, reselling tonnes. Values during the year are stable.

Figure #28: Comparison earnings and reselling



Source: FCC Regios Inc., own processing

Figure #29: Total amount of paper and plastic



Source: FCC Regios Inc., own processing

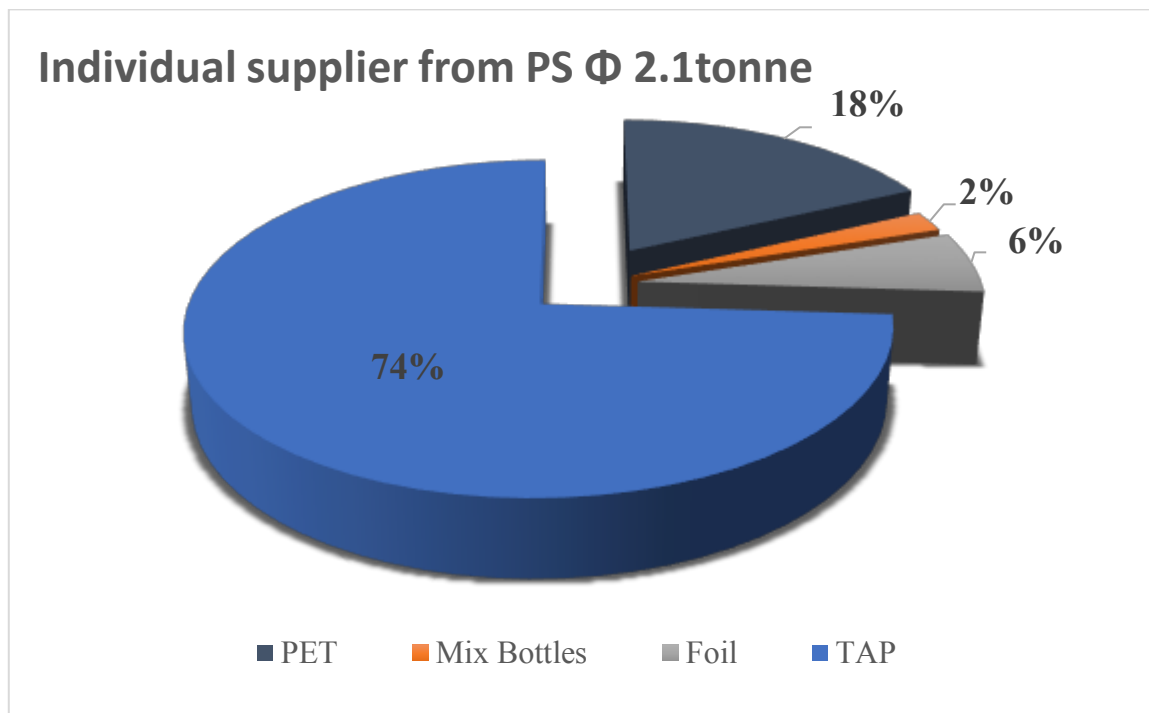
Figure #29: compares the value of waste produced and subsequently forwarded to the TAP.

The graph shows the strong fluctuations in the value. These fluctuations in the value presents the technical problem, ongoing maintenance or relegated the coming months so that the operation of efficient and profitable.

On the Figure #30: we can see from a collection of plastic an average weight of 2.1 tons is 26% used for further processing. From 26% is 18% pure PET, foil 6%, 2% mix bottles.

76% is considered as waste and subsequently forwarded to the incinerator TAP where is treated as an alternative fuel.

Figure #30: Individual supplier from Prague services



Source: FCC Regios Inc., own processing

6.3.4. Prices of materials for reselling

6.3.5. Paper

Designation A2 / 1.02 shows a blank paper A4 / 4.1 is a mixture of paper and carton, A5 / 1.05 a carton. The table shows the prices listed on the Czech crown per tonne, which Regios reselling company Žimrovice. Prices vary each month.

From the table 7 it can be seen, the average prices of paper A2 which amounts for 2015 is 2333 CZK, A4 and A5 are same 2679 CZK. It can be said of blank paper has the lowest sales value on the market ranging.

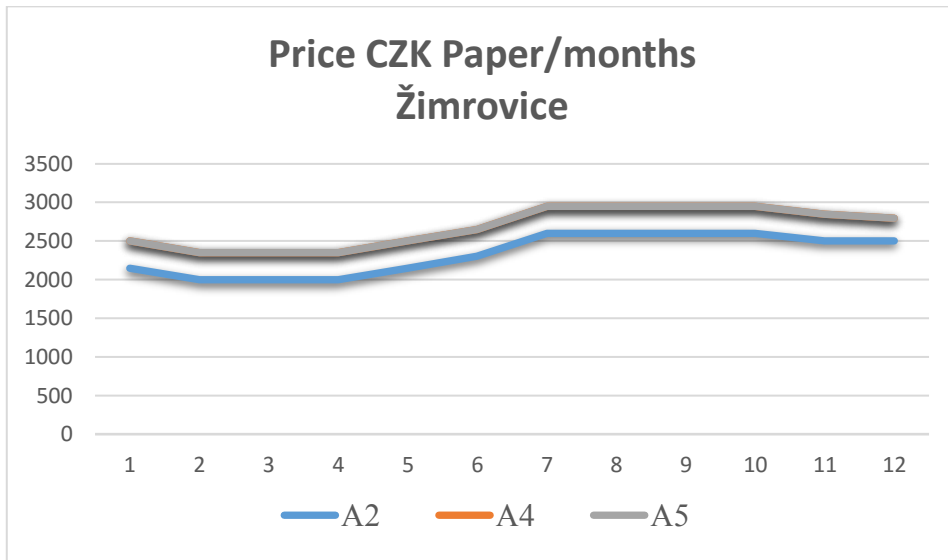
Table # 7: Price paper per individual months(CZK)

Month	A2	A4	A5
1	2150	2500	2500
2	2000	2350	2350
3	2000	2350	2350
4	2000	2350	2350
5	2150	2500	2500
6	2300	2650	2650
7	2600	2950	2950
8	2600	2950	2950
9	2600	2950	2950
10	2600	2950	2950
11	2500	2850	2850
12	2500	2800	2800

Source: FCC Regios Inc., own processing

The graph shows the value of the prices of various commodities paper. From the graph we can tell from the prices A4 and A5 are identical. From the perspective of 2015 can tell from the price of paper was stable.

Figure #31: Comparison of price paper per months(CZK)



Source: FCC Regios Inc., own processing

6.3.6. Plastic

Numbers such as 98/2 and 90/10 shows the percentage of how much of pure plastic and contaminated. Therefore, the explanation for 98/2 means that 98% is a clear plastic, and 2% are dirty. Other plastics are by color. The table shows the prices listed on the Czech crown per tonne, which Regios reselling company in Prague. They are here to see the prices, which vary each month, and it is influenced by the price per barrel of oil. In 2015 the price per barrel were still at around 50 dollars. Nevertheless, plastic with the designation 98/2 has the largest sales value by the Czech on the market. The average price of all plastic per ton is 8,546 Czech crowns.

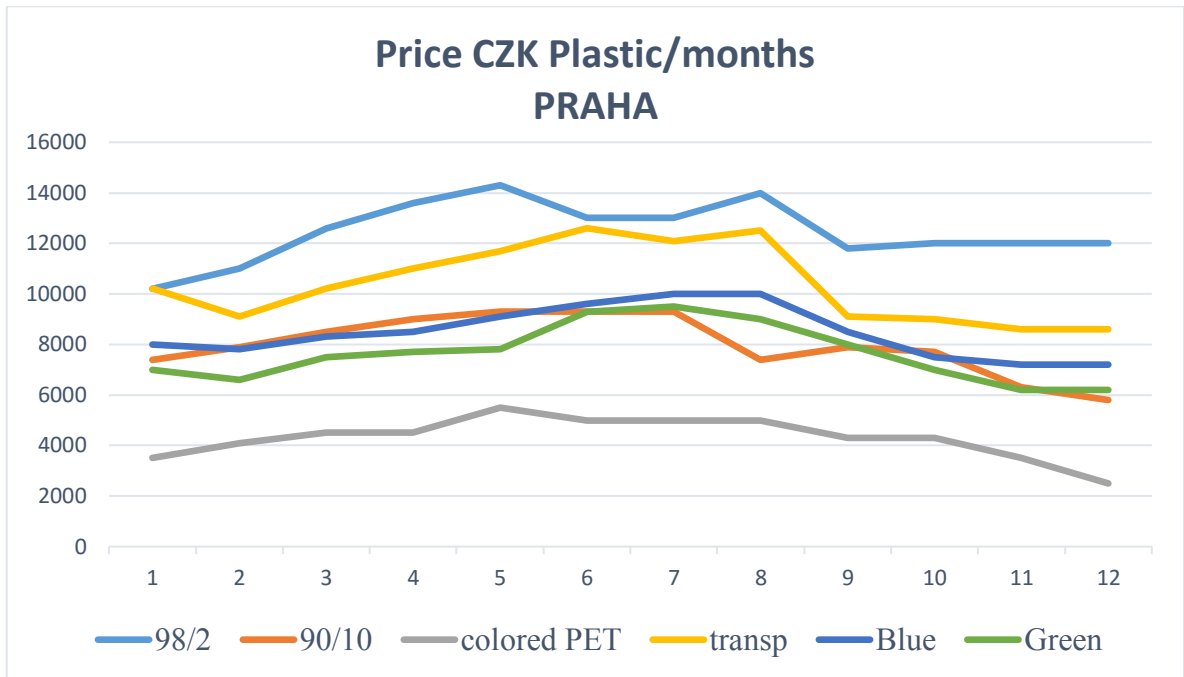
Table # 8: Price per tonnes for plastic(CZK)

Month	98/2	90/10	colored PET	transparent	Blue	Green
1	10200	7400	3500	10200	8000	7000
2	11000	7900	4100	9100	7800	6600
3	12600	8500	4500	10200	8300	7500
4	13600	9000	4500	11000	8500	7700
5	14300	9300	5500	11700	9100	7800
6	13000	9300	5000	12600	9600	9300
7	13000	9300	5000	12100	10000	9500
8	14000	7400	5000	12500	10000	9000
9	11800	7900	4300	9100	8500	8000
10	12000	7700	4300	9000	7500	7000
11	12000	6300	3500	8600	7200	6200
12	12000	5800	2500	8600	7200	6200

Source: FCC Regios Inc., own processing

The graph clearly movement of prices on the market each month. In 2015, the price of plastic is relatively stable and there see a noticeable fluctuation. As mentioned, most of the sales value clearly dominate 98/2 plastic and colored PET is minimal. The difference between them is on average around 8000 CZK.

Figure #32: Price plastic per months (CZK)



Source: FCC Regios Inc., own processing

6.4. The total calculation

From the data that were provided by the FCC is clearly of Regios has double the collection of plastic than the Prague service. This is justified by signing a new contract. According to data from the company for one ton of waste is the price of CZK 200. The company has therefore Regios net income of plastics 450 000 CZK per year, and imports from Prague services amount is 285 000 CZK per year. Thus, the difference between the two companies is 165 000 CZK. According to the results can be estimated that profits in 2016 will climb to hundreds of thousands, if it continues to establish cooperation with the Prague services. Looking at the increasing number of waste can not be excluded from the following year net income will increase in the order of hundreds of thousands. After adding up all the values for plastic is net profit of 925 000 CZK for the year 2015. Out of 62% of resale which is included and the paper is the estimated amount of approximately 1 500 000 CZK. Profit from Asapal materials, including the costs of processing and transport is CZK 150 per ton. Thus,

the remaining 38% which is Asopal net income annually 506 000 CZK. After counting all the material that is in Úholičkách Processing is the estimated amount 2 500 000 CZK.

7. Conclusion

The aim of this thesis was the theoretical elaboration of problems of waste management and recycling in the Czech Republic. Priority for waste management is recycling, leading to the re-use, and from an ecological point of view, recycling is the best method. Sorted waste for individual commodities are processed further to new materials for the manufacture of new products. For traditional raw materials which are collected separately, they are regarded as paper, plastic, glass and metals. This is confirmed by The Czech Statistical Office as well. According to statistics, most people graded paper to one third the total volume of classified materials, also glass which constitutes about 25% of the volume of separated waste, and the third most recycled waste plastics, which represent about 22%. People nowadays sorts metals less compared to earlier times. According to statistics, the ratio is between 9-11% compared to other species collected. Reason is because metal material is mainly used for durable products and if it is decided by people replaced in most cases the goods spend required. Another reason is the minimum available containers for metals, which therefore can be sorted mostly in surrender collecting yards only. To waste sorting is currently being actively devotes more than 72% of the population Czech Republic, ie nearly three quarters of the citizens. The main task of the practical part were descriptive and comparative methods at the company FCC Regios Inc. Úholičky where analysis was carried out for one year. The comparative material was paper and plastic. It has been shown to Regios establish doubly Pieces for sorting hall than the Prague service. From the data implies that 62% of reselling processed products which includes plastic and paper are total profit 1.5 million CZK a year, and 38% of waste or alternative fuel is the annual profit 506 000 CZK. Main profits therefore the company has from paper and plastic. After counting all the material that is in the area Úholičky processing a total annual profit of 2.5 million CZK.

From the data clearly show that the overall increase in garbage, can be inferred from the profits of the company in future years will rise in the order of hundreds of thousands per year.

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