

## Final Research Project

### Thesis: WEEE management in Bulgaria



**Antoniya Dimitrova**

HEBO 3ES1 (2ES3) 20062893

Supervisor: Mrs. Ariens & Mr. van Leeuwen

Mentor: Pascal Leroy

16 June 2008

The Hague School of European Studies

## Executive Summary

This thesis is an overview of the market and management for WEEE (waste of electrical and electronic equipment) in Bulgaria. It was executed to answer certain questions to WEEE Forum, which was my internship provider.

Chapter 2 analyzes the WEEE market and business developments in Bulgaria. Chapter 2.1 is a detailed overview of the legal basis for WEEE management in Bulgaria and how the WEEE Directive is implemented and transposed in the Bulgarian legislation. Directive 2002/96/EC and its obligations are crucial for the WEEE market in Bulgaria, since it provides guidelines for management, sets targets for the recyclers and appoints responsibilities to the specific stakeholders involved. Currently, the legislation of Bulgaria fulfills the requirements of the Directive, however new piece of legislation has to be created to clarify and define EEE, WEEE, prevention, distributor/importer, WEEE from households and financial agreement.

In chapter 2.2 there is a definition of the WEEE market and key terms used to describe it. Definition of all 10 categories of electrical and electronic waste is present, also what is WEEE in detail and key terms such as treatment, recovery and historic waste.

In chapter 2.3 the market size for WEEE is defined along with the conclusion that Bulgaria will reach the target of the Directive of 4kg per inhabitant in 2009 and also that between 2010 and 2015 there will be a gradual growth of the market with 1.4% yearly. Following is chapter 2.4, which explains the market segmentation firstly of EEE and then of WEEE. There is a detailed overview of number of producers, importers and retailers of EEE (future WEEE) and also the exact segmentation per category of waste. The latter shows that categories 1, 2, 3 & 4 have the biggest share of WEEE- 89% and the leader in this market are the large household appliances (category 1) with 55.8%.

Chapter 2.5, which provides the reader with the structure of the recycling and recovery industry in Bulgaria. Key figures in the industry are Ecobultech (the only take-back system in Bulgaria) and Nadin Commerce (authorized by Ecobultech to store and transport WEEE). Following this chapter is 2.6 Stakeholders strategic groupings, which provides the reader with information regarding the Ministry of Environment and waters and other stakeholders in the WEEE management like CECED Bulgaria and BCEE.

In the end of chapter 2.7 there is a conclusion that good strategic planning has to take place for transportation, promotion, information streams, control and monitoring of WEEE.

Furthermore, suggestions for improvements are present in chapter 2.8 Threats. In particular better liaison between the various units and structures that handle WEEE and additionally the lack of a competitor for the current take back system is seen as a huge threat for the WEEE market and the Bulgarian state as a whole.

Chapter 2.9 Opportunities gives few ideas for the management of the WEEE market, such as the opportunity for creating a technology or recycling plant for the plastics and hazardous waste that is not covered by the Bulgarian recyclers and it is exported abroad.

Chapter 2.10 is a summary of all chapters discussed in section 2.

Chapters between 3.1 and 3.8 are an analysis of the 8 Ps in Marketing. With the product analysis one can see that the life cycle of EEE products is getting shorter, therefore there is a trend for bigger amounts of certain categories of WEEE – such as 3 and 4. When describing the “Place” in chapter 3.2 there is an explanation why the targets of kg per inhabitant increase – the decline of the Bulgarian population in this case. Chapter 3.3 People explains the malpractices of the Bulgarian citizen when it comes to disposal of EEE waste and the phenomena of a grey market for WEEE – the gypsy population.

Chapter 3.4 Price suggests that the product fee charge for WEEE is higher than some other countries in the region due to lack of competition on the Bulgarian market. Like for category 1B €0.59 in BG and €0.19 in Czech Republic. In 3.5 Promotion, it is explained that even though that there is an encouragement for separate WEEE disposal and collection, the reality is that these promotional strategies are few and not effective. Chapter 3.6 Politics suggests that the country is politically stable, however still having coercive practices that resulted in the termination of EU funding towards Bulgaria.

Chapter 3.7 explains that the transportation costs for WEEE are 27% of the whole operational costs – €150 and €450-600 when exported per ton. Chapter 3.8 Presentation shows that the WEEE is labeled correctly with the sign mentioned in the Directive.

Chapter 4 is a detailed financial analysis of the management of WEEE in Bulgaria. A collection point for example costs €250 000. Chapter 5 is a detailed comparison between Bulgaria, Slovakia, Romania and Czech Republic in their practices of handling WEEE. The conclusion is that Bulgaria has to follow the example of the Czechs. Chapter 6 has recommendations and an overview of the future scenarios for the market of WEEE between 2009 and 2015.

## Table of Contents

### Executive Summary

1. Introduction	1
1.1. Information requirements	2
1.2. Research methodology	2
1.3. Research results	4
2. WEEE market and business developments analysis in Bulgaria	4
2.1. Legislation	4
2.2. Market definition	7
2.3. Market size	11
2.4. Market segmentation	17
2.5. Recycling/recovery industry structure	21
2.6. Stakeholders strategic groupings	25
2.7. Critical success factors in the industry	26
2.8. Threats	27
2.9. Opportunities	28
2.10. Summary	30
3. Analysis of the 8 Ps in Marketing	31
3.1. Product	31
3.2. Place	33
3.3. People	33
3.4. Price	36
3.5. Promotion	38
3.6. Politics	39
3.7. Physical Distribution	40
3.8. Presentation	41
4. Financial analysis of WEEE management in Bulgaria	42
5. Comparison between Bulgaria, Slovakia and Romania	44
6. Recommendations & Scenarios	47
6.1. Prediction of Future Scenarios	48
6.2. Plan of Action for each Scenario	49
7. Conclusion	54
8. Bibliography	55

### Appendices – Interviews, Statistics and graphs

## Preface

*“Gone are the days when business needed only to concern itself with product, price, place and promotion to be sure of profits. The four Ps of the traditional marketing mix have now been joined by a fifth: **principles.**”*

*Paul de Clerck & Jeroen Verhoeven*

*The Parliament Magazine Issue 268, 2008*

## Aknowledgments

I want to thank all of the people who assist me when writing this final paper. This work is a reflection of everything I learned in both of the universities I studied – The American University in Bulgaria and The Hague University of professional Studies.

I want to thank personally my mother, for everything and particularly in this case for helping me interview Bulgarian recyclers and regional authorities.

I want to thank my supervisors Mrs. Ariens and Mr. Leeuwen and my mentor & internship provider Pascal Leroy.

Furthermore I want to express gratitude to the head of HEBO- Mrs. Sanchez, all my professors, the administration of HEBO (Mrs. Op't Hof in particular) and Mr. Nijman, without these people I wouldn't be able to take 3 academic years in 2 and graduate.

I want to thank for the useful interviews with Willem Canneman, Martin Ciran, Jiri Mikulenka, Jaco Huisman, Georgi Filipov, Petr Novotny, Ivan Stamboliev, Christian Brabant, Francesca Furlan and all WEEE Forum members!

## **1. Introduction**

Bulgaria is in the black list of the European commission when it comes to recycling of WEEE (waste of electrical and electronic equipment). The country's bad reputation came after companies like Nokia, Sony, Hewlett-Packard, Electrolux filed a protest declaration. In this declaration, the companies are criticizing the Bulgarian authorities and the fact that they have obliged the producers to follow collective responsibility scheme for WEEE. The big companies like Nokia are worried that it might turn out that in the end a producer is not collecting the quantities he had put on the market.

The key figure in the market is Ecobultech- Bulgaria. The only take back system authorized by the Bulgarian Ministry of Environment and Waters. Ecobultech has contracts with more than 400 companies. Everyone who wants to dispose obsolete and considered as waste electrical or electronic equipment has to pay a product fee to the system and submit it to the appointed recycling points.

Although it is forbidden by law, Bulgarian people are throwing their batteries and small electrical and electronic appliances in the garbage containers. Few of the people know that BalBok Engineering is collecting old batteries for recycling or that Toner Direct is handling obsolete office appliances and equipment.

There is a lack of promotional campaigns. Usually, the consumers are waiting for a stimulating scheme, like the one introduced by Electrocoord- Hungary. In Hungary people can return their old EEE and receive a solid discount when purchasing new EEE (electrical and electronic equipment) from the store.

The concern towards WEEE started on a bigger scale because of Directive 2002/96/EC that was accepted and approved by the European Parliament and Council. This Directive is also called the "WEEE Directive" and it was published on 13.02.2003. This piece of EU legislation was made to impose the environmentally sound treatment of waste of electrical and electronic goods (called for short WEEE). The aim of the WEEE Directive is to reduce and handle with high efficiency the generated waste by both B2B and B2C consumers of EEE. The main goals of this Directive are to enforce the reuse, recycling and other forms of management and treatment of WEEE. Furthermore, Directive 2002/96/EC was created to regulate the behavior of all stakeholders involved in the WEEE process. These being producers/importers and end consumers of EEE, recyclers and other entities related to



the WEEE management. Supporting legislation to the WEEE Directive is Directive 2002/95/EC, which controls the usage of certain hazardous substances in EEE (BalBok, 2004, p.5).

### **1.1 Information requirements**

The sources that I used are mainly governmental publications or reports prepared especially for the Ministry of Environment and Water in Bulgaria, for example. When calculating the market size or comparing Bulgaria with the other countries having a similar market for WEEE I used several sources to make my estimations as precise as possible. However, my calculations are still round numbers and cannot be 100% true since most of them are forecasts about the future development of the market of WEEE in Bulgaria.

### **1.2 Research methodology<sup>1</sup>: Desk Research & Participatory observation**

My Final Paper is both related to my major European Studies and my specialization Business/Export/Strategic Management. Respectively my research strategy was also using two combined approaches, both qualitative: Desk Research & Case Study. The data collection methods for the first one were bibliographies, search engines, catalogues. For the second strategy the data collection methods were, in depth interviews (6 of them), focus groups and participatory observation (The WEEE Forum Conference in Vienna 3-4 April).

Since my final paper concerns both my major and specialization at the university I focused not on one but on 2 areas: Management and EU Law. This is because the analysis of the WEEE management in Bulgaria won't be possible without viewing the requirements, implementation and transposition of the directive.

My Primary Sources are:

- Reports
- Conference Reports
- Company reports
- Governmental publications

---

<sup>1</sup> Theory used from Power Pint Presentations : "Writing your Final paper" K.Moed, The Hague University 2008

My secondary Sources are:

- Newspapers
- Internet
- Journals

My tertiary Sources: - Indexes<sup>2</sup>

Since my main source of information – BalBok Engineering Report was in Bulgarian I had to use as a helping translation tool (even though I am native Bulgarian) – Google Language Tools.

### **Research topic: WEEE management in Bulgaria**

This should be a research that in the end will show how many take back systems, recyclers there are in Bulgaria who handle WEEE, what amounts of volume they collect per year, how they manage what they have collected and do they report to the member state properly. Additionally I have to make forecasts for the market growth (if there is any).

The organizational problem is that WEEE Forum suspects that Bulgaria is one of the worst cases when it comes to WEEE handling in Europe. This research is to be made to acquire the needed data to see whether this assumption was correct and to see what the market trends of WEEE in Bulgaria are.

WEEE Forum has a request towards me, to investigate and observe whether the gypsy population is an impact on the collection of WEEE, to what extent and how are they influencing the whole process.

**Reason for this research:** WEEE Forum wants to have an overview of the market for WEEE in Bulgaria, to see whether it is similar to other Eastern European countries or it is the worst case up until now.

**Preliminary central research question:** Does the Bulgarian market for WEEE resembles Slovakia and Romania or it is different in terms of scope and dynamics?

**Central Research Question:** How does the Bulgarian WEEE market reach the targets set by the EU Directive?

---

<sup>2</sup> Saunders, Lewis, Thornhill, Research Methods for Business Students, Third Edition



**Results desired by the organisation:** Clear statement of a description of the market for WEEE in Bulgaria, statistical data related to volumes of WEEE produced, number of producers who have output WEEE, number of recyclers and their location.

### **1.3 Research results**

My research results are mainly what my internship provider wanted me to investigate. They wanted me to answer specific questions regarding the Bulgarian WEEE market.

1. There is only one take back system in Bulgaria – Ecobultech, which is actually a private Ltd. (therefore I cannot find out which are the members of this system)
2. There is a recycling facility for luminaries and in particular gas charge lamps in Plovdiv
3. Currently a recycling facility for categories 1,2,3,4 is being build in Sofia
4. Bulgaria will reach the target of the Directive -4kg per person in 2009
5. Bulgarian market is growing every year, in particular from 2010-2015 with 14% yearly
6. There are no treatments facilities for the hazardous waste, therefore these substances are exported to Germany, Czech Republic, Austria or China.
7. The quantities of WEEE in Bulgaria are actually bigger than what United Nations University expects

## **2. WEEE market and business developments analysis in Bulgaria**

### **2.1 Legislation**

Directive 2002/96/EC and its obligations are crucial for the WEEE market in Bulgaria, since it provides guidelines for management, sets targets for the recyclers and appoints responsibilities to the specific stakeholders involved. The WEEE Directive along with Directive 2002/95/EC is the legal framework that manages the correct handling of WEEE. There are 7 legislative acts that are relevant to Directive 2002/96/EC: Law for protection of the environment, Law for waste control and management, Law for classification of the waste, Law for the requirements that have to be answered by the collection points for treatment of waste, Law for the requirements that have to be answered when treating and transporting hazardous waste from the production, Law for the requirements that have to

be answered when treating and transporting recycled motor oils and waste oil products, Law for the cases in which a permission is needed for export, transit of wastes and the requirements of obtaining one and Law for the requirement that have to be answered when putting on the market luminaries and other lightning equipment that contains mercury and treatment and transportation of disposed luminaries and other lightning equipment that contain mercury. By and large the legislation of Republic of Bulgaria is synchronized when it comes to the implementation and transposition of the WEEE Directive (Refer to Appendix VI).

The main purposes and aims of these pieces of legislation completely coincide with the ones of the WEEE Directive when it comes to environmental protection and management of wastes. The main goal of Directive 2002/96/EC, reduction of generated WEEE, its treatment, reuse and recycling are similar to the main purpose of Law for protection of the environment Article 57. Article 5 from the WEEE Directive regarding the separate collection of waste of electronic and electrical equipment is the same as Article 11 from the Law for waste control and management. Given the fact that the electric and electronic equipment was not defined as separate waste before the WEEE Directive, the Bulgarian legislation has to be renewed with new laws and regulations regarding this matter. The new legislation has to better answer the requirements of the WEEE Directive. Currently, the legislation of republic of Bulgaria fulfills the requirements of Directive 2002/96/EC, especially when clarifying the interaction between production, sale and disposal of luminaries and other lightning equipment that contain mercury and also batteries (BalBok, 2004, p.12).

In the legislation of Republic of Bulgaria there is no legal explanation and definition of electrical and electronic equipment (EEE) and the waste coming from it (WEEE). As for the other terms and definitions the Bulgarian legislation answers the requirements of the WEEE Directive. The transposition of Directive 2002/96/EC is possible without the introduction of new definitions or harmonization with the existing pieces of legislation. (BalBok, 2004, p.14)

The following table translated exactly from the BalBok Engineering report from 2004 is relevant to Directive 2002/96/EC.

<b>Directive 2002/96/EC</b>	<b>Legislation of Republic of Bulgaria</b>
Electrical and electronic equipment (EEE)	No legal definition
Waste of electrical and electronic equipment (WEEE)	No legal definition
Prevention	No legal definition
Reuse	Legal definition in paragraph 1, point 16 from the "ZUO"- Law for control and monitoring of the waste No existing difference between the two legislations
Recycling	Legal definition in paragraph 1, point 9 from the "ZUO"- Law for control and monitoring of the waste No existing difference between the two legislations
Recovery	Legal definition in paragraph 1, point 17 from the "ZUO"- Law for control and monitoring of the waste No existing difference between the two legislations with additional detailed suggestions for operations
Disposal	Legal definition in paragraph 1, point 8 from the "ZUO"- Law for control and monitoring of the waste No existing difference between the two legislations with additional detailed suggestions for operations
Treatment	Legal definition in paragraph 1, point 7 from the "ZUO"- Law for control and monitoring of the waste No existing difference between the two legislations. More broad, includes collecting and storing of wastes.
Producer	Legal definition can be found in :Paragraph 1, point 5 from the Law for the technical requirements of products Paragraph 1, point 3 from the Law for protection of the consumers and the rules of trade The Directive (not like the BG legislation) suggests that producer, importer and distributor are one legal entity.
Distributor (importer)	No legal definition
WEEE from households	No legal definition
Hazardous substance or chemical	Legal definition can be found in: Paragraph 1, point 54 from the Law of protection of the environment. For fulfillment of the requirements of the Directive new text must be created or the existing one should be edited.
Financial agreement	No legal definition

There are active laws and regulations in Republic of Bulgaria that are related to Directive 2002/95/EC. There are eight laws that are related to the features of the products, labeling, and safety requirements. All of the Bulgarian laws that are related both to Directive 2002/96/EC and 2002/95/EC are seeking for environmental protection and the safety of the citizens. The legal requirements in Republic of Bulgaria thoroughly satisfy the requirements for handling hazardous wastes. (BalBok, 2004, p.21-22)

## **2.2 Market Definition**

In the following chapter follows a definition of the market for WEEE in Bulgaria. The EEE waste is classified in 10 categories in the WEEE Directive. They represent both appliances from the B2B and the B2C market. Under consideration is the equipment that the Bulgarian law considers as waste. There are almost no differences between the United Nation's description of the 10 EEE categories and the Bulgarian one.

The 10 categories of waste of electronic and electrical equipment described in Directive 2002/96/EC also called the WEEE Directive are:

1. Large Household Appliance
2. Small Household Appliances
3. IT and Telecommunication equipment
4. Consumer electronics
5. Lighting equipment
6. Electrical and electronic tools
7. Toys, leisure and sports equipment
8. Medical devices
9. Monitoring and control instruments.
10. Automatic dispensers

Currently, the product life cycle is getting shorter and shorter everyday due to the demands of the consumers for faster, fashionable and upgraded equipment. Even the 10 categories that are explained in the Directive are affected since new products enter the market.

In the market of WEEE, several stakeholders (players) are involved. All are responsible for bringing EEE to the market, which after a period, different for every category of equipment, comes as a WEEE. We have manufacturers and importers, distributors, consumers, End –of –life managers: producer responsibility organizations, municipalities, and waste management providers, transport companies, recyclers, dismantlers, and scrap brokers; policy makers and regulatory authorities, lobbying groups and academics & research institutions.

Category 1 is Large Household appliances. Examples for that in the Bulgarian list are fridges, washing machines, ovens, air conditioners, driers, freezers, microwaves, heating appliances, fans etc. There are 18 types of electronics considered as waste in this

category. Comparing this list to the one from the WEEE Directive, we can see no changes (Refer to Appendix 3.2).

Category 2 is Small Household appliances. That includes vacuum cleaners, appliances for sawing and knitting, irons, toasters, electrical knives, clocks, scales etc. There are 13 of electronics considered as waste in category 2. Again, we have no differences between Bulgarian and EU categorizing (Refer to Appendix 3.2).

Category 3 is IT and Telecommunication equipment. All types of computers are described in the BG list of categories of WEEE. Under this category fall the telephones, faxes, GSM, printers, typing machines, calculators etc (Refer to Appendix 3.2). There are 11 types of electronics considered as waste in this category. In the Bulgarian list, an emphasis on the differentiation of CRT and LCD monitors is missing. It is stated that when collecting laptop and PC you must consider processor, monitor and keyboard as WEEE also, however there is no outspoken categorization of CRT and LCD. According to the UNU study, these types of monitors have an increase of collection with around 40%. Therefore, a change in the Bulgarian list would be preferable.

Category 5 is Lighting equipment, including 6 types of WEEE, lamps and luminous lamps, etc. In this category, in the Bulgarian list it is not emphasized on the energy saving lamps which include the hazardous mercury (Refer to Appendix 3.2).

Category 6 includes Electrical and electronic tools and it has 8 types of appliances in the BG categorization. This includes saws, drills, mowers etc (Refer to Appendix 3.2).

Category 7 is Toys, leisure and sports equipment. These include electrical train toys, game consoles, and video games, sport appliances with electrical or electronic components. There are 6 types of electronics and electrical equipment. There are no differences between the two categorizations in this case (Refer to Appendix 3.2).

Category 8 is Medical devices excluding all implanted or infected appliances. This category has 8 types of WEEE. These include laboratory equipment; analytical appliances and cardiology devices (Refer to Appendix 3.2).

Category 9 is appliances for monitoring and control, like smoke detectors, heating regulators; thermostats and etc (Refer to Appendix 3.2).

Category 10 is automatic dispensers, for cold or hot drinks, bank cash machines and other automatic delivering appliances (Refer to Appendix 3.2).

The conclusion is that every waste that has electronically or electrical parts or works plugged into electricity is considered WEEE. The WEEE Directive suggests that all disposed electrical and electronic equipment that is “charged by electricity or electromagnetic waves (batteries) to work up to 1000V AC and 1500V DC” is WEEE (BalBok, 2004, p.8).

There is an additional source of information that provides a description of WEEE and precise steps and procedures how to handle it. This is a Twinning contract “Transboundary shipment of waste BG 2004/IB/En/03” between Umweltbundesamt (Austria) and the Ministry of Environment and Waters. In this document there is a detailed description of WEEE, categorization and operations for safely utilization of the waste.

In the manual of the twinning contract, the definition of “waste” goes as following:

“The term “waste” is defined as a substance, object or a part of the object, from which the owner has, is planning or must release himself from.”<sup>3</sup> There are indicators, which help the user of the manual to classify the waste properly. The conclusion has to take into consideration all circumstances. If the material answers to one of the criteria marked with \* then it is automatically considered as waste.

Classification criteria:

- Described as an waste \*
- When there is no option for future use or utilization, but only chance for innocuousness \*
- There is no market for this material\*
- The time for usage has expired \*
- The usage of the material is forbidden by law\*
- The material is usually considered as waste
- The material cannot be used with the purpose it has been produced for.
- The material answers to one of the categories between Q1 and Q16
- The material can be submitted for treatment under operations R1-R13
- The material can be found in the European catalogue for wastes

---

<sup>3</sup> Umweltbundesamt (AT)& MOEW (BG),2004Twinning contract “Transboundary shipment of waste BG 2004/IB/En/03” p. 27 translation from Bulgarian to English made by Antoniya Dimitrova

- There are no existing safety lists; respectively the material does not answer the commonly accepted standards for production.
- It has unknown content
- When using the material one has to follow special rules for security and protecting of the environment, which are not needed when using raw materials

Categories of waste from this manual relevant to WEEE are only:

Q2 products not answering to the standards

Q6 unusable parts (used batteries, catalizators , etc.)

Q13 all materials, substances or products, which usage is forbidden by law

Q14 products, for which the owner does not finds any type of usage any more (unneeded things from shops, offices, homes etc.)

Also in this manual one can find short descriptions of WEEE. On page 40 of Manual 1 it is explained that waste is electrical assemblies consisting only of metals or alloys. Furthermore on page 41 it is explained that WEEE is also electrical scrap and reclaimed electronic components suitable for base and precious metal recovery; printed circuit boards; end –of-life electronic devices; waste electric/electronic equipment.

There are 4 key terms that have to be clarified in order for the market definition of WEEE to be understood. These are the separate collection of WEEE, treatment, recovery and historic waste. The separate collection is prerequisite for the treatment of WEEE. Since this waste needs special recycling and recovery procedures it has to be separated from the municipal waste coming from the households. The separate collection is one way of protecting the health of the citizens and protecting the environment. Both the B2C and the B2B consumers have to be active in this process. The regular citizen can submit their EEE waste to the nearby collection point or to one of the stores in the city who has a department for WEEE gathering. After 31.12.2006 Bulgaria like every other EU member state has to collect 4kg of WEEE per inhabitant. (BalBok, 2004, p.9)

The next step and key term from the WEEE market is the treatment. The treatment standards for WEEE have to answer the requirements of Appendix II from the Directive. The facilities that manage this process have to be approved, authorized and inspected by the agencies responsible for the environmental protection. When dealing with appliances that have hazardous substances, there should be special treatment standards that prevent leakage of these dangerous materials into the surrounding. After this procedure comes the recovery. The only category of WEEE who is not recovered is 8, since there



are special rules and regulations for medical equipment especially if it is infected. Recovery means “recycling of materials, reuse of components or burning/creation of energy”. New recovery targets will be set on 31.12.2008 (BalBok, 2004, p.10-11)

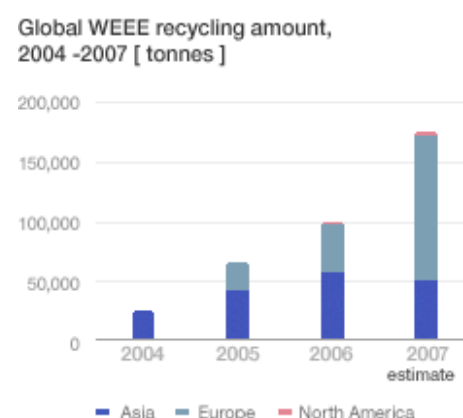
The last very important term when defining the WEEE market is historic waste. All EEE put on the market before 13.08.2005 is considered historic waste. For this WEEE the responsibilities for treatment are for both producers and partly from the consumers. All electronic and electrical waste that is not coming from the households, but from the B2B area is under the responsibilities of the owner of the equipment (BalBok, 2004, p.70)

When observing the market of WEEE, one has to keep into consideration the importance of materials that come from the thrown appliances. Gold, iron and plastic are valuable waste that can become raw materials after recycling. Apparently, after the interviews held with Bulgarian recyclers I come to the realization that a priority for them is not the WEEE and its handling itself, but the iron this appliances have. The iron compressed into small blocks and exported directly to China.

## 2.3 Market Size

Graph 2.3 <sup>1</sup>

To make estimations or predictions about the WEEE market size, one first has to observe the EEE market. All electronics that were placed on the market turn out later as waste. The UNU Report on in its executive summary states that for all 27 European Union member states the amount of EEE estimated for 2005 is 10.3 million tons per year. For the same year according to the same study on page 68 it is described that the total WEEE for 2005 is approximately 7.2 million tones. From this amount 0.04 million tones are coming from Bulgaria. Therefore 0.6% of the WEEE in Europe comes from Republic of Bulgaria.



Even though Bulgaria has a big territory (three times bigger than the Netherlands for example), the GDP of the country is the lowest in the European Union. As shown on Graph 1 in Appendix I, only Turkey and Macedonia have a slightly lower GDP than Bulgaria. That can lead to the conclusion that the purchasing power of the Bulgarian citizen is not so big and the EEE amounts per year are not going to be as big as the ones

in the Czech Republic for example, which has the same population but higher GDP than Bulgaria.

Even though the GDP is low and the population is only 7.6 million, Bulgaria still has a comparatively good size of WEEE market. It is bigger than the one in Luxembourg, Cyprus, Estonia, Litva, Malta, Latvia, and almost the same as in Slovakia. (UNU, p.68) This is because the country possesses huge amounts of historic WEEE and also because since the fall of communist regime many Bulgarians have the opportunity to buy and afford more and more electronic and electrical equipment. People are throwing away their old Russian Mraz refrigerators and buying new western European models.

First, there will be an observation of the amounts of electronic and electrical equipment that was and is put on the market in Bulgaria. This will give a hint of the future waste of EEE that will occur after the life cycle of the present appliances ends. Secondly, there will be a clarification what the actual present WEEE amounts are.

Unfortunately, a clear and precise calculation of the market cannot be made. Firstly, because there are no registered producers of EEE in the territory of Bulgaria (UNU, p.134) Secondly, there is no information from the National Registers (UNU, p.107) However, there is at least a split between the B2B and B2C markets in this case.

All statistical data related to EEE and WEEE put on the market was taken from UNU Report, KERP, BalBok Engineering or the Bulgarian National Statistical Institute. Producers and importers in Bulgaria are supposed to report quarterly to the Bulgarian Executive Environmental Agency (EEA) and customs are obliged to provide information for imported WEEE (C&E Recycling Newsletter). However, producers and importers are not to blame in this case because the monopolistic take back system approved by the authorities is handling all WEEE quantities. All interviews revealed that there is no doubt that Bulgaria manages to collect 4kg per person yearly.

The market size of WEEE in Bulgaria resembles the one in Slovakia by all means. When observing the WEEE amounts for 2006, Slovakia has 49,474 and Bulgaria has 40,684 (UNU Report, p.68) the following years the quantities of both countries continue to be similar. The prediction for 2020 is that Slovakia will reach 108,403 and Bulgaria 88,868. For both amounts of WEEE will double for 14 years. Given the fact that the population of Bulgaria is slowly but steadily declining it is odd to see that quantities of waste in this case

will double. However, this can be explained by the fact that the standard of living and purchasing power is increasing.

Furthermore, Bulgaria does not have so much electronic and electrical waste present days because of one crucial cultural and political determinant- Communism. Until the end of this regime of 1989 Bulgarian citizens did not have the chance to buy electronics or electrical equipment for their home. In the cities almost every household had a TV. However, that was not the case with the villages where big groups of people gathered around one TV for the whole neighborhood.

When making a comparison between the UNU Report analysis of WEEE amounts, the EEA Bulgaria and BalBok's report there are huge differences in the quantities. This might be the case because only few producers and importers submit information to EEA and possibly UNU is using the report of the MOEW (which receives info from the only take back system in Bulgaria). The UNU statistical data will be considered more precise; since it shows that for example in 2006 there was 5.55kg per head of WEEE collected in Bulgaria. For the same year the EEA statistics reveal 0.41kg. Since all interviews suggested that Bulgaria fulfills the WEEE Directive requirements of 4kg per person, one can conclude that the UNU statistical data is the correct one. Additionally, when the UNU Report lacks certain statistical information for a given year, the source will be the BalBok Engineering report.

When comparing the indexes for industrial sales and production for EEE between 2004 and 2008 we can notice a gradual grow. These indexes from the Bulgarian National Statistical Institute are for manufacture of office machinery & computers; electrical machinery and apparatus n.e.c; radio, television and communication equipment and apparatus; medical, precision and optical instruments, watches and clocks. (Refer to Appendix II)

When we observe the graph of EEA Bulgaria below we can see that in 2005 there were 1.1 million tons of hazardous waste. In this amount WEEE is also involved in the form of CFC from refrigerators, mercury from lamps and etc. However, we are not exactly sure what part of this quantity comes directly from WEEE. There is no data regarding this manner. (Refer to Appendix II, p.2)

From Chart 1 (WEEE amounts in Bulgaria) we can see that there is a gradual increase of amounts of WEEE from year to year. From 2005 to 2020 the quantity changes with

additional 2000- 3000 tons per year. When viewing table 3.3 it can be observed that from 2010 until 2020 there will be a gradual growth of the WEEE market with 14%. The amount in 2020 is double the one from 2006. The WEEE market in Bulgaria is middle to small sized when comparing with the other EU member states. Its size will increase constantly since the GDP of the citizens is going up along with their purchasing power. The rapid price erosion of EEE results in permanent inroad of new models and strong obsolescence of the old products.

Product life-cycle is going shorter due to new life style, influence of the press, fashion brands involvement and new design. For some EEE like GSM, after 6 months the product is OUT from the market. There is the new trend of personal digital equipments, like portable audio sets (Mp3/Mp4), mobile telecommunication and new devices (GPS, PDA etc.) Design is taken into account for static equipments at home, which leads to replacement of the old one (GfK Presentation)

According to GfK Presentation on the WEEE Conference 2008, the market trends towards TV sets show that more and more flat screens will be bought. That means that the old CRT TV's will become WEEE. For Bulgaria the increase of purchase of flat TV sets was with 24 %. Another trend revealed by GfK is that the laptop will replace the desktop computers. Therefore we will see an increasing tonnage in the category 3, since PC's are heavier than laptops.

Another trend that will affect the EEE market and then respectively the WEEE one are the air-conditioners. The climate change is affecting even western European countries, which are not used to such high temperatures like Southern and Eastern Europe. More and more people from Western and Northern Europe will have to buy an air conditioner to handle the rising temperatures in their countries. These air conditioners that are EEE present days will be WEEE after 12-13 years.

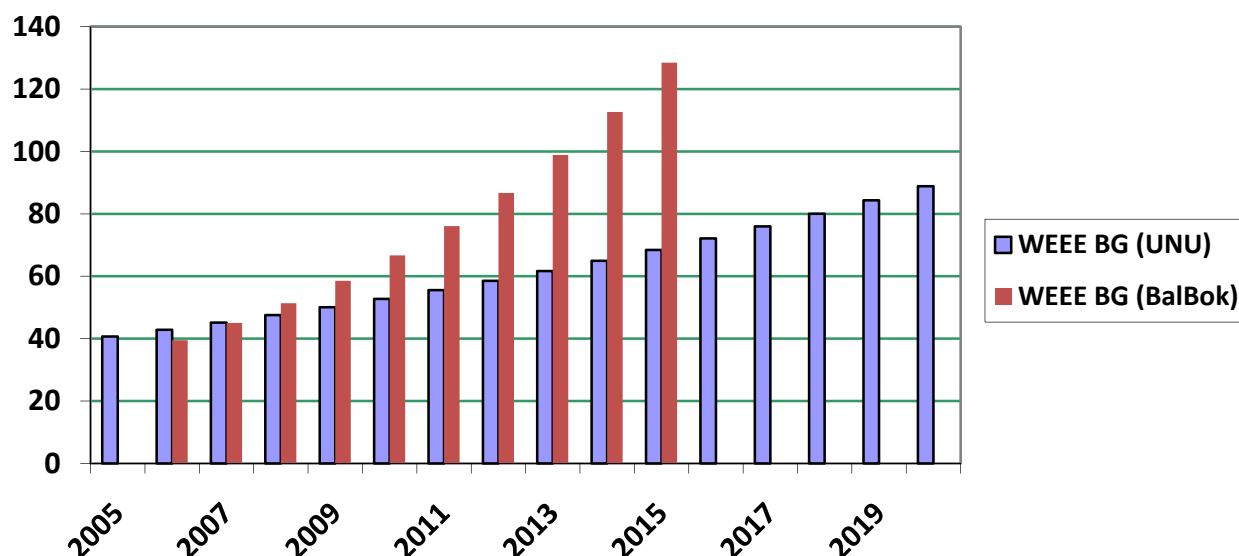
The market size of the waste of electrical and electronic equipment is going to grow steadily but determinately in Bulgaria. The country has huge quantities of historic waste and old, heavy, obsolete appliances from the communist regime, which are abandoned in their closets, basements or villas at the village.

Table 3.3: WEEE and EEE amounts in Bulgaria<sup>1</sup>

WEEE/ton	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020
(UNU)	40,684	42,851	45,134	47,540	50,067	52,749	55,567	58,538	61,668	64,968	68,446	88,868
(BalBok)		39,500	45,030	51,334	58,521	66,714	76,054	86,701	98,840	112,677	128,452	
Population	7 761 049	7 718 750	7 679 290	7 605 064								
BalBok		7 586 524	7 517 232	7 447 940	7 378 648	7 309 356	7 240 064	7 170 772	7 101 480	7 032 188	6 962 896	
Generated Kg/head		5,21kg	5,99kg	6,89 kg	7,93 kg	9,13 kg	10,50 kg	12,09 kg	13,92 kg	16,02 kg	18,45 kg	
% treated		20%	30%	50%	75%	75%	75%	75%	75%	75%	75%	
Actual target collected (BalBok)		1,04kg	1,80 kg	3,45 kg	5,95 kg	6,85 kg	7,88 kg	9,07 kg	10,44 kg	12,02 kg	13,84 kg	
Kg /head (UNU)	5.24kg	5.55kg	5.87kg	6.25kg								
GDP	2800€	3300€	3800€	4036€								
GDP growth	5.5%	6.1%	6.6%	6.2%								
EEE/tons (BalBok)Cat.1	28 289	29 420	30 597	31 821	33 094	34 418						
EEE/tons (EEA)	Q3+Q4 Q1+Q2											
B2C	Kg / head	2 032.7	6 319.6	Kg/head								
B2B	2006	1 122.5	299.8	2007								
General sum	-> 0.41kg	3 155.2	6 619.3	<- 0.86kg								
IT	5,400	5,202	5,930									
WEEE/ton (EEA) B2C		8 863	2 483.1									
B2B		698.9	1 912.1									
General sum		9561.9	24 728.2									

<sup>1</sup> Created by Antoniya Dimitrova with statistical data from UNU, Bulgarian National Statistical Institute, Forton International JSCo. &EEA Bulgaria and BalBok Engineering Report of 2004

Currently in 2008, Bulgaria will have 47, 540 tons of WEEE (UNU, p.68). For the same year when referring to table 3.3 one can see that BalBok Engineering states that 51 334 tons of WEEE will be generated and from them 19 983 tons will be recyclable (Refer to Appendix VII.1). The total amount of waste of EEE for 2008 is 7,775,019 tons. Therefore, Republic of Bulgaria represents 0.6 % of the WEEE market. The population of Bulgaria is 1.6% of the whole population of all 27 European member states. When looking at the predictions of UNU for 2020 one can see that Bulgaria will have 88,868 tons of WEEE from a total 10,615,411 tons. Therefore, Republic of Bulgaria will represent 0.8 % of the whole market for WEEE.



<sup>4</sup> Chart 1: WEEE amounts in Bulgaria

After calculating the total tonnage of WEEE divided by the expected population in Bulgaria for 2008 we can see as shown on table 3.3 that both UNU and BalBok suggest that there will be more than 4kg per head, UNU – 6.25kg and BalBok -6.89. If one tries to calculate the worst case scenario for this year and takes into account only the recyclable WEEE (19 983 tons) then there will be 2.68kg per head. This amount is insufficient according to the WEEE Directive; however the transposition period for Republic of Bulgaria of this piece of legislation is until January 2009. That means that the country has to fulfill its obligations of 4kg in 2009, which will be possible due to the increase in amounts of WEEE and the decrease of population.

In 2008 the Bulgarian take back system will retrieve 6.25kg per/head. If the forecast of UNU is correct for 2020 the country will collect 8.3kg per/head. The forecasts of BalBok Engineering are even or higher quantities of WEEE in 2015. The market size in this country for WEEE is stable and growing slowly, but steadily. The closest resemblance of the size of the Bulgarian WEEE market is the Slovakian one, which is also going to double in 2020.

Since the introduction of the WEEE directive, Bulgaria will reach the target of 4 kg per/head in 2009.

<sup>4</sup> Graph made by Antoniya Dimitrova based on the statistics of UNU Report, 2008, page 68

Chart 1 (WEEE amounts in Bulgaria) can help us determine the market segmentation for WEEE. There is a clear path of how to define parts of the market. Firstly, we make a graph for the EEE amounts and make a distinction between B2B and B2C. Secondly, we make a graph for the EEE amounts from which we show how many producers, importers and hypermarkets there are. Of them we make sub segmentation of the 10 categories of WEEE.

For the WEEE amounts we make similar segmentation. In addition we use the UNU report to help us determine the percentage of total market for the different 10 categories of WEEE. However, the fact that a certain amount of WEEE was on the market does not mean that the entire quantity was gathered and treated. Most of the time only a percentage of a certain category of the waste is actually handled properly, the other is either lost or illegally exported.

For a detailed analysis of the expected market size of WEEE between 2009 and 2015 refer to chapter 6. There the developments in this industry are explained thoroughly.

## **2.4 Market segmentation**

The market for WEEE in Bulgaria can be segmented in B2B and B2C sectors. Then a more detailed segmentation of 3 subcategories should be made between producers, importers and hypermarkets that deal with EEE. EEE is future WEEE, therefore a sufficient knowledge of the market of EEE is a good indication and prediction of the WEEE market. Tonnage of EEE and the number of stakeholders involved is helpful.

Then segmentation in the WEEE market itself should be made. In this case recyclers and take-back systems are the two segments we need. The take back systems case is one with only one big player – Ecobultech. The monopoly of this company leads to the conclusion that they are the ones who cover the whole country's WEEE. However, with an interview with a representative of the company a second take-back system is mentioned. Unfortunately, there is no information whatsoever of an Eltech Resurs to exist in the Bulgarian market.

The recycling segment is not so homogenic in nature. We have several recyclers who are authorized either by the take back system or are private companies who deal with

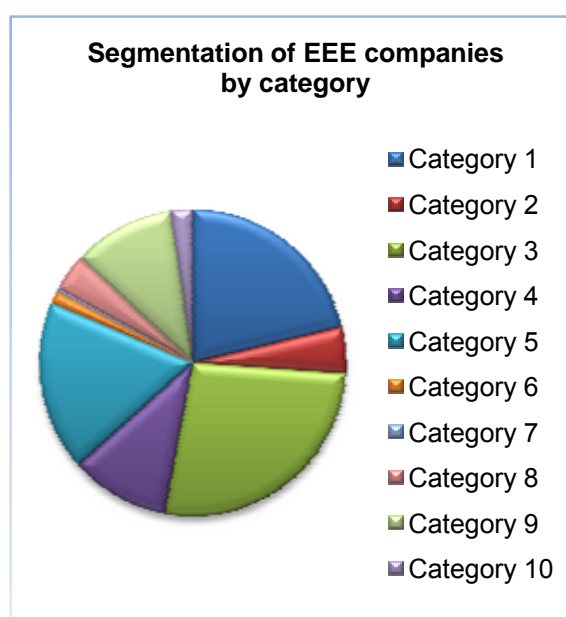
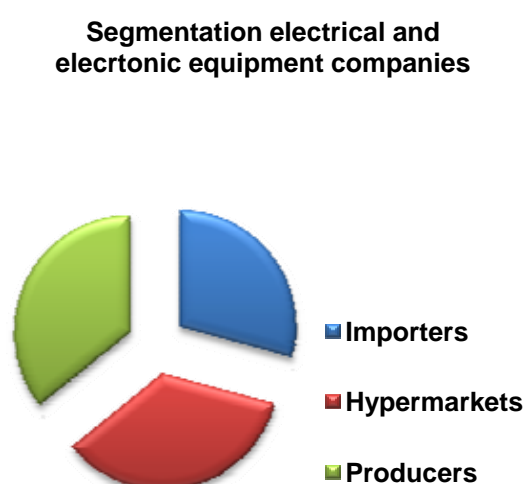


particular waste categories related to WEEE, such as ferrous and non-ferrous metal, glass and plastics.

When analyzing the segmentation of EEE producers, importers and hypermarkets it is difficult to come up with a precise number of stakeholders. This is because there is no national registry of companies in Bulgaria. All information gathered to draw the market segmentation is based on web site research and Bulgarian corporate web site engines.

The hypermarket segment can be described and analyzed more easily than the other two EEE segments. Firstly, because there are few hypermarkets for electronics and electrical equipment like Technomakret Evropa, Technopolis, Hit and Metro. One big chunk of the market has K&K electronics, which owns Tecnomarket Evropa and are the biggest importers of consumer electronics in Bulgaria. There are 26 hypermarkets of Technomarket Evropa, 12 of Technopolis, 8 of Metro and 2 of Hit (Forton, p.3)

As information base there are 3 web site search engines and business catalogues that show how many companies there are in Bulgaria. Two of them are Bulgarian – Need.bg & gbg.bg and one is Dutch- Kompas. Both Bulgarian sources lead to the conclusion that there are 49 producers, 40 importers (distributors) and 48 hypermarkets of EEE on the territory of Bulgaria. However, Kompas information data show that Bulgaria has 306 producers of EEE and 15 importers (distributors). The difference of 25 in the case of importers might be because the Bulgarian databases and the Dutch one have different categorization of what is a manufacturer and what is a producer of WEEE.



From the 49 producers, 34 deal with B2B products, only 14 with B2C and 1 that produces both types of EEE. From the 40 importers (distributors) 11 deal with B2B products and 29 with B2C. The hypermarkets in Bulgaria sale mainly B2C electronic and electrical products. Besides segmenting the EEE market in B2B, B2C, importers, producers and hypermarkets, one can also segment it in the 10 categories of WEEE. Hard competition accelerate market segmentation lead to new segments, new products, need for latest model (Need.bg and GBG.bg)

**Table 2: Likely breakdown for WEEE arising in the future years<sup>5</sup>**

To check whether this prediction of UNU is correct we can check whether category 3 is actually 12% of the whole WEEE. For the year 2007 for example the UNU Report suggests that there were 5 930 tons of Category 3 put on the market (UNU, p.47).

The total WEEE put on the market in Bulgaria for this year is 45,134 tones. If we consider that everything that was put on the market replaces the same amount of old EEE, the forecast turns out to be good. Given the fact that the actual percentage of

Category	Wt% of total market	Tons of WEEE 2007 Bulgaria
1	55.8	25,184.7
2	9.3	4,197.5
3	12.0	5,416
4	12.1	5,461.2
5	3.4	1,534.5
6	4.0	1,805.3
7	2.2	992.9
8	0.5	225.7
9	0.4	180.5
10	0.3	135.4
<b>Total</b>	<b>100.00</b>	<b>45,134</b>

IT for 2007 when calculated from the total amount is 13%, deviation is 1%. This 1% might be a result from the heavier IT equipment which was produced before and it is replaced by a lighter one.

Since, the forecast is correct we can make further calculations and come to the conclusion that the large household appliances for 2007 were 25, 184.7 tons, the small household appliances were 4,197.5 tons, the IT and Telecom equipment is 5,416 tons, the TV sets were 5,461.2 tons, the lightning equipment 1,534.5 tons, the Electrical and electronic tools were 1,805.3 tons, the toys, leisure and sports equipment was 992.9 tons,

<sup>5</sup> Table 36: Distribution (Wt%) between categories, UNU Report, 2008, p.57, additional column and information calculated with the statistics from page 68

the medical devices were 225.7 tons, the monitoring and control instruments 180.5 and the automatic dispensers were 135.4 tons.

Chart 2 in Appendix III reveals the quantities of WEEE for categories 3 and 4. In chapter 2.3 Market Size is shown that Bulgaria represents 0.6% of the WEEE amounts of Europe. That means that from 2.3million tons of categories 3 and 4 Bulgaria has 13,800 tons of WEEE.

This quantity of electronic and electrical waste presented by GfK coincides with the forecasted amounts from the United Nations University Report. GfK is one of the largest market research companies in the world. According to their report and my calculations of the different segments for IT & Telecom and TV equipment the waste is 10,887 tons. The difference of almost 3,000 tons comes from the rough estimations made. Overall the predictions of WEEE market size and segmentation have similar outcomes in number from both resources – GfK and UNU Report.

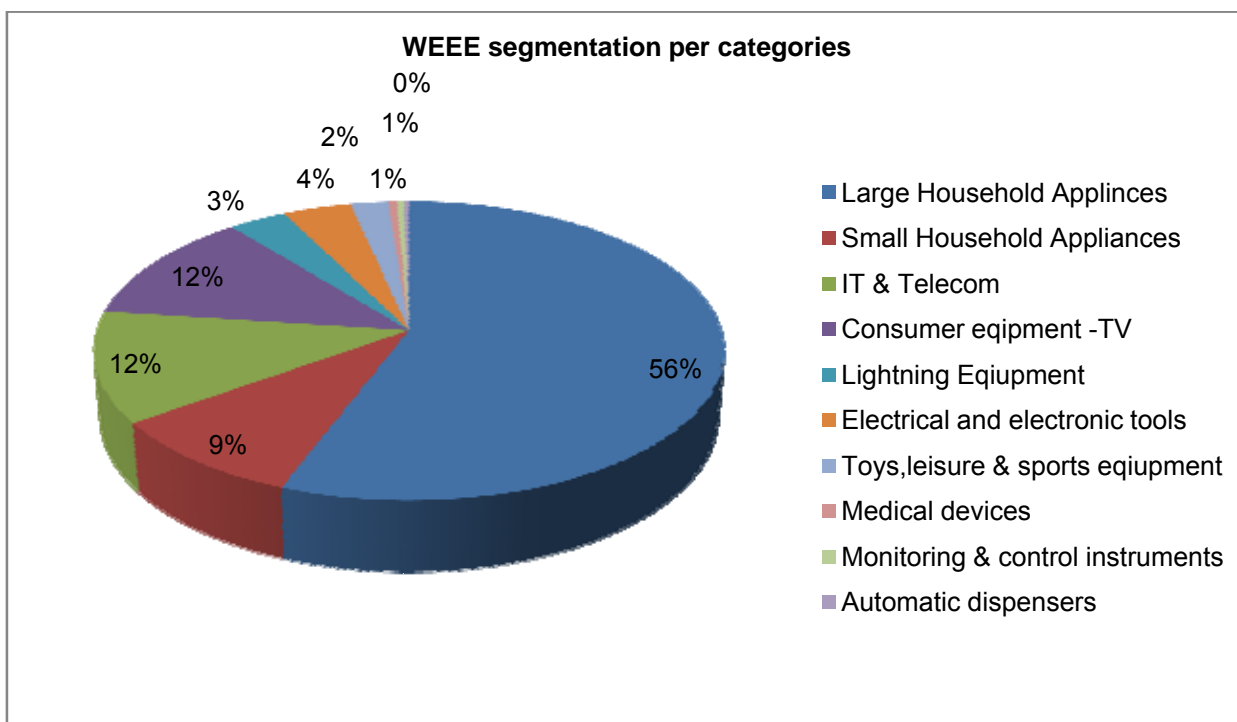


Chart 3: WEEE Segmentation Bulgaria<sup>6</sup>

Categories 1, 2, 3 & 4 have the biggest share of WEEE – 89%. The Large& Small house hold appliances, IT & Telecom and Consumer equipment- TV's are the biggest WEEE

<sup>6</sup> Created by Antoniya Dimitrova with statistics from UNU report, page 57

providers. The leaders in this market are the large household appliances with 56%. That means that truly Bulgarians are throwing away their old excessively heavy appliances that have been acquired during the communist regime. Most of these appliances are old Russian refrigerators or washing machines. Driers are not common for the Bulgarian house hold given the fact that Bulgaria has a warm and dry climate. Dishwashers are luxury for the Bulgarian; therefore there is only small number of this appliance in the country.

## 2.5 Recycling / Recovery industry structure



The tree structure above is created by Antoniya Dimitrova on the basis of 2 months investigation and interviews. It involves information from interviewees, B2B database – Kompass and two online B2B databases from Bulgaria – gbg.bg and need.bg. For detailed information refer to Appendix III “Recycling Industry”. Key figures in the recycling industry are Ecobultech and Nadin, which are the major players on the WEEE market.



Sofia, Bulgaria, 30 Petar Deyan St.  
phone: +359 2/846 76 00,  
fax: +359 2/846 46 00;  
e-mail: [ecobultech@ecobultech.com](mailto:ecobultech@ecobultech.com)  
<http://ecobultex.com>

According to my investigation and interviews with take-back system representative, recycler and municipality administration officer in Bulgaria, there is only one take back system in Bulgaria that deals with WEEE. That is Ecobultech which actually state that they are a Ltd. and therefore cannot provide me with a list of their members, customers or stakeholders. They also suggested that there is a second take back system in the territory of Republic of Bulgaria – Eltech Resurs. However, no information was available for such an entity to exist (Refer to Interview 1).

“Ecobultech is a private Ltd. company and an organization for recovery of WEEE.” The members and stakeholders of the Ltd. are not public information. Every company that wants to pay its product charge for their EEE products can submit their documents and make a payment to Ecobultech, who is authorized by the Ministry of Environment and Water to manage WEEE streams according to Directive 2002/96/EC. After paying the product charge, the quantities of future WEEE are responsibility of Ecobultech. Producers, importers and distributors that have responsibility towards their electrical and electronic equipment have to handle this liability through the take back system or individually. (Refer to Interview 1).

Ecobultech has a wide system build to manage the WEEE streams. It covers “43 municipality regions and 65 collection points”, which are situated in the 14 biggest cities in Bulgaria and therefore covering all the territory of the country (Ecobultech, 2008). These cities are (from the south to the north) Sofia (the capital) and Sofia region, Blagoevgrad, Plovdiv, Stara Zagora, Haskovo, Burgas, Varna, Dobrich, Shumen, Razgrad, Ruse, Veliko Trynovo, Pleven and Vratza (Ecobultech, 2008). The collection points are considered temporary warehouses for WEEE, since only several categories of the waste can be recycled on the territory of Bulgaria and the others have to be exported. On this collection points the waste amounts are temporarily stored, prepared for recycling and dismantled. In the case of the appliances like fridges, the scrap is left for treatment in Bulgaria (transported by Ecobultech to the appropriate scrap recycler) and the hazardous substance (the CFC) is exported to Austria or Czech Republic for example. Luminaries and all lightning equipment, even the ones that have mercury can be recycled in the

factory in Plovdiv. Currently a recycling and treatment plant for categories 1,2,3,4 and 10 is being built in Sofia. Ecobultech has authorized Nadin Commerce to store and treat WEEE. (Refer to interview 1).

**Nadin Commerce**

Sofia, Novi Iskar 35 Pobeda St.  
tel.(+359) 2 936 1051  
<http://www.nadin-bg.com/>

Nadin , which is a private Ltd. “was founded in 1991 with the main activity of collecting, processing and trading with scrap from non-ferrous and ferrous metals...Its activities are centered on four business areas: Processing and trading of metals, WEEE Recycling , Sea Shipping and Construction.” The company has several recycling facilities in Sofia, Pirdop, Devnya, Slivnitsa, Mezdra, Plovdiv, Vratza and Sofia. There they process monthly around “25 tons of scrap” and the capacity of the transportation of waste of Nadin is 500 000 tons per year. Nadin Commerce collects treats, stores and transports WEEE. It works together with the take back system in Bulgaria since 01.09.2006. Along with the collection points there are 70 stores that also receive disposed as waste EEE. Some of these stores are Technomarket, Europe, Technopolis and Elite. Since on their official web site Nadin state that they are building currently a new modern recycling factory/facility to handle WEEE, one can assume that the recycling facility that was mentioned by the Ecobultech representative for categories 1,2,3,4 and 10 is actually launched by Nadin commerce (Nadin, 2008)

Besides Nadin Ltd. there is Nadin Trans Ltd. and Nadin Pomorie. Nadin is a key stakeholder in the recycling/recovery industry. Since, this is the company authorized by the take back system one can assume that they are the one who exports the hazardous WEEE and is responsible for the gathering of all EEE waste from the collection points. The remaining stakeholders in the recycling/recovery industry are specializing in different fields and operate with less amounts of WEEE.

Currently there is no WEEE recycling and treatment facility on the territory of Republic of Bulgaria (it is still under construction). There are amenities that handle the recycling of some of the materials that are constituted in the waste of electronic and electrical equipments such as ferrous metals. According to Kompass in Bulgaria there are 75 recyclers of metal, 4 of plastics, 30 scrap and waste traders, 1 shredder “Deseti Dekemvri Plc” and 1 import –export waste scrap agent “Scholz AG Representative Office in Bulgaria” (Refer to Appendix III).

The biggest recycling facilities for ferrous metals are “Stomana Industry” Pernik and MK Kremikovtzi. Companies that recycle non-ferrous metals are OCK Kurdjali, KCM Plovdiv and “Monbat” Montana. All companies that treat metals are registered in the Ministry of Finance, since they have to obtain special permission to operate. According to this register there are 520 companies that operate in that field (data until 16.08.2004). Recyclers of metals mainly build their businesses around the biggest cities in Bulgaria. The five largest in population are Sofia, Plovdiv, Varna, Burgas and Ruse with respectively 140, 29, 27, 16 and 22 metal recyclers on their territory. Other large cities in Bulgaria are Stara Zagora, Vratza, Shumen, Yambol and Blagoevgrad with 25, 20, 16, 17 and 11 entities that collect and recycle ferrous and non ferrous metals. Recyclers of plastics are “Chimic” Asenovgrad and “Fenix” Targovishte. Other relevant recyclers to the WEEE industry might be the recycler for glass – “Stind” Drujba and recycler of rubber – “Gumi eko” Gaber village. The capacity of plastic recycling is 12 000 tons per year and for 2001 the amount was 3 000 tons, glass capacity 60 000 tons and in 2001 it was 12 000 tons, for metal for 2001 it was 11 000 tons with a total capacity virtually unlimited. Along with the recyclers of WEEE there are reported repair warehouses for WEEE which can fix and contribute to the reuse of some old electrical and electronic equipment. The financial and cost estimation for collection points and other relevant stakeholders from the industry are discussed in chapter 4 (BalBok, 2004, p.30 -31).

The already existing facility that recycles luminaries, especially gas charger lamps reaches recovery of 95%. It has one collection point of 2500 square meters and two mobile ones, 1 with capacity 3.5 tons and another one with 20 tons. In this process the B2B consumers are involved. The other WEEE streams that are collected separately and cannot be treated on the territory of Bulgaria are exported to recycling facilities in Germany (BalBok, 2004, p.32)



## 2.6 Stakeholders strategic groupings

There are fourteen stakeholders involved in the process of managing WEEE in Republic of Bulgaria. All of them are defined along with their responsibilities in the WEEE directive. The difference between them is that they hold different responsibilities and diverse steps of the process of treating WEEE. The biggest expectations and duties are vested in the hands of Ministry of environment and waters and producers/importers of EEE. There are also nonprofit organizations that are not directly involved in this process that try to contribute to it and lobby for improvement, such as CECED Bulgaria and the BCEE (Bulgarian Chamber of Electrical engineering).

**Ministry of Environment and Water**

Executive Director: Dimitar Vergiev  
Address: 1618 Sofia, 136 Tsar Boris III blvd.  
Post address: 1618 Sofia, P.O.B. 251  
Telephone: +359 2 955 90 11  
Fax: +359 2 955 90 15 **web site:**  
[http://nfp-  
bg.eionet.eu.int/ncesd/index.html](http://nfp-bg.eionet.eu.int/ncesd/index.html)

Other stakeholders involved in the WEEE practices are the Ministry of finance, the Ministry of health, local authorities, all producers and manufacturers of EEE (except the ones that export to non EU member states), importers of EEE, retailers of EEE, B2C and B2B consumers of EEE, the repair centers for EEE, collection points of WEEE, dismantling facilities of WEEE, retailers of metals and scrap, all companies dealing with control or management of WEEE, transportation companies exporting WEEE, nonprofit organizations and the media (BalBok, 2004, p.8).

In particular there are several entities that are considered as important in planning strategically the implementation of the WEEE directive in Bulgaria. A key figure one is the Minister of Environment and Water, then the second in charge are the directors of regional inspection centers for environment and water, mayors of municipalities, regional governors, Director of hygienic epidemiological survey, the president of the national agency of meteorological and technical supervision (BalBok, 2004, p.22-23).

**NATIONAL CHAMBER  
OF ELECTRICAL  
ENGINEERING IN  
BULGARIA (NCEEB)**

Bulgaria, 1407 Sofia,  
POBox 76, tel.: (+359 2)  
963 3532, 963 3437  
fax: (+359 2) 963 0727,  
e-mail: [bcee@itp.bg](mailto:bcee@itp.bg),  
[bcee@bcee-bg.org](mailto:bcee@bcee-bg.org)

## **2.7 Critical success factors in the industry**

The WEEE management in Bulgaria depends entirely on the involvement, contribution and efforts of the EEE producers and importers/distributors. The Bulgarian citizen should be able to submit his old, non- functioning, obsolete or damaged electrical and electronic equipment and receive a discount when buying a new appliance in the store. This practice is used in many other EU countries when dealing with WEEE (BalBok, 2004, p.49).

Bulgaria has only one take back system at the moment, however a second one is about to be launched according to the representatives of the first one. There is one factory who handles waste from luminaries and lightning equipment in Plovdiv and fortunately for the Bulgarian WEEE market the building of a facility that will recycle waste from category 1,2,3,4 and 10 started this year (Refer to interview with Ecobultech).

According to the Law of control and monitoring of wastes, the local authorities have to supervise the systems and streams of WEEE handling. At this moment this requirement is not fulfilled because time is needed for the entities handling these responsibilities to get acquainted with the matter and obtain financial and administrative support. Republic of Bulgaria and all involved stakeholders in planning WEEE management has to find a solution for the territorial problem in the country. This issue comes from the fact that most of the land is agricultural in nature and the density of the population is low. Therefore, collection of WEEE is becoming more difficult, more decentralized and expensive. Good strategic planning has to take place in this case for transportation, promotion, information streams, control and monitoring (BalBok, 2004, p.49)

## **2.8 Threats**

The Threats that can occur when managing the WEEE market are many. The most dangerous one is not handling the hazardous elements in the waste, like CFC in the refrigerators, mercury in the light- saving lamps and LCD monitors. These two substances threaten the climate and environment to a huge extent. Due to the grey market activities of gypsies and beggars for example in Bulgaria many refrigerators are turn into scrap with the CFC substance simply thrown or released at unknown places.

There is an appendix to the Bulgarian version of the WEEE Directive which has special requirements for EEE put on the market after 01.07.2006. Lead, mercury, cadmium Chromium IV and two supplements with bromine are banned from the government. The usage of these substances in the EEE is illegal and it affects 13 stakeholders. These are : MOEW, the regional environmental monitoring authorities, the Ministry of Health, the regional hygienic- epidemiological monitoring authorities, the Bulgarian Institute of standardization, the producers of unprocessed or unrefined raw materials, recycling& treatment plants, importers & distributors of EE, factories and companies that sglobqva EEE, producers of EEE, repair warehouses EEE, research centers, plants that treat, recycle and handle WEEE. Other threats affect the economy and the Bulgarian authorities' responsibility towards EU Law (BalBok, 2004, p.59).

Since, currently there is only one take back system – Ecobultech in the country, the market for WEEE is a monopolistic one. This have to change and competition has to be present. More competitors on the market of WEEE will mean lower costs of recycling and handling, which in the end are mainly coming out from the pockets of the consumer. If there are no other take-back systems in the market to handle the waste Bulgaria will also face problems with the EU Commission which monitors the implementation of the WEEE Directive in Bulgaria (BalBok, 2004, p.59)

Moreover, the current take back system is said to have more than 400 members, producers and importers of EEE. They pay their product charge fee for WEEE that is fixed amount set by the Ministry of Environment and Waters. However, when interviewing a representative from the take back system it turned out that these companies are not members of the take back system, which is actually private Ltd. and they pay only the fee to them, without being part of the system. In the other countries take back systems are

take back systems, not Ltd. and post on their web sites a list of their members- producers and importers of EEE (BalBok, 2004, p.59).

The EU Commission authorities and in particular the DG Environment is already questioning the correct implementation of the WEEE Directive in Bulgaria. There is no links and liaison between the various units and structures that handle WEEE, and most of the necessary and crucial units and structures are not build at all. The main reason for this problem is not the lack of regulatory body or a specific law. The issue is that WEEE appears to be mass municipal waste. This characteristic redirects the electronic and electrical waste in the stream of municipal regular waste that comes from the household. The scrap is not an environmental issue and will be used by the recyclers since it is valuable, but the hazardous components of refrigerators for example are a dangerous issue (BalBok, 2004, p.59).

NGO's from the WEEE industry and environmental protection ones are already voicing their concern that Bulgaria is guilty as charge in mishandling WEEE. Take back system managers from all over Europe had personally raised their concern and disappointment from the Bulgarian way of managing WEEE when I interviewed them. All of them warned that if there is no improvement and no entry of a competitor of the WEEE market the EU Commission will intervene and heavily fine the newly accepted member state for not following the WEEE Directive correctly.

## **2.9 Opportunities**

In Bulgaria there are no recycling or treatment plants specially build to handle waste of electronic and electrical equipment, or such that answer the requirements of Appendix II and III of the WEEE Directive. There are recycling and treatment plants for several materials that can be found in WEEE. One of them is metal or scrap, which in 2001 was 11 000 tons. Others are different types of plastics -12 000 tons (2001 the actual amount was 3 000 tons). Finally, there is glass – 60 000 tons per year (in 2001 the actual amount was 12 000 tons) (BalBok, 2004, p. 53).

The authorities responsible of creating a framework for handling WEEE came up with scenarios of schemes to handle WEEE and special streams of materials to be handled. These strategic plans for management of WEEE are on the basis of the WEEE Directive

and more particularly article 7 (2). The materials are segmented into different streams according to categories of WEEE, quantity and possibility of treatment or recycling. The future strategy for WEEE management suggests that the waste is separated into 3 groups for recycling (BalBok, 2004, p.53).

The first one is categories 1 & 10, apparently because both categories involve heavy equipment that require similar practices of treatment and consist of almost the same materials- refrigerators ( category 1) and automatic dispensers ( category 10). The second group is categories 3 & 4. Again ICT & Telecommunication equipment has similarities with TV sets. Both have appliances that are not heavy, however are delicate since LCD monitors for both TV sets and computers have mercury, which is extremely dangerous for the environment if not treated correctly. The opportunity for this group is that in the future a lot of old CRT monitor will come back as a WEEE even if they are still functioning. This is due to the fact that European standards will be imposed on the television signal, which is going to be entirely switched to digital signal, therefore requiring digital receiver and making obsolete and useless the CRT TV set (BalBok, 2004, p. 53).

The third, last group for recycling is made of categories 2, 5, 7 and 9. Category 8 does not exist in this group because medical appliances and equipment requires specific treatment, especially if it is infected. The third group is made of light objects that can be easily thrown in the municipal waste container. These appliances are the most difficult to track and handled when they become waste. It is not critical for the environment if a light bulb is thrown in the container around the block. However, the energy- saving lamps are extremely dangerous for the environment since they contain mercury. Unfortunately, no one in Bulgaria and even most people in the rest of Europe do not know that these apparently harmless bulbs are such threat. The detailed data from the scenarios that were created can be found in appendix VII.1, VII.2 and VII.3. This detailed plan shows that the 3 groups have similar content and also reveals what is the expected amount of these materials. With these forecasts a clear recycling strategy can be set up and the involved stakeholders can have a clear budget, approach and target to reach (BalBok, 2004, p.53).

Bulgaria does not have the opportunity and capacity to recycle separately the collected amounts of WEEE. This is because there are no treatment and recycling plants for these purposes. There is no way for the WEEE to be carefully and correctly recycled or treated. The hazardous elements such as CFC and mercury are exported to other countries for treatment (BalBok, 2004 p.53). Since these substances are tremendously dangerous for the environment and the health of the people recyclers have the practice of dismantling a

refrigerator for example in such a way that they keep the scrap and export the CFC fluids to Austria, Czech Republic or Germany. The energy-saving lamps are not exported, since there is a recycling plant for them in Plovdiv, which is a city in the center of Bulgaria (Refer with Interview 1).

In Bulgaria there is an opportunity and capacity for recycling or treatment of ferrous or non ferrous metals for recycling. The facilities that treat these materials can be used as a basis for the creation of collection points especially for WEEE after being upgraded additionally with the relevant equipment (BalBok, 2004, p.32). Moreover, the Bulgarian recyclers can handle glass. In the country it is possible to handle streams of plastics coming from EEE waste. However, not all types of plastics are handled by the recyclers. That means that there is an opportunity for a creation of technologies and recycling plants for these plastics that are not covered.

## **2.10 Summary**

The forecasts of the BalBok Engineering study suggest that the low levels of consumption of EEE from the population will remain. Fortunately, in 2006 per household there will be 4.7 appliances of category 1 and that is the same quantity that all EU households had in 2000. The amounts of EEE in 1985 will turn up as WEEE in 2001. That means that 5755000 appliances from category 1 and 4 with weight 153 000 tons will be on the market. Apparently, the Bulgarian authorities suggest that the lifecycle of EEE for categories 1 and 2 are 16 years (BalBok, 2004, p.44).

With the operating take back system in Bulgaria the first appliances that will become waste will be the TV sets bought in 1985 as EEE 25 000 ton of them will be disposed as WEEE. Only the households that have 4 or more appliances from category 1, 2 and 4 will contribute vastly to the WEEE stream. Because every time they buy an additional new electrical or electronic equipment for example from category 1 that is around 25kg, that will lead to the disposal of 14 500 tons of WEEE from category 1. The number of households that fall under this category is 576 648. If one considers average lifecycle of 20 years for the EEE, in 2006 there will be 39 000 tons of generated WEEE in Bulgaria. For the forecast of generated WEEE amounts between 2007 and 2015 the authors of the report use a 4% growth in quantities. This increase comes from the expected raise of sales of EEE for category 1 – 4% and category 2 – 10%. These forecasts are made on

the basis of the framework for implementation of the WEEE directive in Republic of Bulgaria. The building of a register of the EEE producers and importers will bring about clearer and more precise information regarding WEEE (BalBok, 2004, p.45).

BalBok Engineering suggests that between 2008- 2009 Bulgaria will be finally reaching 4kg per person of WEEE. This amount is the target set by the WEEE Directive in Article 5(5). After 2009 the writers of the report predict that Bulgaria will have 75% treatment of all waste of electrical and electronic waste and this trend will continue until 2015 where the supposed WEEE amounts will be 128 452 ton ( BalBok, 2004, p. 46).

### **3. Analysis of the 8 P in Marketing**

#### **3.1 Product**

The product life cycle follows a certain pattern. First there is the introduction, then the growth stage, the market maturity and the sales decline. (See Appendix IV, Figure 9.6) For this research relevant is what follows after the product has been bought, used and finally became useless or obsolete. For categories 1,2, and 4 the Bulgarian authorities as seen in chapter 2.3 suggested that after product life-cycle investigation for the electronic and electrical appliances it turned out that in Bulgaria this period is 16 years. The amounts of EEE in 1985 became a waste in 2001.

The MOEW in Bulgaria has introduced special rules for the design of the EEE products. Thinking ahead and trying to make management of WEEE easier, the requirements for the electronic and electrical goods imply that these appliances should be made in such a way so, when they reach the end of their life cycle they can be easily disposed, recycled or reused. This means that the EEE products (future WEEE products) should be produced with a design that allows easy dismantling and has components that are convenient to recycle and reuse (BalBok, 2004, p.47).

The life cycle of some EEE products is shorter than other, which means that they become WEEE products faster. According to international marketing and export theories the rate change of ICT, Telecommunication appliances and network equipment, for example, is fast. Furthermore, this equipment is standardized for all markets meaning that the life cycle of category 3 is going to be exactly the same in Bulgaria and Germany for example. (See Appendix IV, Figure 9.8) The life cycle for category 1 is times longer than the one of



category 3 – ICT products. As already mentioned in chapter 2.3, for the washing machines and refrigerators the expected period for turning from EEE to WEEE is approximately 16 years. What was functional electrical and electronic equipment in 1985 becomes a waste in 2006. In the Netherlands for example the life cycle for this category is 12-13 years (Interview with W. Canneman). The difference between Bulgaria and Netherlands in this case comes from the fact that the GDP and purchasing power of the Dutch citizen is higher than the Bulgarian one. Also, Bulgarians throw away their appliances not with an ease and prefer to keep them at their villas or storage rooms until they are completely deteriorated.

Furthermore, the Bulgarian authorities have introduced more laws and regulations for the electrical and electronic equipment so when becoming waste it can be easily processed. According to article 7 from the “Law for technical requirements for products, producers and importers” there should be a technical dossier for the appliances, which should be submitted to the monitoring authorities when needed. The content of this Technical Dossier has to cover all requirements of the WEEE Directive. Also, there should be an access to this information in the recycling plants and facilities or online (BalBok, 2004, p.55).



### 3.2 Place

Republic of Bulgaria has 110 910 square kilometres of territory, which is 3 times the size of the Netherlands for example and a density of 70.3hab/per square kilometre (CIA, 2008) For 2008 Bulgaria has 7605064 people, of which 67.8% urban residents & 32.2% rural, and a GDP of € 4036 as seen in chapter 2.3.

In terms of political system, Bulgaria is a Parliamentary Republic with a multi- party system and free elections based on universal suffrage. The Constitution, adopted in 1991, is the supreme law of the country and the President being elected every 5 years is the Head of the State as well as Commander in Chief of the Armed Forces. The Prime Minister is appointed respectively by the President and he/she is in charge of forming a government (European Bank for Reconstruction and Development, 2006).

The country is one of the newest member states of the European Union, entering in January 2007. This recent accession of BG in the EU regenerated the interest of many international institutions, scholars, business investors and ordinary citizens.

At this moment there is a system of collection, transportation, temporary storage or export for treatment of luminaries. The financing of this system is handled by the consumers that are non household in character. Unfortunately, this system does not bind the producers to

pay for the treatment of category 6. Currently, only 50 users of luminaries from the B2B sector are part of the plan. In 2004 21 000 tons of luminaries were exported to Germany with 90% recyclability.

### **3.3 People**

The fertility rate is extremely low -1.3 births per woman, while the mortality is comparatively high – 12.3 infants per 1,000 live births compared to the average EU-25 of only 5 infants per 1,000 per live births. A positive aspect is that the literacy rate is impressively high – 98.2% of the total adults' population above the age 15 (World development Indicators Database, 2006).

There is a tendency of decline in the population because of high mortality rate, low birth-rate, and emigration. The population growth this year is – 0.813% (CIA, 2008). Many people prefer to emigrate to Germany, USA, Spain, and Netherlands.

Republic of Bulgaria is located in Eastern Europe and more particularly in the Balkan Peninsula. Bulgaria is bordering with Romania to the north, Macedonia & Serbia to the west, Greece, Turkey to the south and the Black Sea to the east. There are three ethnic groups in the country: Bulgarians- 83.9%, Turks- 9.4% and Roma- 4.7%, as the prevailing part of the population professes Orthodox Christianity (CIA, 2008).

As regarding to WEEE, Bulgarians are still not taking the environmental issues seriously. The mentality and cultural background of the Bulgarian citizen makes him careless regarding environmentally sound policies and practices. Due to the harsh life Bulgarians had in the past and the struggle to keep up with the other 26 members' state of the EU, the citizens are focused on how to meet the ends with an average salary of €150 per month.

Even after heavy promotion on separate disposal of paper, glass and household waste, the Bulgarian citizen does not follow these practices. Currently there are promotions for WEEE disposal, however this waste is thrown on the street, municipal containers or stolen by the gypsy population.



The gypsy population is a phenomenon that contributes to the grey market of WEEE in Bulgaria. This was also proven by several interviewees like recyclers and take back system representatives. They are often spotted dragging or transporting on vehicles as seen on picture 1, refrigerators or washing machines.

Since scrap is a valuable waste, gypsies receive money for it. However, for a fridge to turn into scrap a “procedure” is needed, which removes the CFC from it. This hazardous waste is simply thrown somewhere carelessly by the gypsy population. However, the gypsies must not be vilified. In the end it is the collection point to blame, for taking the scrap. It is obvious that this waste comes from fridge or washing machine, for example.

The Bulgarian population affects the amounts of WEEE firstly with its purchasing power for EEE. As seen on graph 2, 28.4% from the households are with less than 2 electrical appliances and only 10% from them have 4 of the 9 appliances with cultural purpose.

For 2001 Category 1- cooker, microwave, washing machine, dishwasher, fridge and freezer are owned only by 23.5% of the households (BalBok, 2004, p.42).

If one takes into consideration the tempo with which EEE is accumulated in Bulgaria, there is a forecast of how much a household possesses from category 1 appliance. When the calculations were made, the decline of the population growth and the growth of sales for EEE of 4% (linked to the predicted growth of the economy) are taken into account (Balbock report p.43).

The forecasts of the Balbok Engineering study suggest that the low levels of consumption of EEE from the population will remain. Fortunately, in 2006 per household there will be 4.7 appliances of category 1 and that is the same quantity that all EU households had in 2000. The amounts of EEE in 1985 will turn up as WEEE in 2001. That means that 5755000 appliances from category 1 and 4 with weight 153 000 tons will be on the market. The bizarre fact is that the population from 1985 had declined with 890 000 people in 2006. Even though that emigration plays a negative role on the demographics it does not affect

the WEEE market, because the appliances are stored no matter that they are not used by these people any more (Balbock Report p.44).

Even if the Bulgarian buys a new appliance from categories 1,2,4 for example, in most of the cases he/she stores the old one (which in EU 25 is considered WEEE) where he has place, still uses it extremely rarely or store it on his/her villa (village house). To understand this seemingly strange and inappropriate act to a western European, one must look deep into the mentality of the Bulgarian, who doesn't like to throw anything at any time.

When the Bulgarian citizen finally decides to throw the useless appliance, he/she does that along with the other municipal daily waste. The category 1, 2 and 4 equipment is simply left alongside the container or thrown in it. Then the valuable heavier ones are picked up in the best case scenario by the municipal authorities or like in many cases by the gypsies or beggars who do that to earn money from the scrap (BalBok, 2004, p.34).

The non household owners of WEEE, store the appliances when they have hazardous elements or submit them in the correct authorities. If WEEE can be reused these entities submit the equipment to charity organizations (BalBok, 2004, p.34).

### **3.4 Price**

In this chapter total cost of management of WEEE will be discussed along with product charges for the waste per category. The total cost of the management will be discussed more in detail in chapter 4- Financial analysis of management of WEEE.

The creation of a legal framework and Register for WEEE the total cost is €100,000. To maintain, support and operate this register €75,000 have to be paid every year. To build collection points for WEEE the estimated total cost is €3.75 million, in particular it is €250,000 per collection point (15 in total). The maintenance and operational costs per year for all collection points is €1.5million, €100 000 per CP and €150 per ton of WEEE. When exported the price for treatment per ton increases, it is between €450 and €600 per ton (BalBok, 2004, p.67-68).

Since producers, manufacturers and importers of EEE are responsible for the WEEE management, they have to participate in a collective scheme, individually handle this

responsibility or pay the product charges set by the Council of Ministers in Bulgaria. Management of WEEE includes “waste collection, transportation, pre-treatment, (e.g. sorting, dismantling) and recycling and disposal”. An EEE business may not pay the product charges if it proves that it handles its responsibilities toward WEEE separate collection and recovery to the MOEW and their procedure answers the requirements of the Waste management Act in Bulgaria. If a producer, manufacturer or importer of WEEE decides not to pay the product charges price it has to prepare an individual Waste Management Program that has to be approved and granted license by the RIOEW. (Anguelova, 2006, p.1)

“The product charge shall be added to the price of the equipment before calculating VAT and it shall be paid by importers together with all custom duties.” The product charges are growing immensely every year. For categories 1 and 10, excluding the refrigerators and freezers, we have a 400% increase from €0.09 in 2006 to €0.36 in 2008 per kilogram. Keeping in mind that a washing machine for example is 25kg that means the total cost for the product charge changed from €2.25 to €9 per appliance. (Anguelova, 2006, p.1)

The price for categories 1 and 10 is the lowest, mainly because these appliances are big, therefore cannot be thrown in the container with the other waste and easier to collect. People are more willing to dispose them to the collection points because they receive money for the scrap and that means that transportation cost is handled by them. Usually refrigerators and freezers belong to category 1, however the product charge for them has different price of €0.21 in 2006 and €0.59 in 2008. The divergence comes from the fact that refrigerators and freezers have hazardous waste in them and it costs more for them to be recycled. Moreover, in Bulgaria at the moment there are no treatment plants for CFC and that means that these substances must be exported to other countries and the total cost for handling increases. (Anguelova, 2006, p.1)

The highest price for treatment of WEEE is for the discharge lamps. Per kg for 2006 it was €0.79 and in 2008 it is €1.82. Even though there is a factory in central Bulgaria that can handle this waste and there is no need for export of the waste for this category of WEEE the price is still high because the product is delicate, small and with hazardous waste inside- mercury. The fact that these lamps are small suggests that their collection is difficult and the total cost for handling goes up. (Anguelova, 2006, p.1)

When comparing the product charge of Bulgaria and one of Czech Republic's take back systems one can see tremendous differences. For category 1 (excluding refrigerators and freezers) the price is €0.054, which is 6 times less than the Bulgarian one. For category

1B – freezers and refrigerators the product charge in Czech Republic is €0.19, which is 3 times less the price Bulgarian producers/importers pay. (Refer to table 4.1) The huge disparity between the products charges in the two countries come from the fact that in Czech Republic there are 4 take back systems that offer 4 different prices. Competition brings the price down, especially when certain take back systems specialize in handling certain categories and that way lower their costs. The price that producers/importers pay for their electronic and electrical appliances in Bulgaria is high because it is set by the authorities, not by private businesses like in the Czech Republic. In Bulgaria the relevant authorities had to invest heavily in building the take back framework and structure of collection points. This also increased the final price for managing WEEE.

### **3.5 Promotion**

The Bulgarian government tries to impose separate collection for the WEEE both for the B2B and the B2C customers. However, the regular citizen does not follow the rules of separate disposal of paper, plastic and glass, let alone the special rules for the electrical and electronic waste.

The biggest private television channel in Bulgaria- BTV has a special show called “The Reporters of BTV”, which had a special series about the environmental issues in the country. The last topic was “The Nylon apocalypses”. Even though the TV channel and the authorities are trying to promote environmentally sound policies and lifestyle, the Bulgarian citizen is more concerned with his daily struggle to meet the ends and does not have the luxury to spend time, effort or resources on the environment. The separate collection of WEEE is a preliminary requirement for the special treatment and recycling of this waste. The consumers are supposed to be pushed to act actively upon this segmented gathering of waste. Furthermore, this special collection is imposed not only over the households but to the industrial and B2B consumers. The promotion strategy includes setting up convenient spots and collection points where the household can dispose their electrical and electronic equipment that is no longer functioning or it is not used (BalBok, 2004, p.9).

Since 31.08.2005 there is no fee for submitting your WEEE. Since 31.12.2006 the Bulgarian state is obliged to collect minimum 4kg of WEEE per inhabitant. New promotional schemes will be set up after 31.12.2008 (BalBok, 2004, p.9). There is a promotional strategy introduced by 8 stakeholders in marking the EEE with the special WEEE label. The local authorities, the producers, importers & retailers of EEE, the non-profit organizations & the media, the commission for protection of the consumer, the national meteorological agency and the consumers of EEE are all linked to this scheme. It involves labeling of the electrical appliances that were put on the market with the sign for separate collection – the crossed container that is discussed in chapter 2.8. All producers are obliged to circulate information about the rightful way to dispose your WEEE. The conditions, places and procedures have to be clarified and the importance of the threat of the hazardous waste has to be underlined. Environmental protection and human health must be promoted fully (BalBok, 2004, p.54).



When transposing the WEEE Directive into the Bulgarian law, the ministry of environment and waters also set requirements for the design of the EEE. This was made in order to have a lighter, cost efficient and more environmentally sound procedure of recycling and treatment of the WEEE. The Bulgarian authorities are pushing for the R&D and production of EEE, which can be dismantled easy and reused after that with less complication and costs. This strategy affects the MOEW, Ministry of culture and education, the Bulgarian Institute of Standardization, producers of WEEE, the educational facilities, nonprofit organizations and the media (BalBok, 2004, p.47).

This promotional strategy for correct handling of WEEE can be implemented by standardization of documents, including subjects in schools or universities with “green design” disciplines when training specialists in the different educational levels, with popularization of the eco-label for WEEE and through consultations between producers and importers of EEE with centers of reuse, treatment and recycling or other ways of handling WEEE (BalBok, 2004, p.47).

### **3.6 Politics**

The government type of Republic of Bulgaria is a parliamentary democracy. Politically Bulgaria is stable; there are no wars, recent upheavals or overthrowing of the government. There are no transnational disputes. The conventional long form of the name of the country is Republic of Bulgaria, the short form is Bulgaria. The country was under Ottoman slavery until 1878, when on 3 March the Bulgarians were liberated from the occupation. The suffrage is universal when one 18 years of age is. Civil and criminal law is based on the Roman law. The capital of Bulgaria is Sofia and the country has 28 provinces. The five biggest cities are: Sofia, Plovdiv, Varna, Burgas and Ruse. (CIA, 2008)

The current president of Bulgaria is Georgi Parvanov, who is holding this title since 2002. The president is also the chief of state and of the army. The vice-president is Angel Marin, also active vice-president since 2002. Both are elected “on the same ticket by popular vote for five- year term”. The head of government is the prime minister; currently this is Sergei Stanishev, since 2005. The cabinet is the Council of Ministers who is “nominated by the prime minister and elected by the National Assembly”. The National Assembly unicameral is responsible for the legislative procedures in Bulgaria, this is the legislative

branch. The Assembly has 240 seats and is elected by popular vote for four-year term. (CIA, 2008)

Currently Bulgaria is a member of the European Union. Unfortunately, all EU funding is temporarily ceased due to bribe/ coercion and misuse allegations towards governmental officials and other stakeholders that are involved in managing the funds. Coercion and lack of transparency is the biggest issue for the Bulgarian state. There are still malpractices in some governmental institutions.

The current president and prime minister are both from the Socialist Party (BSP). Key ministries (like the Ministry of Environment and Water) are held by the Movements of Rights and Freedoms (MRF), which mainly represents and protects the interests of the Turkish population in Bulgaria. Other big parties present in the current cabinet are National Movement Simeon II (NMS2), Union of Democratic Forces (UDF), Ataka (extreme right party), Democrats for a strong Bulgaria (DSB) and Bulgarian People's Union (BPU) (CIA 2008).

### **3.7 Physical Distribution**

The physical distribution of WEEE can be carried out by road, rail or ship. In the case of Bulgaria this is mainly done by road. When exported the Bulgarian WEEE that cannot be treated on the territory of the country is send to Czech Republic, Germany, Austria or China for example by road or ship. The transportation costs per one collection point a year are 27% of the whole operational costs of the facility. The physical distribution is crucial for the management of WEEE since some of the products are heavy, like category 1 and 10, which are on average 25 -50kg.

The total cost for transportation of waste from electrical and electronic equipment in Bulgaria for one collection point per year is €27 200. That is 27% of the total expenses. From them €20 000 are spent on transportation of WEEE. This amount of money is for 400 deliveries, 1.5 tons each, 100km per delivery. Additionally there are costs for administrative transportation €600 or €7 200 per year. When exported the transportation costs are between €150 and €300, the first one is when exporting category 1 and the second for categories 3 and 4. When transporting the WEEE one delivery handles around 6-15 tons (BalBok, 2004, p.66-67).

### 3.8 Presentation

One of the requirements of the capacity of implementation of the WEEE Directive suggests that there should be a certain way of which the producer of EEE labels the appliances. It must be clear to the consumer that this equipment when obsolete or not functional is electronic and electric waste. The entities responsible for this act are only the producers of the good (BalBok, 2004, p.55)

There are two procedures when presenting the EEE (future WEEE). The producer can supply the consumer with manuals, on-line or CD-Rom versions of information that suggest how to righteously dispose the electronic or electrical waste (BalBok, 2004, p.55).



There should be a clear identification of the producer's name on the equipment. Also, there should be information regarding the centers for reuse, treatment plants and recycling ones and the exact location in the product itself of hazardous waste. (BalBok, 2004, p.55)

All products that were put on the market after 1<sup>st</sup> of July 2006 should have the name and ID number of the producer. This rule is binding for all equipment considered as waste by the WEEE Directive and the Bulgarian Ordinance on WEEE. "The marking should be on the product, if not possible on attached label and instruction, packaging and guarantee. " In addition the product should have the sign above present on the packaging. "All markings should be durable and readable" (Angelova, 2006, p.2)

#### **4. Financial analysis of WEEE management in Bulgaria**

In this chapter the financial framework of the implementation of Directive 2002/96/EC will be discussed. A detailed estimation of the total cost was given by BalBok Engineering in their report to the Ministry of Environment and Waters in 2004. The total cost for launching a system for control and monitoring of WEEE, building collection points and their operational costs yearly, creation of recycling and treatment facilities are discussed below.

The total cost for the set up of one collection point is €250 000 euro. All estimations regarding the creation of a facility of this type come from the WEEE Directive (Appendix III). The cost of square meter of a building like that is €70 (€ 175 000 per collection point). However, there are additional operational costs like transportation equipment and other that are €75 000. Furthermore, a collection point will have 15 employees, which each have a salary of €4000 a year. In total there will be €60 000 expenses for salaries. Monthly the operational costs for the facility such as electricity, telephone, water and heating are approximately €500 or €6 000 per year. For transportation the costs are around €20 000 and for “administrative transport” is €7 200. For promotional and informational campaigns the budget is €5 000. In the end when calculating how much WEEE will pass through one collection point there is an average price of €150 for the treatment of 1 ton of electrical and electronic waste. This estimation depends on the category of WEEE. For category 1 and 2 it is € 150, however for categories 3 and 4 it is € 300, the last being more delicate to handle and the first having more valuable substances such as scrap that can be reused or exported. (BalBok, 2004, p.66)

Since, some of the WEEE appliances cannot be treated or recycled on the territory of Republic of Bulgaria they have to be exported. Then when adding all transportation costs, documentation and services the average rate of WEEE is “€450 - €600” (BalBok, 2004, p.68). The costs for handling the future WEEE amounts are processed with the international Accounting standard IAS 37 (International Accounting Standard -MCC 37). The Bulgarian producers and other stakeholders involved with EEE and WEEE (mainly the producers of EEE) will have special tax reduction over the product charges for EEE that they pay. If tax reductions are postponed for a future period this counts as a future cost leading to an increase of the taxes in the current year and the potential threat of losing the tax reductions in the future (BalBok, 2004, p.70-71)

The premium per year or insurance, paid by the producer follows an accounting procedure of 3 steps. The first one is when the expense is made with “provision for the

premium or interest". The second one appears when the payment is due to be paid to the manager of the system or the insurance company. The third step is paying these entities. When the expenses are processed in the accounting departments of the EEE producer, the "provisions for expected expenses can be used for reduction of taxes". This is the case only if these future estimations are calculated precisely and accordingly as stated in IAS 37 (BalBok, 2004, p.71). In the end the costs savings will €11 000 and the estimated cost savings to industry from Reduced Registration and Reporting Requirements €7 000 (Okopol, iiiiee, RPA, 2007, p.246-247). As shown on table 1 in the next chapter the average hourly labor cost for 2005 is the lowest in whole Europe €1.55 and the operational cost per producer is €17.

In Republic of Bulgaria all expenses made when managing WEEE are processed according to the National Accounting Standard (NAS 6) – "Reporting of expenses for protection of the environment". Also, according to this standard when a producer is in breach with the law for environmental protection or he/she does not pay the taxes for polluting, the sanctions are considered current operational costs. The NAS 6 standard does not resemble any international accounting standard. Therefore the Ministry of Environment will issue accounting procedures that are in sound with IAS 37 for example (BalBok, 2004, p.72).

There are additional expenses that will be made by all stakeholders involved in the EEE becoming WEEE process. "The expenses for implementing the WEEE Directive include ones for reconstruction of manufacturing machines, expenses for the gradual elimination of the usage of hazardous/forbidden waste, the increasing exploitation expenses, and the expenses for R&D for founding and testing of alternative substances." The operating expenses for monitoring, promotion and information are due to be paid by the producers of electrical and electronic equipment. Republic of Bulgaria and more particularly the responsible authorities are expected to promote R&D investments in this area.

## **5. Comparison between Bulgaria, Slovakia, Romania and Czech Republic**

When interviewing the system managers of the Slovakian, Romanian and Czech take back systems I asked them all the same 5 questions that I think are vital when comparing the situation of the market of WEEE for the 3 countries with Republic of Bulgaria. These questions are:

1. What were your first years of business?
2. What are the amounts of WEEE per year recently in your country?
3. Are there any illegal systems in the territory of your country?
4. Is the market for WEEE growing in your country?
5. What is the situation for recycling plants in your country?

The comparison below is not only based on the interviews I made. I also use the official web sites of these take back system and some data from the United Nations University Report.

Additionally, I prepared a table that compares the 8 take back systems in the 4 countries. With the help of this table it can be concluded in what direction should the Bulgarian take back system go and what can be learned from the systems in Slovakia, Czech Republic and Romania.

### **Romania - RoRec**

Even though the quantities of WEEE for Romania are almost three times bigger than the ones in Bulgaria there are certain similarities in both countries. The two new member states of the European Union can be compared since Romania has 3 times bigger population than Bulgaria, therefore the amounts per person in the end are almost similar when calculated. Unlike Bulgaria, in Romania there are two other take back systems – Environ and Ecotic. According to RoRec these take back systems are run by retailers so they don't fit the requirements of a system 100%. They also suggest that the Bulgarian take back system is also not answering the requirements 100% since it is a private Ltd. There are three recyclers in Romania and currently hazardous waste is only gathered and not exported to Austria (where Bulgaria also exports is hazardous WEEE). This is

because in Romania the amount of these substances is still not sufficient to be exported cost efficiently (Refer to Interview 2 with Catalin Gurau).

	Bulgaria	Romania	Slovakia		Czech Republic			
	Ecobultech	RoRec	Envidom	Sewa	Asekol	Rema	Retela	Elektrowin
Legal	There are 7 legislative acts that are relevant to WEEE Directive	The WEEE Directive is transported through Governmental decision no.448/2005.	In 2001 the Slovak government issued Act on Waste No.223/2001 (legal base). WEEE Directive was transported through Amendment No.733/2004 (Dec.2, 2004) Other Decrees are: No.208/2005, 359/2005, 388/2005.		The Directive implemented in July 2005. 15 September 2005 implementing regulations were issued by the Czech Ministry of Environment with Decree n.352/2005.			
WEEE Covered	1,2,3,4,5,6,7,9,10	All 10 categories	1 & 2	All 10 categories	3,4,7,8,10	3,8	All 10 categories	1,2,6
Fees per category 2006	1A-€0.09 1B-€0.21 3-€0.34	No data available	1A- €4.97 (new €0.41) 1B- €16.56 (new €0.12)	No data available	3- €0.06 other- € 3.72	1A-€4.14 1B- €14.47	1A-€0.06 1B-€0.20 3-€0.04	1A-€3.21 1B-€10.7
Members	More than 400	100	93 (cat. 1 -84% & cat.2 – 68%)	170	500	800 (80% of IT)	951	420
Results	2005- 5 968 t 2006- 10 517 t 2007-45 030 t	2005- 103 928t 2006- 109 450t 2007-115 266t	2006- 4564 tons 2007-8 0137 tons	2005- 610.7 tons	Currently covering 80% of the population & 600 tons per month (double in 2007).	2006 – 3000 tons	2006 – 1057 tons	2005- 500 t 2006 –11 000t 2007- 18 000t.
Annual Op. Costs	€11 022	€15 030	€16 500		€43 095			
Registered Producers	660	900	763		3 060			
Op. Cost per producer	17	17	22		14			
Average hourly labor cost'05	€1.55	€2.33	€4.8		€6.63			

<sup>1</sup> Created by Antoniya Dimitrova on the basis of Chapter 4.4 Price, factsheets of RoRec, Envidom, Sewa, Asekol, Rema, Retela, Elektrowin all available in PDF files on : [http://www.weee-forum.org/index.php?subcat=all&section=members&page=members\\_community](http://www.weee-forum.org/index.php?subcat=all&section=members&page=members_community) last accessed on 16.06.2008

Additional sources for the price charges or quantities: Table 4.1, Appendix VII.1, [http://envidom.sk/en/about\\_envidom/financing/products\\_and\\_fees.php](http://envidom.sk/en/about_envidom/financing/products_and_fees.php) , Table 100&106 Chapter 9 from DG Environment Report 19.08.2007

One of the differences between the two countries is that there is a national collection day on 3.11 every year. The similarity is that the amount gathered had to be protected by police since this waste is valuable and there was a possibility of stealing. Romania and Bulgaria have both problems with the so called “grey market”. It is represented by the gypsy population mainly that likes to steal WEEE objects and submit them in the

collection point for money. For both countries since 2008 there was no possibility to reach the target of 4kg per person.

In Romania there are around 90 collection points, in Bulgaria they are 65. According to RoRec only 6-7 are functioning properly. After obtaining information from the Regional Environmental agency in Ruse, the reported amounts of WEEE 110 000 tons for 2007 come from 7 collection points. The Bulgarian member state as discussed in the previous chapters planned to build 15 functional collection points that answer the requirements of the Directive. In both countries these amenities are given to public tender to private companies (Refer to Appendix IV).

In table 1 in this chapter it can be spotted that the average hourly labor cost for 2005 for both countries is extremely low. The lowest in whole Europe is in Bulgaria. The operational costs for both countries are €17 for 2005. In both Bulgaria and Romania the take back systems cover all 10 categories.

### **Slovakia: Envidom and Sewa<sup>7</sup>**

In Slovakia there are in total 5 take back systems: Envidom, Sewa, Zeo, Etalux and Ecolamp. They cover categories: Envidom 1&2, Sewa – all 10, Zeo -6, Etalux and Ecolamp -5. Sewa, also like Bulgaria will reach the 4kg per inhabitant in 2009. Sewa covers categories 3 and 4 85 or 90%. Envidom are more focusing on categories 1 and 2 and they cover respectively 85% and 66%. According to their system manager there were 15 800 tons of WEEE in Slovakia for 2007 – 2.7kg or 2.9kg per inhabitant. As already discussed in 2.3 in Bulgaria for 2008 the recyclable WEEE is 19 983 tons and that results in 2.68kg per inhabitant. This amount is almost exactly the same is in Slovakia. Even though the amounts of waste are comparable the annual operational costs as shown in table 1 in this chapter and the operational costs per producer are more for Slovakia, €16 500 (compared to €11 022) and €22 (compared to €17). In Slovakia all take back systems cannot reach the 4 kg target of the WEEE Directive up until now for 2005 they had 0.57kg 2006- 2.6kg. Some of the producers are handling their responsibility towards WEEE individually. There are 8 or 12 recycling companies. This year is the first one when Slovakia can reach the target of 4kg since they have around 55 000 tons.

---

<sup>7</sup> Interviews 3 and 4 with system managers : Sewa- Jiří Mikulenka and Envidom – Martin Ciran



**Czech Republic – Asekol, Rema, Retela, Elektrowin**

The Czech Republic has similar population size as Bulgaria. However according to UNU on page 68, it can be seen that the amounts of WEEE for Czech Republic are almost 3 times more. The example that Bulgaria has to follow is the Czech Republic because from all compared countries Czech Republic has the lowest operational cost per producer-€14. The Czechs had split up the market between 4 take back systems each covering different categories of WEEE. The focus and specialization on particular streams of WEEE helps the take back system to lower their costs. Competition plays a positive role in this case. For example for category 1A in Bulgaria a producer of EEE pays a product fee charge of €0.09 in Czech Republic it is €0.06 for category three in BG it is €0.34 and in CZ it is €0.04. The prices given for Czech Republic are the lowest in the country, there are others that are higher. However, the point in this comparison is that a producer can always choose the lowest possible price and the take back system that offers it. In Bulgaria such a choice is simply impossible. Czech Republic also had insufficient amounts of WEEE and couldn't reach the target of 4kg in the beginning of their business (Refer to Table 1 chapter 5)

**6. Recommendations & scenarios**

The main purpose of Directive 2002/96/EC and the Bulgarian national legislation that corresponds to the requirements of this Directive, is to protect the environment and the health of the citizens with reducing the risks that might jeopardize the well being of the society and nature. One of the ways to abide by the environmentally sound policies is to avoid the usage of hazardous substances. The Bulgarian authorities control the usage of such substances by laws and regulations that answer the requirements of the WEEE Directive. In the case of electrical and electronic equipment, the according entities that monitor the hazardous substances are banning their full or only partial usage in the production of the new EEE. "For a fully effective transportation of the Directive and unification of the internal legislation, a law must be created, which will create a single uniform regulation for introducing constraining measurements for the usage of hazardous substances in the electrical and electronic equipment..." Even though there are many rules and regulations related to this manner in several different laws, there is no single

uniform piece of legislation. The creation of such a law is one of the future scenarios for the WEEE management in Republic of Bulgaria (BalBok, 2004, p.22)

In this chapter three main points are going to be discussed. From the legal point of view: What are the legal requirements that still have to be fulfilled by Bulgaria in regards to Directive 2002/96/EC (the WEEE Directive)? From financial point of view: What will be the total costs of the Bulgarian state and private companies to build the needed facilities for recycling? (Discussed in detail in chapter 4) From the marketing point of view: What are the expected quantities of WEEE between 2009 and 2015? Furthermore there will be a detailed suggested plan aimed especially to the already existing recyclers of glass, plastics, ferrous and non-ferrous metals.

## **6.1 Prediction of future Scenarios**

There is a need for a transition period of 2 years after Bulgaria joins the EU for implementation and transposition of the WEEE Directive. Since Bulgaria joined the EU in 01.01.2007 that means that the transition period will end in 01.01.2009. The Bulgarian authorities have to focus mainly on two articles of Directive 2006/96/EC – article 5 (5) and 7 (2). The first is regarding the collection target of 4kg of WEEE per head of the population and the second is concerning the aims of the reuse, recovery and recycling of WEEE. (Balbok, 2004, p.62)

As already discussed in chapter 4, when the WEEE Directive was introduced in Bulgaria 15 collection points were predicted to be created. They were strategically located in specific locations (divided by regions) close to big cities so that transportation costs will be low. Each collection point will have 15 employees and will cost €250 000. In the near future the creation of a recycling facility for all categories of WEEE besides 8 (Medical equipment) will be finished. Most probably in the future another recycling and treatment plant will be build, especially for the hazardous waste in fridges, freezers, LCD monitors and others.

The estimations of the WEEE amounts made by BalBok Engineering suggest that from this year on there will be 25 000 tons of WEEE more every year. BalBok use Germany as an example to conclude that only 20% of the generated WEEE is collected and treated by the take back system. In 2006 that meant 10 000 tons and in 2015 the amount will be 13 689 tons according to the forecasts of United Nations University and 25 690 tons according to the predictions of BalBok Engineering. Additionally the environmental

consultant made detailed scenarios for every year from 2009 until 2015 that will be discussed in the next chapter. (Refer to Table 3.3)

The recyclers that have a functioning recycling plant for glass should focus on WEEE from category 3&4 since, 55.2% of the glass as waste comes from this category; the rest is from category 1&10 –only 2.3%. For the recyclers of ferrous metals the center of attention should be category 1&10, since 63.5% of the waste ferrous metals come from there, 20% from categories 2,5,6,7&9 and only 0.6% from categories 3&4. Recyclers of non-ferrous metals should emphasize on categories 1&10 since 5.6% of the waste that concerns them comes from there and only 2.9% comes from categories 3&4. Finally, recyclers of plastics should focus on categories 2,5,6,7 and 9, since 20% of the waste comes from there, and definitely not on category 3 & 4. (Refer to Appendix VII.3)

## **6.2 Plan of Action for each Scenario**

From legislation point of view there is the expected transposition of the WEEE Directive into the Bulgarian legislation, which will take 2 years because of several reasons. When it comes to article 5(5) from the Directive that will happen because of:

1. The low consumption of EEE from the Bulgarian population. ( for 2001 only 40% are fully equipped with EEE and this will affect the WEEE amounts)
2. 4kg of WEEE per head will be finally reached in the year 2009
3. Low density of the population
4. High percentage of agricultural land

The 2 year period comes also from the “lack of infrastructure that treats WEEE” (regarding article 7(2)) with the following reasons:

1. Lack of treatment facilities of WEEE
2. Lack of amenities for burning and recovery of energy
3. Lack of facilities for treatment of hazardous wastes from WEEE
4. The possibility of recycling only of limited types and quantities of glass, metal and plastics.
5. Restricted market for recycling of materials in Bulgaria. (Balbok, 2004, p.62)

From the financial point of view the creation of the first 15 collection points will set up a logistical basis for the gathering of WEEE. The authorities responsible for analysis of the

EEE market concluded that collection points should be divided into regions according to the consumption of EEE and the size of the population. This segmentation will lead to the creation of 1 collection point that will cover “225 000 households with 610 000 inhabitants”. (BalBok, 2004, p.64) These collection points should employ 15 people each, will cost €250 000 and additionally every year the operational cost will be €100 000. That means that if the collection point is ready by 2008 from 2008 until 2015 the total cost for this facility will be €950 000. Collection points will be built in 13 of the biggest cities in Bulgaria: Sofia, Plovdiv, Varna, Burgas, Ruse, Stara Zagora, Shumen, Pleven, Blagoevgrad, Veliko Trynovo, Montana, Haskovo and Pernik. Each will have 1 collection point as a start, Sofia and Plovdiv will have 2 each. This organization of the collection points will bring about reduction in the operational costs since all facilities are located in such a way that 50-60km is the average distance between the collection point and the treatment facility. Every amenity will have a capacity of 500-600 tons per year. These calculations are made with the help of the example set by RWE Umwelt Germany (Number 1 in Germany and 3 in whole Europe of managing WEEE). Their allocation of collection points also brings about a WEEE capacity of 620 tons per year and 50 km average distance between the CP and the TF (BalBok, 2004, p.65)

From the marketing point of view the quantities of WEEE will slowly but steadily increase between 2008 and 2015. Only in the period 2008-2010 the change is drastic. The increase in amounts of WEEE between 2008 and 2009 is 90% and between 2009 and 2010 is 71%. After this period, from 2010 on until 2015 the quantities of WEEE will grow yearly with 14%. The amount of WEEE in 2015 will be 12 times bigger than the one in 2006, from 7 898 tons to 96 160 tons in 2015.

### Scenario 2009

In total recyclable waste from electronic and electrical equipment will be 34 170.6 tons. The hazardous substances in all categories will be 938 tons. For 2009 United Nation's university forecast is 50,067 tons and BalBok Engineering 58,521 tons. Since, the latter suggest that only 20% of the generated WEEE is recycled in the end that means that only 11 704.2 tons in 2009 will be recycled and the total cost for this process will be around €1.61 million for the regular WEEE and €422 100- €562 800 for the hazardous waste. Given the above calculations for recyclable WEEE and the expected population in Bulgaria for 2009 the average amounts of WEEE per head will be **4.63kg**. This quantity answers the requirements of the target set in the Directive (Refer to table 3.3, Appendix VII.1 and Appendix VII.3).

Most profitable, recyclable materials and their quantities for the year (Calculations made on the basis of Appendix VII.3 and BalBok, 2004, p.31) :

**Plastics: 1889.6 tons (total capacity 12 000)**

**Ferrous metals: 19 324.5 tons (total capacity virtually unlimited)**

**Non-ferrous metals: 1973.6 tons (total capacity virtually unlimited)**

**Glass: 7014.3 (total capacity 60 000 tons)**

### **Scenario 2010**

In total recyclable waste from EEE will be 38 955 tons. The hazardous substances in all categories will be 1069.2 tons. For 2010 United Nation's university forecast is 52,749 tons and BalBok Engineering 66,714tons. Since, the latter suggest that only 20% of the generated WEEE is recycled in the end that means that only 13 342.8 tons in 2010 will be recycled and the total cost for this process will be around €1.84 million for the regular WEEE and €481 140- €641 520 for the hazardous waste. Given the above calculations for recyclable WEEE and the expected population in Bulgaria for 2010 the average amounts of WEEE per head will be **5.32kg**. This quantity answers the requirements of the target set in the Directive (Refer to table 3.3, Appendix VII.1 and Appendix VII.3).

Most profitable, recyclable materials and their quantities for the year (Calculations made on the basis of Appendix VII.3 and BalBok, 2004, p.31) :

**Plastics: 2154.2 tons (total capacity 12 000)**

**Ferrous metals: 21 930.4 tons (total capacity virtually unlimited)**

**Non-ferrous metals: 2249.9 tons (total capacity virtually unlimited)**

**Glass: 7 996.6 (total capacity 60 000 tons)**

### **Scenario 2011**

In total recyclable waste from EEE will be 44 410 tons. The hazardous substances in all categories will be 1219 tons. For 2011 United Nation's university forecast is 55,567 tons and BalBok Engineering 76,054 tons. Since, the latter suggest that only 20% of the generated WEEE is recycled in the end that means that only 15 210.8 tons in 2011 will be recycled and the total cost for this process will be around €2.10 million for the regular WEEE and €548 550- €731 400 for the hazardous waste. Given the above calculations for recyclable WEEE and the expected population in Bulgaria for 2011 the average amounts of WEEE per head will be **6.13kg**. This quantity answers the requirements of the target set in the Directive (Refer to table 3.3, Appendix VII.1 and Appendix VII.3).

Most profitable, recyclable materials and their quantities for the year (Calculations made on the basis of Appendix VII.3 and BalBok, 2004, p.31):

**Plastics: 2456 tons (total capacity 12 000)**

**Ferrous metals: 25 115.6 tons (total capacity virtually unlimited)**

**Non-ferrous metals: 2565.2 tons (total capacity virtually unlimited)**

**Glass: 9116.3 (total capacity 60 000 tons)**

### **Scenario 2012**

In total recyclable waste from EEE will be 50 625.1 tons. The hazardous substances in all categories will be 1389.6 tons. For 2012 United Nation's university forecast is 58,538 tons and BalBok Engineering 86,701tons. Since, the latter suggest that only 20% of the generated WEEE is recycled in the end that means that only 17 340.2 tons in 2012 will be recycled and the total cost for this process will be around €2.4 million for the regular WEEE and €625 320 - €833 760 for the hazardous waste. Given the above calculations for recyclable WEEE and the expected population in Bulgaria for 2012 the average amounts of WEEE per head will be **7.05 kg**. This quantity answers the requirements of the target set in the Directive (Refer to table 3.3, Appendix VII.1 and Appendix VII.3).

Most profitable, recyclable materials and their quantities for the year (Calculations made on the basis of Appendix VII.3 and BalBok, 2004, p.31):

**Plastics: 2799.5 tons (total capacity 12 000)**

**Ferrous metals: 28 630.6 tons (total capacity virtually unlimited)**

**Non-ferrous metals: 3124 tons (total capacity virtually unlimited)**

**Glass: 10 392 (total capacity 60 000 tons)**

### **Scenario 2013**

In total recyclable waste from EEE will be 57 712.7 tons. The hazardous substances in all categories will be 1584 tons. For 2013 United Nation's university forecast is 61,668 tons and BalBok Engineering 98,840 tons. Since, the latter suggest that only 20% of the generated WEEE is recycled in the end that means that only 19 768 tons in 2013 will be recycled and the total cost for this process will be around €2.73 million for the regular WEEE and €712 800 - €950 400 for the hazardous waste. Given the above calculations for recyclable WEEE and the expected population in Bulgaria for 2013 the average amounts of WEEE per head will be **8.13kg**. This quantity answers the requirements of the target set in the Directive (Refer to table 3.3, Appendix VII.1 and Appendix VII.3).

Most profitable, recyclable materials and their quantities for the year (Calculations made on the basis of Appendix VII.3 and BalBok, 2004, p.31):

**Plastics: 3191.5 tons (total capacity 12 000)**

**Ferrous metals: 32 639.2 tons (total capacity virtually unlimited)**

**Non-ferrous metals: 3 333.2 tons (total capacity virtually unlimited)**

**Glass: 11 848.2 tons (total capacity 60 000 tons)**

#### **Scenario 2014**

In total recyclable waste from EEE will be 65 793.8 tons. The hazardous substances in all categories will be 1806 tons. For 2014 United Nation's university forecast is 64,968 tons and BalBok Engineering 112,677 tons. Since, the latter suggest that only 20% of the generated WEEE is recycled in the end that means that only 22 533.4 tons in 2014 will be recycled and the total cost for this process will be around €3.11 million for the regular WEEE and €812 700 - €1.08 million for the hazardous waste. Given the above calculations for recyclable WEEE and the expected population in Bulgaria for 2014 the average amounts of WEEE per head will be **9.36 kg**. This quantity answers the requirements of the target set in the Directive (Refer to table 3.3, Appendix VII.1 and Appendix VII.3).

Most profitable, recyclable materials and their quantities for the year (Calculations made on the basis of Appendix VII.3 and BalBok, 2004, p.31):

**Plastics: 3638.4 tons (total capacity 12 000)**

**Ferrous metals: 37 209.1 tons (total capacity virtually unlimited)**

**Non-ferrous metals: 3800.2 tons (total capacity virtually unlimited)**

**Glass: 13 505.7 (total capacity 60 000 tons)**

#### **Scenario 2015**

In total recyclable waste from EEE will be 75 005.1 tons. The hazardous substances in all categories will be 2059 tons. For 2015 United Nation's university forecast is 68,446 tons and BalBok Engineering 128,452 tons. Since, the latter suggest that only 20% of the generated WEEE is recycled in the end that means that only 25 690.4 tons in 2015 will be recycled and the total cost for this process will be around €3.55 million for the regular WEEE and €926 550 - €1.23 million for the hazardous waste. Given the above calculations for recyclable WEEE and the expected population in Bulgaria for 2015 the

average amounts of WEEE per head will be **10.8kg**. This quantity answers the requirements of the target set in the Directive (Refer to table 3.3, Appendix VII.1 and Appendix VII.3).

Most profitable, recyclable materials and their quantities for the year (Calculations made on the basis of Appendix VII.3 and BalBok, 2004, p.31):

**Plastics: 4147.7 tons (total capacity 12 000)**

**Ferrous metals: 42 418.3 tons (total capacity virtually unlimited)**

**Non-ferrous metals: 4323.2 tons (total capacity virtually unlimited)**

**Glass: 15 396.6 (total capacity 60 000 tons)**

## **7. Conclusion**

The WEEE market in Bulgaria is similar in size and some practices as the one in Czech Republic, Slovakia and Romania. The Bulgaria take back system and all stakeholders involved in the industry have to follow to example and knowhow of the Czechs. Bulgaria already has contact with them, since some of the hazardous waste is sent to this country.

There is an opportunity for creation of a recycling facility or treatment plant for hazardous substances like CFC in the fridges. Since the total cost for exporting this dangerous WEEE is 3 times bigger than the regular cost for treatment, an attempt to handle this waste stream locally will be cost efficient.

The Bulgarian take back system can introduce a National Collection day for Electrical and Electronic Waste like the Romanians. Also, the creation of at least 2 more take back systems will make the product charge lower. That way the take back systems can focus on certain categories of WEEE, specialize, improve the collection and treatment procedures. All of these practices will bring the total costs down.

In the end, one can conclude that Bulgaria has the correct legal basis for Directive 2002/96/C, has a considerably good in size and growth market and is using as examples the practices of western European take back systems.

The things that Bulgaria lack when managing WEEE is good controlling framework, competition on the WEEE market between take back system and an efficient information



data like a register. It is not like the market is not lucrative; it is the inefficient management of the WEEE streams that is giving a bad name to the Bulgarian member state.

## 8. Bibliography

- Anguelova, r. (2006). *WEEE Management in Bulgaria. Financial and Organizational aspects of the New Legislation*: BalBok, Sofia
- BalBok Engineering, (2004). *Analysis of the requirements of Directive 2002/96/EC for WEEE and Directive 2002/95/EC; Analysis of their implementation*. Sofia: BalBok Engineering.
- CIA. (2008, 06 10). *Republic of Bulgaria*. Retrieved 06 16, 2008, from CIA World Fact Book: <https://www.cia.gov/library/publications/the-world-factbook/geos/bu.html#Govt>
- Ecobultech . (2008). *Ecobultech* . Retrieved 11 06 2008, from Ecobultech Bulgaria: <http://ecobultex.com/index.php?m=71&lang=1>
- Envidom Slovakia. (2008). *Envidom: product and fees*. Retrieved 06 16, 2008, from Envidom: [http://envidom.sk/en/about\\_envidom/financing/products\\_and\\_fees.php](http://envidom.sk/en/about_envidom/financing/products_and_fees.php)
- Forton JSCo. (2007). *Bulgarian Retail Market Q4 2007*. Sofia: Forton JSCo.
- GBG.bg. (2008). *Electronics*. Retrieved 01 05 2008, from gbg.bg: <http://search.gbg.bg/search.phtml?q=electronics>
- Kompass. (2008) Retrieved on 01.06.2008 from: [http://kompass.com/kinl/static/index\\_kise.php? Lang=en&login=no&action=ma\\_sign\\_in](http://kompass.com/kinl/static/index_kise.php? Lang=en&login=no&action=ma_sign_in)
- Nadin Commerce. (2008). *Nadin* . Retrieved 11 06 2008, from Nadin Commerce: <http://www.nadin-bg.com/#>
- Need.bg.(2008) *Electronics*. Retrieved 01 05 2008, from Need.bg: <http://www.need.bg/search.php>
- Okopol, iiee, RPA. (2007). *The Producer Responsibility Principle of the WEEE Directive*. Brusses: DG Environment.
- United Nations University. (2007). *2008 Review of Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE) Final Report*. Delft: TU Delft.
- WEEE Forum . (2008, 03). *WEEE Forum Members*. Retrieved 16 06, 2008, from WEEE Forum: [http://www.weee-forum.org/index.php?section=members&page=members\\_community&weeeforum=b923657fd267bf866f1e58bceea6366b](http://www.weee-forum.org/index.php?section=members&page=members_community&weeeforum=b923657fd267bf866f1e58bceea6366b)



## **ABBREVIATIONS**

B2B – Business to Business (non-household)

B2C- Business to Consumer (household)

BCEE- Bulgarian Chamber of Electrical Engineering

CECED - Conseil Européen de la Construction d'appareils Domestiques

CP- collection point

CRT – cathode Ray Tube

EEE- electrical and electronic equipment

EU- European union

IT - Information technology

MOEW – Ministry of Environment and Waters (Bulgaria)

NGO – Nongovernmental organization

TF – treatment facility

UNU – United Nations University

WEEE –waste electrical and electronic equipment

WEEE Directive – Directive 2002/96/EC

## **MATERIAL SUBSTANCES**

CFC – Chloro- Fluoro Carbon

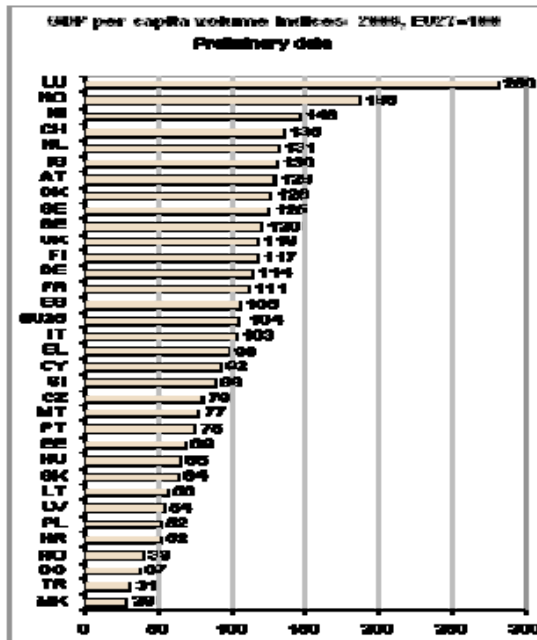
## Appendices

### Appendix I

1. Front page photo – The WEEE Man

Source: [http://www.weeeman.org/html/press/images/press\\_thumb\\_11.jpg](http://www.weeeman.org/html/press/images/press_thumb_11.jpg) lastly accessed on 21.05.2008

### Graphs



#### Graph 1

GDP per capita volume indices 2006 from the National Statistical Institute in Bulgaria

Source: [http://www.nsi.bg/GDP\\_e/ECP\\_e.htm](http://www.nsi.bg/GDP_e/ECP_e.htm)

Last accessed on 21.05.2008

Producers, Importers and Hypermarkets of electrical and electronic equipment

Producers:

Toys- 1 company

Central heating systems, hot air generators [10 companies]

Space heating, air conditioning, ventilation and humidifying plant [7 companies]

Heating equipment, industrial, electric [4 companies]

Heating appliances, domestic [44 companies]

Refrigeration equipment [18 companies]

Fans, blowers and ventilators [4 companies]

Lamps, lighting equipment [55 companies]

Telecommunications equipment [82 companies]

Radio, television and audiovisual equipment [25 companies]

Household and kitchen equipment, electric and electronic [58 companies]

- Audio-visual (AV) equipment [7 companies]

- Cooking and heating appliances, domestic, electric [26 companies]

- Refrigerators and freezers [14 companies]

- Electrical appliances NES [4 companies]

- Floor cleaning machinery. Vacuum cleaners [6 companies]

- Washing, drying and ironing machines, domestic [5 companies]

Electro-medical and electro-biological equipment [12 companies]

Testing, measuring and control instruments [2 companies]

Ultrasonic, ultraviolet (UV), infrared and radiological equipment [4 companies]

Automation systems and servomechanisms [7 companies]

Electrical equipment NES [91 companies]

- Electric and electromagnetic tools [4 companies]

- Intruder detection and access control systems [27 companies]

- Signalling and alarm equipment [36 companies]

- Driers and drying plant, industrial, electric [2 companies]

- Laundry and dry-cleaning machinery and equipment [2 companies]

Importers:

Importers-exporters, domestic appliances [1 companies]

Importers-exporters, toys [2 companies]

Importers-exporters, electrical and electronic products [10 companies]  
 Importers-exporters, office machinery and equipment [2 companies]

## Appendix II

### Indexes of Industrial Sales 2004-2008 <sup>\*) \*\*)</sup> (2000=100)

Economic activities	Indexes January and December				
	2004	2005	2006	2007	
Manufacture of machinery and equipment n.e.c.	132.5 - 234.4	153.2 - 245.4	182.8 - 289.0	211.2 - 290.1	
Manufacture of office machinery and computers	41.0 - 55.1	44.1 - 78.9	70.9 - 107.6	96.5 - 88.3	
Manufacture of electrical machinery and apparatus n.e.c.	108.4-196.0	136.0 - 206.2	186.6 - 259.3	223.9 - 260.2	
Manufacture of radio, television and communication equipment and apparatus	143.2 -233.1	132.0 - 517.8	225.6 - 122.4	124.7 - 152.4	
Manufacture of medical, precision and optical instruments, watches and clocks	124.6 - 138.3	114.0 - 131.7	72.3 - 194.4	132.3 - 191.2	

### Industrial Production Indexes 2004-2008 <sup>\*) \*\*)</sup> (2000=100)<sup>1</sup>

Economic activities	Indexes January and December				
	2004	2005	2006	2007	
Manufacture of machinery and equipment n.e.c.	116.9- 240.2	156.4 - 262.5	166.3 - 319.0	184.7 - 287.9	
Manufacture of office machinery and computers	41.4 - 57.2	43.0 - 75.0	65.7 - 76.7	89.0 - 72.8	
Manufacture of electrical machinery and apparatus n.e.c.	108.1 - 206.0	134.9 - 208.7	177.4 - 259.4	203.6 - 276.7	
Manufacture of radio, television and communication equipment and apparatus	172.4 - 256.1	163.6 - 596.8	243.5 - 115.9	182.1 - 154.5	
Manufacture of medical, precision and optical instruments, watches and clocks	124.0 - 169.9	130.8 - 165.2	122.7 - 256.8	177.2 - 246.4	

<sup>1</sup> Created by Antoniya Dimitrova on the basis of the statistics of the Bulgarian National Statistical Institute

- Data are reconciled
- \*\* In the tables are not included divisions that according to the Law on Statistics are confidential and in this way they are statistical secrecy

GENERATED WASTE FROM ECONOMIC ACTIVITY (tons) <sup>2</sup>	2004	2005	2006
<b>Generated waste - total</b>	<b>251 482 928</b>	<b>278 009 056</b>	<b>239 628 783</b>
Hazardous waste <sup>1</sup>	526 079	1 106 694	857 875
Non - hazardous waste from economical activities	250 956 849	276 902 361	238 770 908

### Appendix III

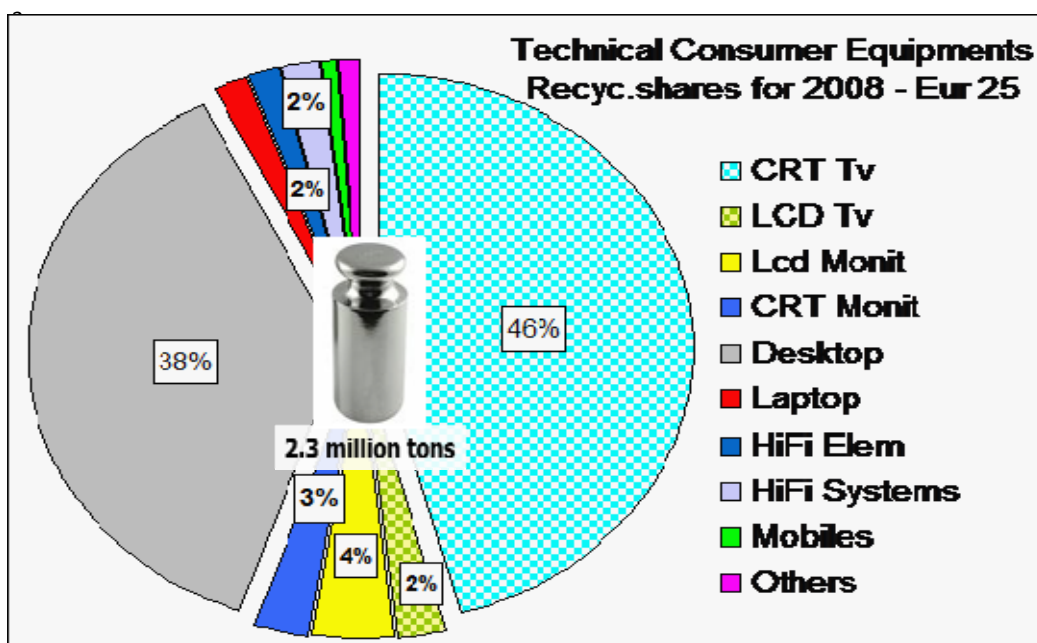


Chart 2: 2008-WEEE share in % of total weight

### Recycling industry structure

#### WEEE

- Importers-exporters, waste and scrap [1 companies]
- Refuse and waste collection and disposal services [45 companies]
- Technical environmental contractors and services [41 companies]
- Environmental consultants [66 companies]
- Recycling services [81 companies]
  - Recycling of plastics [4 companies]
  - Recycling of chemicals

<sup>2</sup> <sup>1)</sup> Source of information - EEA - Bulgaria

<sup>2)</sup> As of 2004 the survey is based on the "List of waste" Updated on 11.01.2008

<sup>3</sup> Chart 2: Source : GfK Digital Convergence – March 2008

- Rubber processing services [1 companies]
- Textile waste processing [1 companies]
- Metal recycling [75 companies]
- Scrap and waste (trade) [26 companies]
- Domestic refuse and industrial waste collection and disposal plant and equipment [9 companies]

Source : [http://kompass.com/kinl/static/index\\_kise.php? Lang=en&login=no&action=ma\\_sign\\_in](http://kompass.com/kinl/static/index_kise.php? Lang=en&login=no&action=ma_sign_in)

0 companies in

Recycling services for information technology (IT) and telecommunications equipment  
 Recycling services for electrical household appliances  
 Recycling services for lighting equipment  
 Recycling services for electrical and electronic tools  
 Recycling services for electrical medical devices

Source: [http://kompass.com/kinl/static/index\\_kise.php? Lang=en&login=no&action=ma\\_sign\\_in](http://kompass.com/kinl/static/index_kise.php? Lang=en&login=no&action=ma_sign_in) last accessed on 01.06.2008

[Scrap and waste \(trade\) \[30 companies\]](#)  
[Metals, scrap \(trade\) \[26 companies\]](#)  
[Scrap metals, ferrous \(trade\) \[26 companies\]](#)  
[Scrap metals, non-ferrous \(trade\) \[26 companies\]](#)  
[Scrap tyres and rubber waste \(trade\) \[1 companies\]](#)  
[Waste, plastic scrap \(trade\) \[9 companies\]](#)

Source: [http://kompass.com/kinl/static/index\\_kise.php? Lang=en&login=no&action=ma\\_sign\\_in](http://kompass.com/kinl/static/index_kise.php? Lang=en&login=no&action=ma_sign_in) last accessed on 01.06.2008

[Shredders, industrial waste, scrap and domestic refuse \[1 companies\]](#)  
[Importers-exporters, waste and scrap \[1 companies\]](#)

Приложение № 2  
към чл. 3, ал. 2

Списък на видовете уреди, попадащи в отделните категории ЕЕО, съгласно прил. № 1 към чл. 3, ал. 1, т. 1

Големи домакински уреди:

- 1.1. Големи охладителни уреди
- 1.2. Хладилници
- 1.3. Замразители
- 1.4. Други големи уреди, използвани за охлаждане, консервиране и съхраняване на храна
- 1.5. Перални машини
- 1.6. Сушилни машини за дрехи
- 1.7. Миялни машини
- 1.8. Готварски печки
- 1.9. Електрически фурни
- 1.10. Електрически котлони
- 1.11. Микровълнови печки
- 1.12. Други големи уреди, използвани за готвене и обработка на храна
- 1.13. Електрически нагревателни и отоплителни уреди
- 1.14. Електрически радиатори
- 1.15. Други големи уреди за отопление на стаи, легла, мебели за сядане
- 1.16. Електрически вентилатори
- 1.17. Климатични инсталации
- 1.18. Други вентилационни уреди, уреди за отвеждане на газове и климатични уреди

Малки домакински уреди:

- 2.1. Прахосмукачки
- 2.2. Уреди за почистване на килими
- 2.3. Други уреди за почистване
- 2.4. Уреди, използвани за шиене, плетене, тъкане и друга обработка на тъкани
- 2.5. Ютии и други уреди за гладене, гладачни преси и друга грижа за дрехите



- 2.6. Тостери
- 2.7. Фритюрници
- 2.8. Мелнички, кафе машини и уреди за отваряне или затваряне на кутии или опаковки
- 2.9. Електрически ножове
- 2.10. Уреди за подстригване, изсушаване на коса, измиване на зъби, бръснене, масаж и други уреди за грижа за тялото
- 2.11. Ръчни и стенни часовници и уреди за измерване, отчитане и регистриране на време
- 2.12. Везни
- 2.13. Други малки уреди, използвани за готвене и обработка на храна

#### Информационно и телекомуникационно оборудване:

- 3.1. Оборудване за централизирана обработка на информация:
  - 3.1.1. Големи компютри
  - 3.1.2. Миникомпютри
  - 3.1.3. Печатащи устройства
- 3.2. Оборудване за персонална обработка на данни:
  - 3.2.1. Персонални компютри (процесор, мишка, екран и клавиатура)
  - 3.2.2. Лаптоп компютри (процесор, мишка, екран и клавиатура)
  - 3.2.3. Ноутбук компютри
  - 3.2.4. Ноутпад компютри
  - 3.2.5. Принтери
  - 3.2.6. Копирно оборудване
  - 3.2.7. Електрически и електронни пишещи машини
  - 3.2.8. Джобни и офис калкулатори
  - 3.2.9. Други продукти и уреди за събиране, съхранение, инф-я по електронен път
- 3.3. Потребителски терминали и системи:
- 3.4. Факс апарати
- 3.5. Телекс апарати
- 3.6. Телефони
- 3.7. Телефонни апарати с монети и/или карти
- 3.8. Безжични телефони
- 3.9. Клетъчни телефони
- 3.10. Телефонни секретари
- 3.11. Други продукти или уреди за предаване на звук, картина или друга информация на разстояние

#### Потребителски уреди:

- 4.1. Радиоприемници
- 4.2. Телевизори
- 4.3. Видеокамери, фотоапарати
- 4.4. Видеокасетофони и записващи устройства
- 4.5. Hi-fi записващи устройства
- 4.6. Усилватели
- 4.7. Музикални инструменти
- 4.8. Други продукти или уреди за записване или възпроизвеждане на звук или картина, включително сигнали или други технологии за разпространение на звук и картина, различни от телекомуникационните

#### Осветителни тела:

- 5.1. Осветителни тела за луминесцентни лампи с изключение на осветителните тела в домакинствата
- 5.2. Прави луминесцентни лампи
- 5.3. Компактни луминесцентни лампи
- 5.4. Газоразрядни лампи с висок интензитет, включително натриеви лампи високо налягане и металхалогенни лампи
- 5.5. Натриеви лампи с ниско налягане
- 5.6. Други осветителни тела или уреди за разпръскване или контролиране на светлина с изключение на електрически лампи с нажежаема жичка

#### Електрически и електронни инструменти (с изкл. на големи стационарни промишлено оборудване):

- 6.1. Бормашини
- 6.2. Триони
- 6.3. Шевни машини
- 6.4. Инструменти за струговане, смилане, фрезование, шлифование, рендосване, рязане, нарязване, отрязване, пробиване, перфориране, щанцоване, фалцоване, огъване или подобни процеси на обработка на дърво, метал и други материали
- 6.5. Инструменти за занитване, заковаване или завинтване или отстраняване на нитове, пирони, винтове или за подобна употреба
- 6.6. Инструменти за заваряване, запояване или за подобна употреба
- 6.7. Уреди за пулверизиране, пръскане, диспергиране или друга обработка на течности или газообразни вещества чрез други методи

6.8. Инструменти за косене или други градинарски дейности

Електрически и електронни играчки, уреди за забавление и спорт:

- 7.1. Електрически влакчета или комплекти състезателни коли
- 7.2. Портативни конзоли за видео игри
- 7.3. Видео игри
- 7.4. Компютри за колоездене, гмуркане, бягане, гребане и други
- 7.5. Спортни уреди с електрически или електронни компоненти
- 7.6. Монетни игрални автомати

Медицински устройства (с изключение на всички имплантирани и инфектирани елементи):

- 8.1. Уреди за:
  - 8.1.1. Радиотерапия/лъчетерапия
  - 8.1.2. Кардиология
  - 8.1.3. Диализа
- 8.2. Белодробни апарати (за инхалация, обдишване)
- 8.3. Уреди за ядрената медицина
- 8.4. Лабораторно оборудване за ин-витро диагностика
- 8.5. Аналитична апаратура
- 8.6. Замразители
- 8.7. Уреди за тестване на бременност
- 8.8. Други уреди за откриване, предотвратяване, профилактика, мониторинг, лечение, облекчаване на заболявания, травми или недъзи

Уреди за мониторинг и контрол:

- 9.1. Детектори за дим
- 9.2. Регулатори за отопление
- 9.3. Термостати
- 9.4. Уреди за измерване, претегляне или регулиране, използвани в бита или като лабораторно оборудване
- 9.5. Други уреди за мониторинг и контрол, които се използват в промишлените инсталации (например в контролните табла)

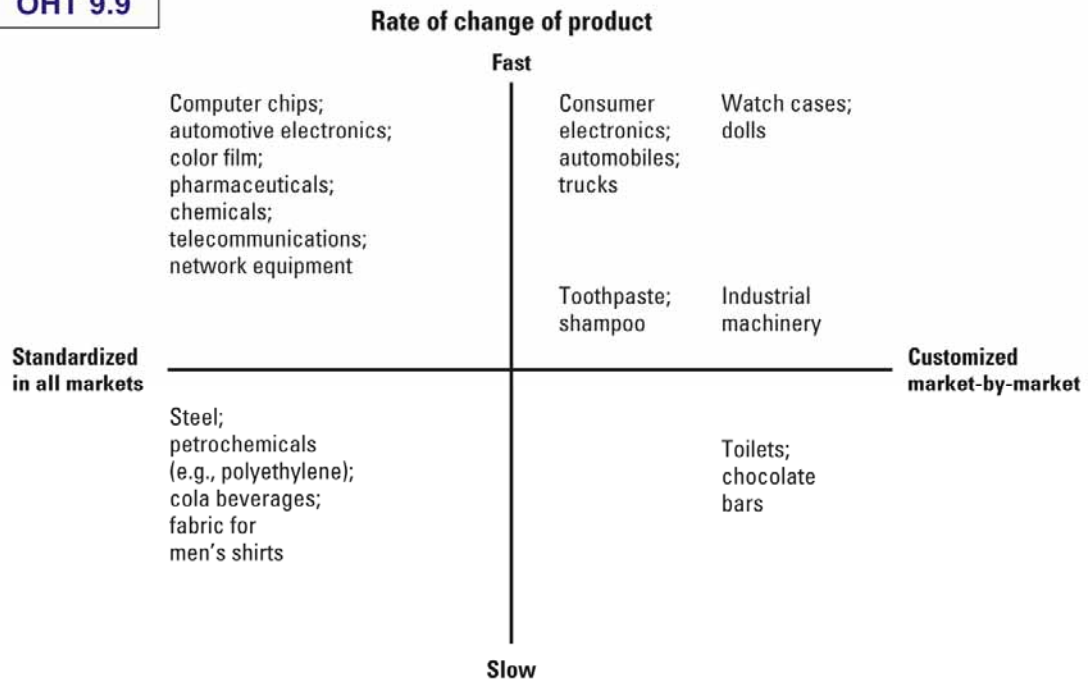
Автомати:

- 10.1. Автомати за горещи напитки
- 10.2. Автомати за горещи или студени бутилки или метални кутии
- 10.3. Автомати за твърди продукти
- 10.4. Банкомати
- 10.5. Всички уреди, които автоматично предоставят всякакви видове продукти

## Appendix IV

8.	Съоръжения и инсталации за разкомплектоване на отпадъци от електрическо и електронно оборудване	<p>8.1. "АВ ПИ ЕМ" ООД София, Русе, град София, ул. Христо Смирненски блок №65, вход В, град Русе, ул. "Попови" №10 А, С разрешение № 10-ДО-054-03/2005</p> <p>8.2 "БОН ФЕР" ЕООД Русе Гр. Русе, бул. "Цар Освободител" № 108, вх. Б, ет. I Разр. № 10 - ДО - 311 - 02 от 04.04.2007</p> <p>8.3. "ДИ ЕНД ВН ГРУП" ООД Русе, бул. "Гоце Делчев" № 142 Разр. № 10 - ДО - 352 - 01 от 14.12.2006</p> <p>8.4. "Никстране" ЕООД - Русе, ул. "Цар Освободител" № 108, вход Б, етаж I русе, разр № 10 - ДО - 310 - 02 от 30.03.2007 г.</p> <p>8.5. "СТОРУС" ЕООД Русе, ул. "Стрешер планина" № 49, разр. № 10 - ДО - 351 - 01 от 18.12.2006</p> <p>8.6. ЕТ "Силина Стоянова" Русе, бул. "Цар Освободител" № 108, с разр. 10 - ДО - 312 - 02 от 16.03.2007</p> <p>8.7. "РИК" ООД - Силистра, ул. "Славянска" № 6, разр. № 10-ДО-304-02/31.05.2007</p> <p>8.8 ЕТ „Нест“ Силистра ул. „СТ. Караджа“ 11 разр. № 10 - ДО - 025 - 06 - от 10.08.2007 г</p>	<p>8.1. Център за разкомплектовка на ЕЕО.</p> <p>8.2. Център за разкомплектовка на ЕЕО.</p> <p>8.3. Център за разкомплектовка на ЕЕО.</p> <p>8.4. Център за разкомплектовка на ЕЕО.</p> <p>8.5. Център за разкомплектовка на ЕЕО.</p> <p>8.6. Център за разкомплектовка на ЕЕО.</p> <p>8.7. Център за разкомплектовка на ЕЕО.</p> <p>8.8. Център за разкомплектовка на ЕЕО.</p>	<p>8.1. 100 тона годишно</p> <p>8.2. 100 тона годишно</p> <p>8.3. 100 тона годишно</p> <p>8.4. 100 тона годишно</p> <p>8.5. 100 тона годишно</p> <p>8.6. 100 тона годишно</p> <p>8.7. 100 тона годишно</p> <p>8.8 100 тона годишно</p>	<p>30 т/год</p> <p>10 т/год</p> <p>5 т/год</p> <p>15 т/год</p> <p>5 т/год</p> <p>15 т/год</p> <p>15 т/год</p> <p>15 т/год</p>
----	---	---	---	--	---

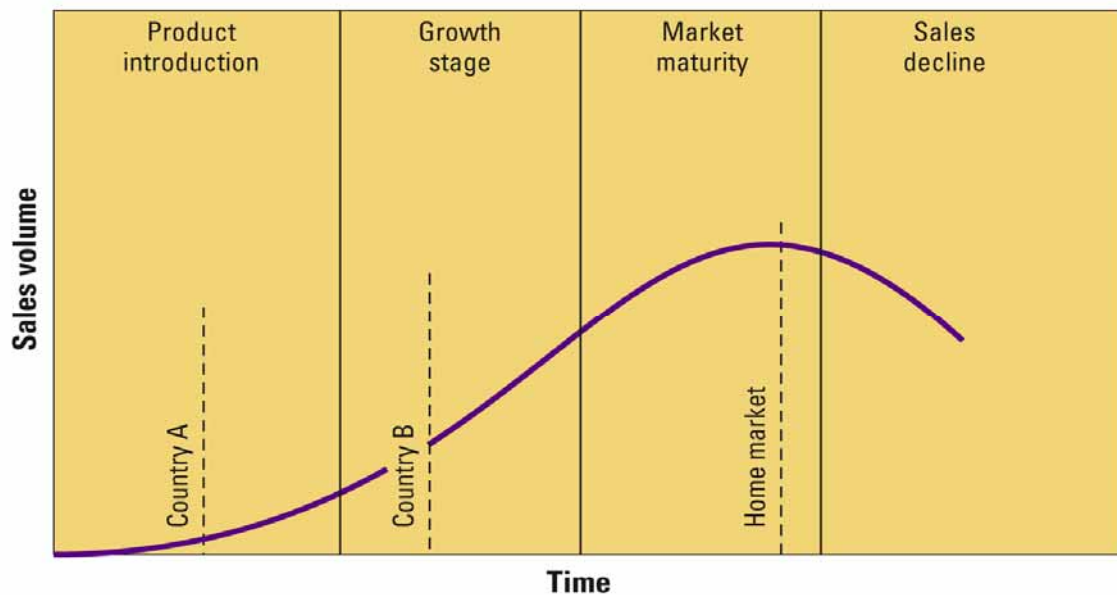
### OHT 9.9



**Figure 9.8** Market requirements and product characteristics

Albaum, Duerr and Strandskov, *International Marketing and Export Management*, fifth edition © Pearson Education Limited 2005

### OHT 9.8



**Figure 9.6** Product life cycle

Albaum, Duerr and Strandskov, *International Marketing and Export Management*, fifth edition © Pearson Education Limited 2005

**Table 4.1 Price list<sup>4</sup>****Current price list in CZK per 1kg (without VAT)****(1 EUR = 25,80 CZK)**

Number	Category	New waste + admin	Historical waste	Total balance for advance payment
1A	Large household appliances excluding the below listed	0,40	1,00	1,40
1B	Cooling and freezing appliances and air-conditioning devices	0,40	4,50	4,90
2A	Small household appliances excluding the below listed	0,40	0,40	0,80
2B	Watches and appliances for measuring time under 150g	0,40	0,30	0,70
3A	IT and telecommunication equipment excluding the below listed	0,40	0,60	1,00
3B	Mobiles, digital cameras, dictaphones, personal players (digital)	0,40	0,30	0,70
3C	CRT monitors	0,40	2,00	2,40
4A	Consumer equipment excluding the below listed	0,40	2,00	2,40
4B	Analogue cameras	0,40	0,30	0,70
4C	TV sets	0,40	2,00	2,40
5A	Lighting equipment	0,40	0,50	0,90
5B	Fluorescent tubes	0,40	5,21 CZK/piece	
5C	Gas discharge lamps	0,40	5,21 CZK/piece	
6A	Electric tools excluding the below listed	0,40	0,40	0,80
6B	Garden equipment over 10kg/piece and safe deposits over 10 kg/piece	0,40	0,30	0,70
7A	Toys, sporting equipment excluding the below listed	0,40	0,40	0,80
7B	Sport equipment and gaming machines over 30kg/piece	0,40	0,30	0,70
8A	Medical devices	0,40	0,40	0,80
9A	Monitoring and control devices	0,40	0,40	0,80
10A	Vending machines	0,40	-	0,40

<sup>4</sup> [http://www.retela.cz/index\\_en.php?s=15](http://www.retela.cz/index_en.php?s=15) lastly accessed on 06.06.2008

## Appendix V

### The Producer Responsibility Principle of the WEEE Directive 9. Impact Assessment

Table 108: Estimated Number of Registrations Under Different Assumptions and Associated Costs Savings

	% of EU-27 manufacturing sites	Current Number of Producers Registered	Low Estimate		High Estimate		Average Estimate	
			Number of Producers Registered	Cost savings (€'000)	Number of Producers Registered	Cost savings (€'000)	Number of Producers Registered	Cost savings (€'000)
AU	3%	1,450	196	580	65	640	82	632
BE	3%	2,341	168	1,042	56	1,096	70	1,089
DK	2%	1,036	140	581	47	642	59	634
FI	3%	770	168	102	56	121	70	119
FR	8%	3,725	531	137	177	152	223	150
DE	17%	6,100	1,146	7,796	382	8,999	481	8,843
GR	1%	640	84	267	28	294	35	290
IE	3%	850	168	327	56	381	70	374
IT	8%	3,230	559	1,281	186	1,460	235	1,437
LU	0%	420	28	188	9	197	12	196
NE	4%	1,780	252	733	84	813	106	803
PT	2%	950	112	309	37	336	47	333
ES	6%	951	363	282	121	398	153	383
SE	6%	1,083	363	66	121	88	153	85
UK	16%	3,100	1,063	977	354	1,317	446	1,273
BU	0%	660	0	11	0	11	0	11
CY	0%	580	28	9	9	10	12	9
CZ	4%	3,060	280	39	93	42	117	41
EE	0%	126	28	35	9	41	12	41
HU	5%	704	336	5	112	9	141	8
LT	0%	590	28	9	9	10	12	10
LI	0%	589	28	9	9	10	12	10
MT	0%	510	28	8	9	8	12	8
PO	3%	2,020	224	30	75	32	94	32
RO	0%	900	0	15	-	15	0	15
SK	3%	763	196	12	65	15	82	15
SV	1%	665	84	10	28	11	35	11
EU-27	100%	39,593	6,599	14,861	2,200	17,147	2,769	16,851

Similar cost savings will be experienced by industry, resulting from reduced annual renewal costs (payable in seven MS) and reduced reporting requirements. Data from UNU (2007) (Table 83, p.138) suggests that an average of 7 hours is required to produce a report per Member State, whatever frequency of reporting is required. It is assumed that this increases to 10 hours per report under this Measure, as the report will include data for all Member States. Reports will still be submitted at different frequencies in different Member States, as in the current situation. The table below sets out the estimated costs savings for industry under a single registration system, providing low, high and average estimates. These scenarios use the same assumptions regarding the number of producers registered in each country as set out in Table 108.

Table 109: Estimated Cost Savings to Industry from Reduced Registration and Reporting Requirements

	Average Annual Renewal Costs per Producer (€)	Frequency of Reporting (No. per year)	Low Estimate		High Estimate		Average Estimate	
			Savings in Total Annual Renewal Costs (€'000)	Savings in Annual Reporting Costs (€'000)	Savings in Total Annual Renewal Costs (€'000)	Savings in Annual Reporting Costs (€'000)	Savings in Total Annual Renewal Costs (€'000)	Savings in Annual Reporting Costs (€'000)
AU	0	4	-	831	-	964	-	946
BE	0	4	-	1,808	-	1,946	-	1,928
DK	470	1	422	187	465	217	460	213
FI	130	1	78	98	93	127	91	124
FR	0	2	-	1,216	-	1,424	-	1,397
DE	0	12	-	9,907	-	12,331	-	12,017
GR	0	12	-	1,108	-	1,278	-	1,256
IE	1,000	12	682	1,300	794	1,641	780	1,597
IT	0	1	-	432	-	526	-	514
LU	0	1	-	83	-	89	-	88
NE	0	1	-	273	-	319	-	313
PT	940	2	788	117	858	133	849	131
ES	0	4	-	184	-	332	-	312
SE	300	1	216	100	289	162	279	154
UK	370	4	754	1,084	1,016	1,777	982	1,688
BU	0	1	-	7	-	7	-	7
CY	0	1	-	20	-	21	-	20
CZ	0	1	-	123	-	136	-	134
EE	0	1	-	3	-	4	-	4
HU	0	1	-	10	-	23	-	22
LT	0	4	-	43	-	45	-	44
LI	0	1	-	14	-	14	-	14
MT	0	1	-	27	-	29	-	29
PO	940	4	1,689	264	1,829	297	1,811	293
RO	0	1	-	15	-	15	-	15
SK	0	1	-	16	-	23	-	22
SV	0	4	-	164	-	188	-	185
Total Cost Savings EU-27			4,628	19,434	5,344	24,065	5,251	23,466

The assumptions made for the assessment of this Measure implicitly include the assumption that companies will choose to register in the Member State where their main manufacturing site(s) are located, regardless of the costs of registration renewal and reporting frequency. However, it is possible that companies may choose to register where these costs are lowest, thereby increasing the costs savings indicated above.

#### Total Costs of Measure 7

## Appendix VI

The seven relevant pieces of legislation in Bulgaria are:

1. "Zakon za opzване na okolната среда" Law for protection of the environment – National Newspaper (Dyrjaven Vestnik) edition 91 from 2002
2. "Zakon za upravlєnie na otpadytzite" Law for waste control and management – National Newspaper (Dyrjaven Vestnik) edition 86 from 2003
3. "Naredba N3 za klasifikatziq na otpadytzite" Law for classification of the waste - National Newspaper (Dyrjaven Vestnik) edition 44 from 2004
4. "Naredba n12 za iziskvaniqta, na koito trqbva da otgovarqt ploshtadkite za razpolagane na syorajeniq za tretirane na otpadytzi" Law for the requirements that have to be answered by the collection points for treatment of waste - National Newspaper (Dyrjaven Vestnik) edition 152 from 1998
5. "Naredba za iziskvaniqta za tretirane i transportirane na proizvodstevni i opasni otpadytzi" Law for the requirements that have to be answered when treating and transporting hazardous waste from the production - National Newspaper (Dyrjaven Vestnik) edition 29 from 1999
6. "Naredba za iziskvaniqta za tretirane i transportirane na otraboteni masla i otpadychni neftoprodukti" Law for the requirements that have to be answered when treating and transporting recycled motor oils and waste oil products - National Newspaper (Dyrjaven Vestnik) edition 59 from 2000
7. "Naredba za sluchaite, za koito se iziskva razreshenie za vyvejdane, iznasqne i transit na otpadytzi, i za usloviqta na negovoto izdavane" Law for the cases in which a permission is needed for export, transit of wastes and the requirements of obtaining one - National Newspaper (Dyrjaven Vestnik) edition 66 from 2000.

Special case: "Naredba za iziskvaniqta za puskanie na pazara na luminiscentni i drugi lampi, sydyrjashti jivak i za tretirane i transportirane na izlezli ot upotreba luminiscentni i drugi lampi, sydyrjashti jivak" Law for the requirement that have to be answered when putting on the market luminaries and other lightning equipment that contains mercury and treatment and transportation of disposed luminaries and other lightning equipment that contain mercury - National Newspaper (Dyrjaven Vestnik) edition 101 from 2000

## Appendix VII.1

Разчет за количествата ОЕЕО по сценарии (2006 – 2015), по групи ЕЕО, по еко характеристики, в килограми и проценти

<b>Сценарий 2006</b>	7898000	кг.	
<i>Големи домакински уреди</i>	2900005	кг.	
За директно обезвреждане (сметища)	401726	кг.	13.9 %
За обезвреждане с оползотворяване на енергия	0	кг.	0.0 %
Рециклируеми	2414360	кг.	83.3 %
Съдържащи опасни вещества	83920	кг.	2.9 %
<i>Потребителски уреди</i>	4997995	кг.	
За директно обезвреждане (сметища)	683786	кг.	13.7 %
За обезвреждане с оползотворяване на енергия	760499	кг.	15.2 %
Рециклируеми	3553671	кг.	71.1 %
Съдържащи опасни вещества	38	кг.	0.0 %
<b>Сценарий 2007</b>	13483433	кг.	
<i>Големи домакински уреди</i>	9942290	кг.	
За директно обезвреждане (сметища)	1418861	кг.	14.3 %
За обезвреждане с оползотворяване на енергия	268907	кг.	2.7 %
Рециклируеми	7996929	кг.	80.4 %
Съдържащи опасни вещества	257594	кг.	2.6 %
<i>Компютърно и телекомуникационно оборудване</i>	165099	кг.	
За директно обезвреждане (сметища)	13315	кг.	8.1 %
За обезвреждане с оползотворяване на енергия	961	кг.	0.6 %
Рециклируеми	119786	кг.	72.6 %
Съдържащи опасни вещества	31037	кг.	18.8 %
<i>Потребителски уреди</i>	3376044	кг.	
За директно обезвреждане (сметища)	461884	кг.	13.7 %

За обезвреждане с оползотворяване на енергия	513702	кг.	15.2 %
Рециклируеми	2400433	кг.	71.1 %
Съдържащи опасни вещества	26	кг.	0.0 %
<b>Сценарий 2008</b>	25619026	кг.	
<i>Големи домакински уреди</i>	18891000	кг.	
За директно обезвреждане (сметища)	2695923	кг.	14.3 %
За обезвреждане с оползотворяване на енергия	510910	кг.	2.7 %
Рециклируеми	15194716	кг.	80.4 %
Съдържащи опасни вещества	489451	кг.	2.6 %
<i>Компютърно и телекомуникационно оборудване</i>	313588	кг.	
За директно обезвреждане (сметища)	25275	кг.	8.1 %
За обезвреждане с оползотворяване на енергия	1825	кг.	0.6 %
Рециклируеми	227519	кг.	72.6 %
Съдържащи опасни вещества	58969	кг.	18.8 %
<i>Потребителски уреди</i>	6414438	кг.	
За директно обезвреждане (сметища)	877573	кг.	13.7 %
За обезвреждане с оползотворяване на енергия	976026	кг.	15.2 %
Рециклируеми	4560790	кг.	71.1 %
Съдържащи опасни вещества	49	кг.	0.0 %
<b>Сценарий 2009</b>	43807931	кг.	
<i>Големи домакински уреди</i>	32303241	кг.	
За директно обезвреждане (сметища)	4609960	кг.	14.3 %
За обезвреждане с оползотворяване на енергия	873583	кг.	2.7 %
Рециклируеми	25982730	кг.	80.4 %
Съдържащи опасни вещества	836968	кг.	2.6 %
<i>Компютърно и телекомуникационно оборудване</i>	536579	кг.	
За директно обезвреждане (сметища)	43275	кг.	8.1 %
За обезвреждане с оползотворяване на енергия	3124	кг.	0.6 %
Рециклируеми	389309	кг.	72.6 %
Съдържащи опасни вещества	100871	кг.	18.8 %
<i>Потребителски уреди</i>	10968111	кг.	
За директно обезвреждане (сметища)	1500571	кг.	13.7 %
За обезвреждане с оползотворяване на енергия	1668917	кг.	15.2 %
Рециклируеми	7798540	кг.	71.1 %
Съдържащи опасни вещества	83	кг.	0.0 %
<b>Сценарий 2010</b>	49941889	кг.	
<i>Големи домакински уреди</i>	36825723	кг.	
За директно обезвреждане (сметища)	5255439	кг.	14.3 %
За обезвреждане с оползотворяване на енергия	995958	кг.	2.7 %
Рециклируеми	29620220	кг.	80.4 %
Съдържащи опасни вещества	954106	кг.	2.6 %
<i>Компютърно и телекомуникационно оборудване</i>	611925	кг.	
За директно обезвреждане (сметища)	49378	кг.	8.1 %
За обезвреждане с оползотворяване на енергия	3564	кг.	0.6 %
Рециклируеми	443977	кг.	72.6 %
Съдържащи опасни вещества	115005	кг.	18.8 %
<i>Потребителски уреди</i>	12504241	кг.	
За директно обезвреждане (сметища)	1710732	кг.	13.7 %
За обезвреждане с оползотворяване на енергия	1902656	кг.	15.2 %
Рециклируеми	8890758	кг.	71.1 %
Съдържащи опасни вещества	95	кг.	0.0 %
<b>Сценарий 2011</b>	56935240	кг.	
<i>Големи домакински уреди</i>	41982730	кг.	
За директно обезвреждане (сметища)	5991197	кг.	14.3 %
За обезвреждане с оползотворяване на енергия	1135524	кг.	2.7 %
Рециклируеми	33768281	кг.	80.4 %
Съдържащи опасни вещества	1087728	кг.	2.6 %
<i>Компютърно и телекомуникационно оборудване</i>	697709	кг.	
За директно обезвреждане (сметища)	56221	кг.	8.1 %
За обезвреждане с оползотворяване на енергия	4058	кг.	0.6 %
Рециклируеми	506213	кг.	72.6 %
Съдържащи опасни вещества	131218	кг.	18.8 %
<i>Потребителски уреди</i>	14254801	кг.	
За директно обезвреждане (сметища)	1950230	кг.	13.7 %
За обезвреждане с оползотворяване на енергия	2169023	кг.	15.2 %
Рециклируеми	10135440	кг.	71.1 %
Съдържащи опасни вещества	108	кг.	0.0 %



**Сценарий 2012***Големи домакински уреди*

За директно обезвреждане (сметища)	6829850	кг.	14.3	%
За обезвреждане с оползотворяване на енергия	1294318	кг.	2.7	%
Рециклируеми	38494112	кг.	80.4	%
Съдържащи опасни вещества	1239960	кг.	2.6	%
<i>Компютърно и телекомуникационно оборудване</i>	795368	кг.		
За директно обезвреждане (сметища)	64173	кг.	8.1	%
За обезвреждане с оползотворяване на енергия	4632	кг.	0.6	%
Рециклируеми	577072	кг.	72.6	%
Съдържащи опасни вещества	149490	кг.	18.8	%
<i>Потребителски уреди</i>	16249738	кг.		
За директно обезвреждане (сметища)	2223161	кг.	13.7	%
За обезвреждане с оползотворяване на енергия	2472574	кг.	15.2	%
Рециклируеми	11553878	кг.	71.1	%
Съдържащи опасни вещества	124	кг.	0.0	%

**Сценарий 2013***Големи домакински уреди*

За директно обезвреждане (сметища)	54558728	кг.		
За обезвреждане с оползотворяване на енергия	7786123	кг.	14.3	%
Рециклируеми	1475502	кг.	2.7	%
Съдържащи опасни вещества	43883550	кг.	80.4	%
<i>Компютърно и телекомуникационно оборудване</i>	1413553	кг.	2.6	%
За директно обезвреждане (сметища)	906059	кг.		
За обезвреждане с оползотворяване на енергия	73050	кг.	8.1	%
Рециклируеми	5273	кг.	0.6	%
Съдържащи опасни вещества	657380	кг.	72.6	%
<i>Потребителски уреди</i>	170356	кг.	18.8	%
За директно обезвреждане (сметища)	18525087	кг.		
За обезвреждане с оползотворяване на енергия	2534457	кг.	13.7	%
Рециклируеми	2818793	кг.	15.2	%
Съдържащи опасни вещества	13171696	кг.	71.1	%
	141	кг.	0.0	%

**Сценарий 2014***Големи домакински уреди*

За директно обезвреждане (сметища)	84350390	кг.		
За обезвреждане с оползотворяване на енергия	62198262	кг.		
Рециклируеми	8876213	кг.	14.3	%
Съдържащи опасни вещества	1682250	кг.	2.7	%
<i>Компютърно и телекомуникационно оборудване</i>	50028311	кг.	80.4	%
За директно обезвреждане (сметища)	1611488	кг.	2.6	%
За обезвреждане с оползотворяване на енергия	1033844	кг.		
Рециклируеми	83406	кг.	8.1	%
Съдържащи опасни вещества	6021	кг.	0.6	%
<i>Потребителски уреди</i>	750096	кг.	72.6	%
За директно обезвреждане (сметища)	194321	кг.	18.8	%
За обезвреждане с оползотворяване на енергия	21118284	кг.		
Рециклируеми	2889238	кг.	13.7	%
Съдържащи опасни вещества	3213376	кг.	15.2	%
	15015510	кг.	71.1	%
	161	кг.	0.0	%

**Сценарий 2015***Големи домакински уреди*

За директно обезвреждане (сметища)	96159497	кг.		
За обезвреждане с оползотворяване на енергия	70905741	кг.		
Рециклируеми	10118883	кг.	14.3	%
Съдържащи опасни вещества	1917722	кг.	2.7	%
<i>Компютърно и телекомуникационно оборудване</i>	57032042	кг.	80.4	%
За директно обезвреждане (сметища)	1837094	кг.	2.6	%
За обезвреждане с оползотворяване на енергия	1178630	кг.		
Рециклируеми	95057	кг.	8.1	%
Съдържащи опасни вещества	6862	кг.	0.6	%
<i>Потребителски уреди</i>	855143	кг.	72.6	%
За директно обезвреждане (сметища)	221568	кг.	18.8	%
За обезвреждане с оползотворяване на енергия	24075126	кг.		
Рециклируеми	3293769	кг.	13.7	%
Съдържащи опасни вещества	3663292	кг.	15.2	%
	17117881	кг.	71.1	%
	183	кг.	0.0	%

## Appendix VII.3

Разчет за количествата ОЕЕО по сценарии (2006 – 2015), по обобщени групи ЕЕО,  
по материали в килограми и проценти

Категория/Материал		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
<b>Групи 1 и 10</b>		<b>2900005</b>	<b>9050690</b>	<b>17197000</b>	<b>29406745</b>	<b>33523475</b>	<b>38217730</b>	<b>43566735</b>	<b>49666480</b>	<b>56620510</b>	<b>64547245</b>
ODS	кг	29832	89746	170525	291598	332408	378955	431997	492480	561433	640031
	%	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Други	кг	8352	29900	56812	97148	110747	126254	143926	164077	187050	213237
	%	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Други метали	кг	401726	1418861	2695923	4609960	5255439	5991197	6829850	7786123	8876213	10118883
	%	13.9	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7
Пластмаса ОО	кг	213520	650336	1235695	2113046	2408776	2746090	3130444	3568724	4068404	4637963
	%	7.4	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2
Пластмаса рециклируема	кг	181308	403280	766273	1310307	1493740	1702914	1941230	2213081	2522885	2876033
	%	6.3	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Съкло	кг	65424	206001	391417	669323	763032	869895	991631	1130459	1288757	1469186
	%	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Цветни метали	кг	153700	504355	958311	1638736	1868159	2129861	2427870	2767729	3155364	3597144
	%	5.3	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
Черни метали	кг	1846143	5748212	10922045	18676626	21291174	24272564	27669787	31543808	35960403	40994767
	%	63.7	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5
<b>Групи 2,5,6,7 и 9</b>		<b>0</b>	<b>891600</b>	<b>1694000</b>	<b>2896496</b>	<b>3302248</b>	<b>3765000</b>	<b>4291504</b>	<b>4892248</b>	<b>5577752</b>	<b>6358496</b>
Гума	кг	0	90587	172110	294284	335508	382524	436017	497052	566700	646023
	%	0	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2
Пластмаса изгаряне	кг	0	152464	289674	495301	564684	643815	733847	836574	953796	1087303
	%	0	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1
Пластмаса ОО	кг	0	204176	387926	663298	756215	862185	982754	1120325	1277305	1456096
	%	0	22.9	22.9	22.9	22.9	22.9	22.9	22.9	22.9	22.9
Пластмаса рециклируема	кг	0	178320	338800	579299	660450	753000	858301	978450	1115550	1271699
	%	0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Текстил	кг	0	87733	166690	285015	324941	370476	422284	481397	548851	625676
	%	0	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8
Черни метали	кг	0	178320	338800	579299	660450	753000	858301	978450	1115550	1271699
	%	0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
<b>Групи 3 и 4</b>		<b>4997995</b>	<b>3541143</b>	<b>6728026</b>	<b>11504690</b>	<b>13116166</b>	<b>14952510</b>	<b>17045105</b>	<b>19431146</b>	<b>22152128</b>	<b>25253756</b>
Други	кг	237500	166102	315580	539639	615235	701337	799524	911430	1039070	1184542
	%	4.8	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7
Други метали	кг	1015913	701661	1333123	2279580	2598887	2962662	3377360	3850157	4389253	5003782
	%	20.3	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8
Пластмаса изгаряне	кг	615599	415825	790062	1350934	1540138	1755753	2001468	2281721	2601124	2965316

	%	12.3	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7
Пластмаса ОО	кг	151117	167987	319109	545838	622402	709465	808883	921794	1051290	1198454
	%	3.0	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7
Стъкло	кг	2852997	1953008	3710689	6344976	7233623	8246404	9400399	10716622	12216866	13927424
	%	57.1	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.1	55.1
Тежки метали	кг	8369	12213	23206	39687	45247	51606	58808	67029	76437	87147
	%	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Цветни метали	кг	116500	103058	195808	334845	381747	435278	496124	565540	644799	735111
	%	2.3	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
Черни метали	кг	0	21289	40449	69190	78885	90006	102540	116852	133290	151980
	%	0	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
<b>Всичко</b>		<b>7898000</b>	<b>13483433</b>	<b>25619026</b>	<b>43807931</b>	<b>49941889</b>	<b>56935240</b>	<b>64903344</b>	<b>73989874</b>	<b>84350390</b>	<b>96159497</b>