

Integrated Project-8

Life-cycle of electronics

New engagement theme for Robeco



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Certification of Authorship

I hereby certify that I am the sole author of this research paper. All assistance I have received from outside sources have been documented in the research, as well as, listed after the conclusion and recommendations under “bibliography.” This research was created exclusively by me specifically for the course International Business and Management, at The Hague University.

Signature:

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List of Abbreviations

<i>Abbreviation</i>	<i>Explanation</i>
BFR	Brominated flame retardants
CE	Consumer Electronics
CEA	Consumer Electronics Association
CRT	Cathode ray tube
CSR	Corporate Social Responsibility
EICC	Electronic Industry Citizenship Coalition
EPA	US Environmental Protection Agency
EPR	Extended Producer Responsibility
ESG	Environmental, Social and Governmental
HBCD	Hexabromocyclododecane
ICT	Information and Communication Technologies
IEA	International Energy Agency
ILO	International Labour Organization
IR	Investor Relations
LCD	Liquid Cristal Display
MLA	Modern Language Association
NGO	Non-Governmental Organization
OECD	Organization for economic Cooperation and Development
OEMs	Original equipment manufacturers
OFCOM	The Office of Communications (UK)
PBB	Polybrominated Biphenyls
PBDE	Polybrominated Diphenyl Ethers
PC	Personal Computer
PVC	Polyvinyl Chloride
RoHS	European Union's Restriction on Hazardous Substances
TV	Television Set
WEEE	Waste from Electrical and Electronic Equipment

Executive summary

The issue of management of the supply chains of electronics in a sustainable manner is becoming more and more important all around the world. There are growing concerns about the amounts of electronic waste, controversial labour practices and the chemical and energy consumption management. These are important issues for companies active in the area and also for the shareholders of these firms. That is why Robeco, a Dutch asset manager, decided to conduct a thorough research investigating several electronics producers in which it is a shareholder in order to find out whether it should start a thematic engagement with the companies or not.

The central question in this research is to find *how electronics manufacturers worldwide can improve with respect to their supply chains and products in order to minimize the impact their products have on the environment, the health of the employees and of the consumers*. This question results into engagement objectives for Robeco's engagement theme on the life cycle of electronics.

Literature overview:

This research also covers the most relevant contemporary issues that electronics manufacturers and the society as a whole encounters:

- 1) Electronic waste, which is the various forms of electric equipment that have ceased to be of any value to their owners, is one of the fastest growing solid waste streams around the world. It is always regarded as a waste problem, which can cause environmental damage if not dealt with in an appropriate manner. Thus, EPA estimates that only 15-20% of it is recycled and the rest of these electronics go directly into landfills and incinerators. This usually results in leakages into soil and drinking water of the hazardous chemicals like Mercury, Lead, and Cadmium etc. To control the amounts of these materials used in the products several initiatives/programs were adopted by governments around the world. For instance, those include the EU Restriction of Hazardous Substances Directive, Extended Producer Responsibility (or WEEE) Directive, Basel convention etc.
- 2) Lifetime of electronics, which is the time consumers actively use the devices before either abandoning them or sending them to recyclers. For instance, the average life-time of a cell phone was estimated to be around 18 months in 2002, which is down from 3 years in 1991. The same tendency can be seen in the PCs useful lives. In 2005 it was approximately 2 years, while 4-6 years in 1997. Thus, in order to extend life time of the devices the producers of electronics should offer longer product warranties and spare parts.
- 3) The illegal export of the e-waste, also called "the hidden flow" accounts for 60 to 75 per cent of the end of life electronics appliances. Different studies indicate that the most attractive destinations for e-waste are China, India and West coast of Africa. However, there are many more countries affected. Nevertheless, it would be inconsiderate to say that all of the waste in those countries comes from the developed world. It is estimated that by 2030 400 to 700 million obsolete personal computers will be discarded per year in developing nations, while only 200 to 300 million in developed countries.
- 4) Energy consumption of the electronics is another crucial issue, as more and more devices enter common households the energy intensity increases and this leads to higher CO2 emissions. In order to tackle this problem the European Parliament adopted a policy on eco-design of energy-using products, and in USA the ENERGY STAR initiative was adopted by many electronics producers.
- 5) Lastly, the labour standards in the supply chain are very important especially when most of the production has been moved to the countries with cheap labour. Therefore, this research identified the most common violations in the electronics supply chain at the moment. They include lack of policies allowing freedom of association and collective bargaining and gender discrimination against women.

In order to obtain a deeper understanding of the particular issues in sustainable supply chains this research focuses only on three phases of the life cycle of electronics and three categories. The phases include manufacturing, consumer use and recycling. As for the categories, they are health and safety of employees and consumers, labour condition of the employees, and the waste and recycling.

To have a better overview of these stages and to get an initial starting point of the research the publications of two NGOs were used. These are the latest Guide to Greener Electronics released by Greenpeace in November 2011 and Sustainability profiles per individual company from EIRIS, a UK based research provider.

These reports were used to establish the relevant criteria under three of the phases to be used for individual company assessment. It allowed for a quantitative evaluation of the progress made by the companies starting

from the initial NGOs' assessment (Step 1) to Desk research (Sep 2) and Field research (Step 3) conducted in this paper.

Initial assessment (Step 1):

Out of 15 companies covered by the Guide for Greener Electronics only 11 were chosen for the investigation, because EIRIS database could not offer the sustainability reports for the other 4 organizations. That is why the empirical sample of this paper includes Hewlett Packard, Dell, Nokia, Apple, Philips, Samsung, Panasonic, Sony, Sharp, Toshiba, and Research in Motion.

For the quantitative assessment of the companies a 0 to 10 (0 to 100%) grading system was chosen, the same as utilized in Greenpeace's report. That is why after combining two of the inputs (EIRIS and Greenpeace), it was obvious that Nokia was the best performing firm with respect to the manufacturing, consumer use and recycling phases of electronics life cycle. However, RIM was rated the lowest.

Desk research (Step 2):

The issues that each company still had to address in order to get the highest score were derived from the initial NGO's reports. On the basis of these requirements the further desk and field research took place. Those requirements fall into 9 criteria, which are supply chain policies, supply chain systems, supply chain reporting, product energy efficiency, avoidance of hazardous substances in products, use of recycled plastics in products, product life-cycle, chemical management and advocacy, and voluntary take-backs where no EPR laws.

Before the actual empirical research could take place a check of companies' publicly available documents was made. It resulted in re-scoring of several companies. More specifically, only Sony, Toshiba and Apple proved to have achieved some progress in either one or two criteria. Nevertheless, the overall positions of the companies in rating did not change.

Field research (Step 3):

To get a better picture of how the companies are currently doing on the issues in all three life-cycle stages the field research was conducted. The primary data was gathered through e-mails and phone interviews with the companies' representatives.

Despite the fact that all 11 organizations were contacted, and all of them replied to the questionnaire, and only 10 managed to show the progress made on one or more criteria. Although the leader and the worst performing company did not change, the firms in between managed to increase their scores. For instance Sony, Samsung and Panasonic each moved one position up in the ranking. On the basis of these final results Robeco will choose the most appropriate candidates for the new thematic engagement on the life-cycle of the electronics. Thus, it is most likely that from 5 to 6 least performing companies will be targeted. Those would potentially include RIM, Sharp, Toshiba, Sony, and Samsung.

In addition, this research also investigates the stage of completion per criteria used. It can be said that most of the companies have sufficiently addressed the supply chain policies and product energy efficiency criteria (83.5% and 76.4% respectively). On the other hand, the use of the recycled plastics, product life-cycle, and supply chain reporting are the least addressed issues with the scores of 24.2%, 31.8% and 35.8% respectively. Lastly it can be said that in the case with companies selected for the future engagement the pattern of financial returns does not correlate to the ESG issues investigated. In other words, the worst performing company (RIM) has the best average financial parameters out of the 5 selected organizations.

Conclusion and Recommendations:

The criteria used in this research were transformed into the engagement objectives for Robeco's new theme. However, as Robeco usually tends to have 3 to 6 engagement objectives per thematic engagement, some of the criteria had to be combined. That is why 5 objectives that the companies would have to address were created: Labour issues in the supply chain, Energy efficiency, Hazardous substances and recycled plastics management, Chemical management transparency, and Product life-cycle management.

Therefore, it was recommended for Robeco to open the new engagement on the life-cycle of electronics and start a dialogue with 5 least performing companies, mentioned above, in order to make them address all of the 5 objectives. Moreover, to consider a single engagement successfully closed it was recommended that each company would need to address a threshold of at least 4 objectives.

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1. Introduction

The purpose of this chapter is to describe the problem, the sponsor organization and its need for the research. In addition the central, theoretical and empirical research questions are presented in this section.

1.1 *Problem overview*

The issue of sustainable supply chains of electronics is increasingly becoming important worldwide, because of the dramatically growing amounts of electronic waste generated and disposed in landfills in developed and developing countries. For instance, the United Nations has estimated the global production of e-waste at 50 million tonnes a year. While at the same time less than one per cent of this waste is recycled safely in developing countries. (Pool 24) Managing e-waste in these countries is not an easy task given that most of them have neither a well-established system for separation, storage, transportation, treatment and disposal of waste nor any effective enforcement related to managing e-waste. (Vetrivel and Devi 49-50)

That is why the biggest threat of the electronics is considered to be the hazardous materials/chemicals that are used in production. On the one hand they affect the health of the employees and consumers. On the other hand they can leak out of the waste into the ground and contaminate the surrounding areas affecting the health of local inhabitants.

It is also known that many environmental impacts associated with electronics are aggravated by the increasingly short product life cycles. The extremely rapid process of putting a new product on the market encourages people to replace electronics faster and faster. (Greenpeace, Introduction To The New Guide)

In addition, the issues of labour conditions in factories located in developing countries, have recently been publicly highlighted, are also applicable to the electronic sector.

According to many publications zero waste is becoming the new conventional wisdom when it comes to handling municipal solid wastes. The public and private sector investors currently very interested in zero waste growth industries. (Seldman 46) Thus, the sustainable profitability is also becoming an important issue for the investors. That is why it is crucial for the producers of electronics to adhere to all the legislation covering e-waste, chemical use and energy consumption as well as to manage their supply chains in a sustainable way.

Therefore, this research focuses on three main phases and topics in the supply chain of electronics, which the sponsor organization is interested in (see section below). Those phases are Manufacturing, Consumer use and Recycling. The categories include the labour conditions of the employees at the factories, the health and safety of consumers and employees, and the waste and recycling of the devices.

This research assesses 11 producers of electronics on the scale from 0 to 10 with regards to their performance in each of the phases mentioned above. The final grades, acquired as a result of desk and field researches indicate the current status of the issues each company needs to address. In addition, on the basis of these scores up to 6 organizations were chosen for a further and in depth research.

1.2 *Sponsor Organization*

For the reasons mentioned above Robeco, a Dutch asset manager, decided to look into this contemporary issue of the sustainable supply chain management in electronics industry. The company is a big institutional investor with 176 billion euro under management. It employs around 1567 people in the offices located in Europe, Middle East, Asia, North and South Americas. (Robeco)

Apart from managing the investors' assets Robeco strongly focuses on being environmentally and socially sustainable. It brings this initiative to investors and advises them to be more responsible. Apart from that, the Organization focuses on thematic engagements with companies which in some occasions may lead to their exclusions from the investment list. Those engagements are conducted by the Responsible Investing department and are based on the researches done by different third parties such as EIRIS, Maplecroft etc. The engagements are conducted on various subjects like Remuneration policies, Biodiversity, Forced labour in the supply chain etc.

Because of my very well completed internship at Robeco, which mostly dealt with engagements in the field of Labour Standards and Biodiversity violations, the Company has asked me to research the topic of the sustainable supply chain in the electronics industry for a particular set of organizations. However, only three phases of the life-cycle of the electronics were chosen for the examination. Those include the manufacturing in regard to labour standards, consumer use and recycling stages. Consequently, this research serves as a background document for Robeco's new engagement on the electronics life-cycle theme.

1.3 *Central research question*

How can electronics manufacturers worldwide improve in respect to their supply chains and products in order to minimize the impact their products have on the environment, the health of the employees and of the consumers?

This question was addressed in such a way that the answers fed into the objectives for Robeco's new engagement theme on life-cycle of electronics. In order for this question to be answered the relevant theoretical and empirical research questions were formulated in accordance to the theoretical framework of the research, Figure 1. The section below covers the exact questions and objectives that are addressed in this research.

1.4 *Theoretical framework*

The theoretical framework for this research consists of three fundamentals: field- Strategic Management, an area- Supply Chain Management in Electronics and a topic- the impact of the electronics on the environment, the health of employees and consumers.

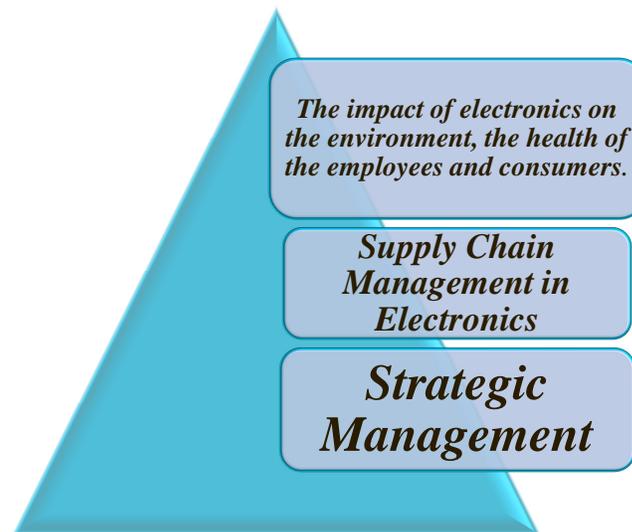


Figure 1: Theoretical framework

The sources of secondary quantitative and qualitative data that were used in this paper are:

- 1) **Journals:** Waste Management, the Journal of Advanced Manufacturing Technologies, International Journal of Academic Research, Chemosphere, Environment International, Journal of Environmental Management etc.
- 2) **Reports:** Guide to Greener Electronics by Greenpeace, reports by MakeIT Fair.
- 3) **Literature:** Social Research Methods by Alan Bryman (3rd edition), Environmental Management Accounting and Supply Chain Management by Roger Burritt, Sustainable Supply Chain Management by Balkan Cetinkaya and The Challenge of Closed-Loop Supply Chains by V. Daniel.
- 4) **Internet:** www.greenpeace.com, Companies 'websites.
- 5) **Database:** EIRIS, Business Source Elite.

Referencing method used in the research is MLA basic referencing tool in Microsoft Word 2007/2010. Consequently, all the sources are shortly cited in the main text and their full explanation are in the bibliography.

1.5 *Theoretical research questions*

The theoretical questions refer to the general situation in each of the phases of the consumer electronics life cycle and the particular status of the several selected companies in each of the underlined stages. Further in the text these questions are not addressed in the same order.

Manufacturing phase:

- 1) What are the latest allegations of violations of Labour Standards in electronics suppliers' factories in general (Latest NGOs reports)?
- 2) Does any of the sponsor company's selected firms source from these suppliers?
- 3) How well do selected companies address the issues regarding Supply chain Policies, Systems and Reporting in reference to Labour Standards? (EIRIS initial assessment)

Consumer use phase:

- 1) What is the average usage and technical lifetime of electronics?
- 2) What do the producers of electronics do in order to extend the products' life cycles?
- 3) Why is energy efficiency an important matter for the consumer electronics to address?

Recycling phase:

- 1) What is the current trend/amount for the electronic waste in the world?
- 2) Where is the electronic waste usually shipped to?
- 3) What are the hazardous substances used in the electronic equipment?
- 4) What kind of legislation is currently in force in the developed countries in relation to the e-waste management?
 - How well do the selected companies do with regards to the environmental matters? (Greenpeace initial assessment)
 - How do the companies perform in relation to environmental and social issues in the three phases of the electronics supply chain? (Combined initial assessment)
 - What is financial position of the companies proposed for the engagement=

1.6 *Empirical research questions*

The empirical research includes the assessment of the current situation of each company in regards to all the issues described above through questionnaires. Moreover, all the questionnaires were customized for every specific firm because they were in different development stages in each of the phases. Therefore, the main idea of the questionnaires was to find how the companies were dealing with the issues of Labour standards policy, systems, reporting, product energy efficiency, chemical management, use of recycled plastics, product life cycle, and voluntary take-backs of the electronics. The exact questionnaires for each interviewee can be found in Appendix 5.

1.7 *Research objectives*

The research questions described above result into several research objectives:

- 1) Examine how the selected companies perform with regards to the environmental and social issues on the basis of the desk research.
- 2) Examine how the companies currently perform in the three phases of electronics life cycle, as a result of the field research.
- 3) Define the engagement objectives for Robeco's new engagement theme on life-cycle of electronics.

2. Methodology

This chapter explains how the desk and field researches were conducted. It also explains what research philosophy and approach were used in this paper and how reliable and valid the findings are.

2.1 *Research philosophy*

The theoretical and empirical research questions described in the previous chapter imply the application of the interpretivism research philosophy. It is based on the view that a strategy is required that respects the differences between people and objects of the natural science and therefore requires the social scientist to grasp the subjective meaning of social action. (Bryman 2008) This philosophy states that only through the subjective interpretation of and intervention in reality, that reality can be fully understood.

Moreover, interpretivism methodology leans towards the collection of qualitative data and uses methods such as unstructured interviews and participant observation that provide this type of data. (Livesey 2006) Therefore, semi-structured interviews were conducted that allowed for interpreting the outcomes subjectively, and for further assessment of how the respondents perform.

2.2 *Research approach*

The research was approached by taking both deductive and inductive perspectives. The above mentioned theories were applied by asking the theoretical questions the approach was deductive. However, as I conveyed my own field research and comparison, the inductive approach was applied. Furthermore, the research included exploratory, descriptive and explanatory aspects.

2.3 *Research strategies*

2.3.1 *Desk research*

The desk research included the analysis of qualitative data to which the theories concerning the environmental management of the supply chain could be applied. This generally helps to develop a comprehensive overview of what the current status of electronic waste in the world, and in particular countries is, if applicable.

Furthermore, the research made use of quantitative data as well. This was done for all the companies that were covered both by the EIRIS database and Greenpeace report Guide to Greener Electronics published in November 2011, described in details in Sections 4.1 and 4.2. The reasons behind the choice of the initial reports were that both of the providers were well known among the CSR specialists as well as among the general public and that they were reliable sources of information. The sample size did not exceed number of companies covered in that report. For the assessment of the companies' achievements with regards to the three phases of electronics life cycle, I used the grading system utilized in the Greenpeace's report (see chapter 4.1). Therefore, the quantitative data collected was mainly represented by the scores assigned to each of the companies, which allowed a better comparison among the firms.

2.3.2 *Field research*

The case study approach was used in this research. It helped to strengthen Robeco's knowledge about the current situation of the companies in question in comparison to the already available information. The questions for the empirical research per selected company can be found in Appendix 5 where the exact letters are shown. In addition, those questions were based on the specific requirements per company, which can be found in Appendix 4. Furthermore, the selective sampling method was used in this research and it was based on self-selected criteria which are discussed in depth in Chapter 4.

In order to acquire relevant information in more efficient way the selected companies were contacted via e-mails on behalf of Robeco as being a shareholder in in each of them. More specifically for each selected company the electronics address of the Investor Relations or Corporate Social Responsibility departments, where the questionnaire were sent, was gathered through the public websites. After that, it was up to the organizations to either answer via e-mail or to arrange a phone interviews in order to discuss the issues. Thus, this research utilized both methods for gathering primary data.

2.4 *Empirical framework*

The specific issues such as Supply chain reporting, use of recycled plastics in products, voluntary take-backs etc. varying from company to company were addressed in the dialogues/e-mails with the interviewees. That is why the research method to collect the primary data included the semi structured interviews initially communicated via e-mails. This approach allowed for gathering information on crucial topics while at the same time allowing the respondents answers not to be limited to some pre-set options.

The majority of the primary data gathered was qualitative. That is why, as a result of the subjective analysis of the raw data, it was possible to identify whether any of the requirements per company had been fulfilled or not. This information was incorporated into the companies' scores and it allowed seeing the progress made by each single firm. It also allowed me to identify which of the criteria have been addressed by the companies best and which have not. This served as a basis for choosing the future engagement objectives for Robeco's theme.

2.5 *Reliability*

Reliability refers to the consistency of a measure of a concept, it consists of three factors:

- 1) The stability of the measure over time. This mainly refers to little variation in the results if the research to be done at different times.
 - 2) The consistency of the indicators that make up the scale or index.
 - 3) The consistency of the inter-observer when categorising the qualitative data.
- (Bryman 2008)

This term is mostly used for the quantitative data, but in some cases it can be applied to the qualitative as well. However, not all of the three factors apply to sample examined by this research, because it is too small. Thus, the consistency of the indicators that make up scale utilized in the research and the consistency of the inter-observer when categorizing the data are relevant to this particular sample. Nevertheless, it is still hard to say that the findings are absolutely reliable in their nature.

2.6 *Validity*

Validity is concerned with the integrity of the conclusions that are generated from a piece of research. There are several types of it:

- 1) Measurement/construct validity refers to the question whether a measure that is devised for a concept really reflects the concept that is supposed to be denoting.
 - 2) Internal validity relates to the question of whether a conclusion that incorporates a causal relationship between two or more variables holds water.
 - 3) External validity is concerned with the question of whether the results of a study can be generalized beyond the specific research context.
 - 4) Ecological validity refers to the question of whether social scientific findings are applicable to people's every day, natural social settings.
- (Bryman 2008)

Due to the size of the sample and time restrictions, it is difficult to relate any types of validity to this research. However, the most applicable type, in my opinion, is the construct validity, because it seeks an agreement between a theoretical concept and a specific measuring device or procedure (the scale assessment used in this particular research).

3. Literature review

This chapter will discuss the market value of global electronics industry, the importance of sustainable supply chains for companies worldwide, and it will describe in details the issues of waste and recycling, labour conditions of employees as well as health and safety of the customers and the employees.

In short, to improve on their taking responsibility for all of the issues mentioned above the companies, including the ones covered by this research, should implement the sustainable supply chain management, which would require them to:

- 1) Control and recycle the e-waste flows of their products, strive for lower amounts of hazardous substances used in the production and adhere to the local, regional and global legislation and initiatives.
- 2) Offer longer warranties as well as make the appropriate spare parts available for the reparations in order to increase the life time of electronic devices.
- 3) Take care of the disposed goods themselves through recycling their products in the appropriately equipped facilities/smelters.
- 4) Make the products more energy-efficient.
- 5) Adopt policy for suppliers allowing for freedom of association and collective bargaining, prohibiting basic labour standards violations such as discrimination, excessive working hours etc.

All of these points are discussed in depth in the sections below.

3.1 *Electronics industry – financials*

This research investigates three phases of supply chain of producers of electronics. In 2011 the global consumer electronics market experienced a moderate growth of 4.7 per cent in comparison to 8.2 per cent in 2010 and – 0.3 per cent in 2009. The industry was expected to generate 213,939.9 million euro in 2011 representing a compound annual growth rate (CAGR) of 4.3 per cent between 2007 and 2011. Furthermore, the forecast for the next 5 years shows that the industry will grow with approximately CAGR of 3.9 per cent. This will result in the overall market value of 258,577.4 million euro in 2016.

It was observed that the geographical segmentation of the industry sales for 2011 Americas represents 41 per cent share, Europe would stand for 28.5 per cent share, while Asia-Pacific and Middle East & Africa would account for 27.7 per cent and 2.8 per cent, respectively.

In addition, it is observed that 72.8 per cent of the sales are through Electricals and electronics retailers, while department stores, hypermarkets discounters, music, video, books retailers and others account for 3.6, 1.9, 1.8 and 19.8 per cent, respectively. (MarketLine 6-11)

As the industry is expected to grow and the competition becomes more and more intense the issue of sustainable supply chains is therefore more important for the companies to address. For instance, when companies create environmentally-friendly value chains, they unlock the monetary benefits that energy efficiency and waste reduction can deliver, as well as they learn how to build mechanisms that link sustainability initiatives to business results. (Nidumolu, Prahalad and Rangaswami) The section below describes the sustainable supply management in details.

3.2 *Sustainable supply chain*

Currently, for many companies around the world the issue of having sustainable supply chains is increasing in importance and the organizations included in this research are no exceptions. There is a number of reasons for that related to companies' external and internal risks, to increases in globalized trade and to reduction in the barriers to transportation and communications across the borders. Taken together within a globalized setting, these manufacturing and information flow processes and product perspectives mean that supply chain management brings pressure to hold companies responsible for their environmental, social and economic performance. As Figure 2 shows sustainability can be split into three main categories Social, Economic and Environmental and nine subcategories. (Burritt, Schaltegger and Bennett 6) This research focuses on three of those subcategories, the labour conditions of the employees, consumers and employees' health and safety, as well as the waste and recycling.

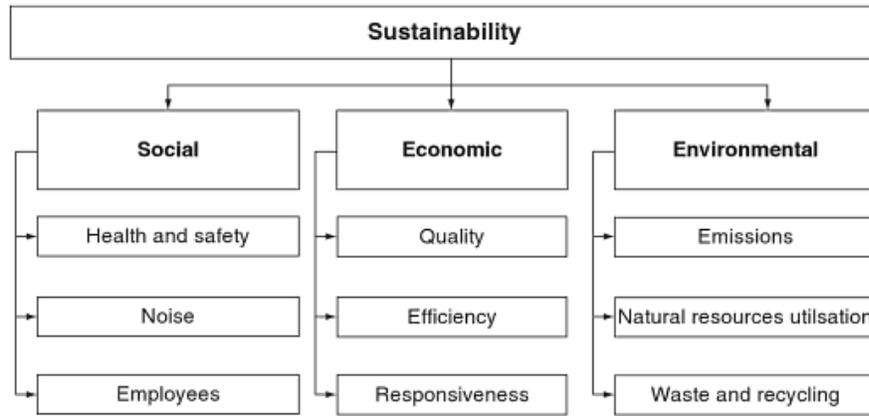


Figure 2: Metric dimensions and sub dimensions (Cetinkaya, Cuthbertson and Ewer 11)

Each of these three categories refers to a particular phase of the life cycle of electronics. For instance the labour conditions of the employees fits into the manufacturing phase, the consumers' and employees' health and safety refers to the consumer use and manufacturing phases and waste and recycling fits into recycling phase.

Furthermore, according to Richard Cuthbertson (2011) sustainable supply chain is not restricted to so-called "green" supply chains, but recognises that in order to be truly sustainable, it must operate within a realistic financial structure, as well as contribute some value to the society. (Cetinkaya, Cuthbertson and Ewer 3)

These chains are believed to be utilizing the closed-loop structures for management of the raw materials, components and final products. The typical product/material flow in these chains can be seen in the Figure 3. The typical closed-loop supply chain includes reverse supply chain activities in addition to traditional forward activities. (Daniel, Guide and Harrison 3)

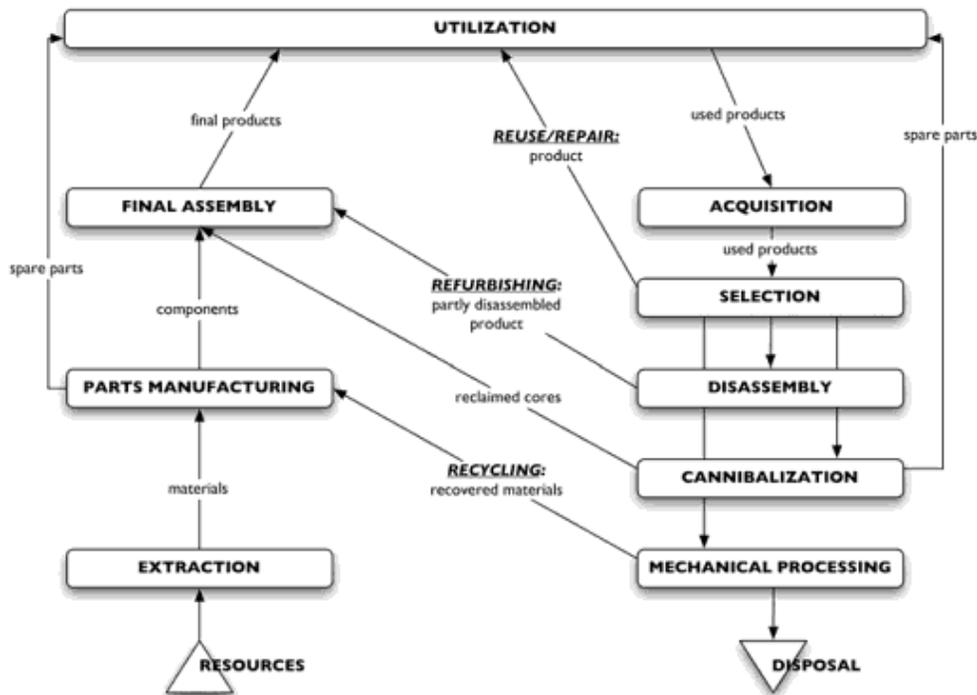


Figure 3: Asset recovery processes: Overview (Lebreton, Baptiste. Strategic Closed-Loop Supply Chain Management 5)

Consequently, one of the ways for the companies to improve on taking responsibility with respect to supply chains in order to minimize impact of their products on the waste and recycling, the health and safety of the employees and consumers and labour conditions of employees is to implement sustainable supply chain management, which would include the closed-loop raw material management structures. The sections below address all of the issue that

constitute the three phases of the life cycle of electronics (see 1.4), in other words all three subcategories of sustainability model.

3.3 *E-waste – Recycling phase*

As it can be seen in the Figure 2, waste and recycling is one of the components of the sustainability concept for the green supply chain. It is very important for the companies worldwide to be able to address this issue by taking care of the waste produced. This research covers the producers of electronic equipment. Therefore the waste generated in this industry is called 'Electronic waste'. This section describes the issue of e-waste from a perspective of the quantity, constitutes and legislation/initiatives regulating it.

E-waste is a generic term embracing various forms of electric equipment that have ceased to be of any value to their owners. There is however no standard definition for it. According to Basel Action Network, e-waste encompasses a broad and growing range of electronic devices ranging from large household devices such as refrigerators, air conditioners, cell phones, personal stereos and consumer electronics to computers which have been discarded by their users. While OECD defines e-waste as any appliances using an electric power supply that has reached its end life. (Widmer, Oswald-Krapf and Sinha-Khetriwal 439)

This waste is one the fastest growing solid waste streams around the world today. United Nation's University estimates that current e-waste originating across the twenty seven members of the European Union amount to approximately 8.3-9.1 million tons per year and the global arising are estimated to be around 40 million tons per year. (UNEP 1)

Figure 13 in Appendix 1 shows the number of electronic products sold in the United States up until 2009. Thus the year 2010 has been forecasted based on the past sales. Therefore, looking at the data it can be seen that starting from 1997 the growth was mainly driven by mobile devices and slightly by keyboards. Moreover, the mobile sales were projected to account for 53 per cent of sales across all product categories in 2010, while it accounted only 12 per cent of sales in 1998.

Furthermore, in comparison to Figure 13, Figure 14 in Appendix 1 shows that even though the number of products is dramatically increasing, their weight is not increasing by the same percentage. Therefore, even with an estimated 33 per cent increase in unit sales compared to 2000, the total weight of products sold in 2010 is estimated to decrease by almost 15 per cent relative to the year 2000. That is because the electronic products have become lighter. (ICF International 8)

Nevertheless, both of those charts indicate that huge amount of electronics is being bought and eventually disposed off every year and that this amount tends to constantly grow. Thus, The Natural Resources Defence council reports that in the USA about 130,000 computers are thrown out every day and over 100 million cell phones are discarded annually. (McConnell 60)

E-waste is usually regarded as a waste problem, which can cause environmental damage if not dealt with in an appropriate manner. However, the enormous resource impact of electrical and electronic equipment (EEE) is widely overlooked. (UNEP 6)

Specifically, electrical and electronic equipment contains a wide range of metals, plastic and other substances. For instance, a single mobile phone can contain over 40 elements from the periodic table including metals like copper, tin, cobalt, indium, antimony as well as precious metals like silver, gold and palladium. Furthermore, looking at one ton of phone handsets (without batteries) this would be 3.5kg of silver, 340g of gold, 140g of palladium as well as 130 kg of copper. (UNEP 7)

At first glance this appears to be very little, but taking into account the leverage of 1.2 billion mobile phones sold globally in 2007, a significant demand for metals can be seen. Therefore, the combined 2007 unit sales of this phones and personal computers already add up to 3 per cent of the world mine supply of gold and silver, to 13 per cent of palladium and to 15 per cent of cobalt. (UNEP 7) Furthermore, electronics make up for almost 80 per cent of the world's demand of indium, over 80 per cent of ruthenium and 50 per cent of antimony. (UNEP 8)

A study on e-waste recycling found that many base metals can be recovered to over 90 per cent, while precious metals can be recovered to an extent of 97-98 per cent. (Khetriwal, Kraeuchi en Widmer)

There are several identifiable objectives for e-waste recycling, such as:

- 1) Taking care of hazardous substances contained in e-waste.
- 2) Recover valuable materials
- 3) Create economically and environmentally sustainable businesses (optimize eco-efficiency)
- 4) Consider the social implication and the local context of operations (for instance, employment opportunities, available skills and education etc.)

(UNEP 16)

In nature, there is no waste, because one creature's wastes become another's nutrients. Therefore, to maintain environmental sustainability, electronic products need to be designed and manufactured in a well-planned way so waste of natural resources can be avoided and most material could be recovered. (Rahman and Akhter 104)

Electronic wastes can cause widespread environmental damage as it contains toxic materials and some of them also are used in the manufacture of electronic goods. Those hazardous materials such as lead, mercury and hexavalent chromium in one form or the other are present in such wastes prim tubes (CRTs), printed board assemblies, capacitors, mercury switches and relays, batteries, liquid crystal displays (LCDs), Cartridges from photocopying machines, selenium drums (photocopier) and electrolytes. (Vetrivel and Devi 47) The section below describes some of those materials and chemicals and their effect on the health of humans.

3.3.1 Hazardous substances

Every day, millions of tons of refrigerators, televisions, mobile phones and computers are discarded globally. The Environmental Protection Agency estimates that only 15-20% of e-waste is recycled, the rest of these electronics go directly into landfills and incinerators. When this happens, dangerous chemicals leak out of the products into the air and/or soil. If these enter sources of drinking water like rivers or wells, they can cause serious health problems in humans, animals and plants alike. (Vetrivel and Devi 48) The table below represents the most common chemicals and substances used in the production of the electronic equipment and their effects on the health of both the consumers and the employees.

Table 1: Effects of e-waste constituent on health

<i>Constituent</i>	<i>Source of e-waste</i>	<i>Health effects</i>
Lead (PB)	Solder in printed circuit boards, glass panels and gaskets in computer monitors.	Lead causes damage to central and peripheral nervous systems, blood system, kidneys. It affects reproduction and brain development of children.
Cadmium (CD)	Chip resistors, semiconductors, contacts and switches	Toxic irreversible effects on human health. Accumulates in kidney and liver. It causes kidney and bone toxicity, hypertension (high blood pressure), heart disease as well as trachea-bronchitis and pulmonary oedema. It is teratogenic
Mercury (Hg)	Relays and switches printed circuit boards and lighting device that illuminate flat screen displays.	Causes chronic damage to the nervous system, the brain, and respiratory and skin disorders due to bioaccumulation in fishes.
Hexavalent chromium (CR) VI	Corrosion protection of untreated and galvanized steel plates, decorator of hardener for steel housing	Causes asthmatic bronchitis, DNA damage, allergic skin reactions, damage to kidneys and liver. In addition, it is associated with lung cancer.
Plastics including Polyvinyl Chloride (PVC)	Cabling and computer housing	Many additives can be released from PVC during the lifetime of the product and following disposal. While burning it produces dioxin. It causes reproductive and developmental problems, immune system damage and intervenes with regulatory hormones.
Brominated flame retardants (BRF). It includes Polybrominated diphenyl ethers (PBDEs), hexabromocyclododecane	Plastic housing of electronic equipment and circuit boards.	Chronic exposure to one of the types of BFR (PBDE) intervene with brain and skeletal development in foetuses. It disrupts endocrine system functions and certain hormone systems.

(HBCD) and tetrabromobisphenol-A (TBBPA)		
Barium (Ba)	Front panel of CRTs	Short term exposures causes: muscle weakness, damage to heart, liver and spleen.
Organotins	Used in PVC containing materials	It is neurotoxic to mammalian brain cells. Therefore, exposure to organotins can result in neurotoxicity or immunotoxicity. The poisoning with this chemical results in memory deficits, seizures, hearing loss, disorientation and death.
Phthalates (phthalate esters)	Used as plasticising (softening) additives in flexible plastics, especially PVC	Phthalates have an impact on many aspects of development and liver function, including hormone metabolism and immune function. Furthermore, it has toxic effects on the liver and kidneys.
Beryllium (Be)	Motherboard	Carcinogenic (lung cancer). It causes shortness of breath, coughing, chest pain, rapid heart rate and death in extreme cases. In addition, inhalation of fumes and dust causes chronic beryllium disease or beryllicosis and skin diseases such as warts.

(Osuagwu and Ikerionwu 144) (Greenpeace, Toxic Tech: The dangerous chemicals in electronic products)

In order to restrict the use of several hazardous chemicals, in February 2002 the European Union adopted a Restriction of Hazardous Substances Directive (RoHS), which took effect on 1 July 2006. Now it is required to be enforced and become law in each member state. This directive restricts the use of six hazardous materials found in electrical and electronic products. All applicable products in the EU market must pass RoHS compliance. (RoHSGuide, Welcome to RoHS Guide)

More specifically, the maximum levels of the materials restricted by the directive are:

- 1) Lead (Pb): < 1000 ppm
- 2) Mercury (Hg): < 100 ppm
- 3) Cadmium (Cd): < 100 ppm
- 4) Hexavalent Chromium (Cr VI) < 1000 ppm
- 5) Polybrominated Biphenyls (PBB) (Included in BFRs): 1000 ppm
- 6) Polybrominated Diphenyl Ethers (PBDE): < 1000 ppm

(RoHSGuide, RoHS Restricted Substances)

Therefore, the electronic companies should make sure that their products adhere to the RoHS directive. Moreover, it is important for the firms to reduce the use of other chemicals, not covered by the law.

3.3.2 Initiatives on Waste of Electrical and Electronic Equipment

In order to help the electronics companies to make their supply chains and products greener several laws, initiatives and programs were launched by the governments or different associations around the world. Therefore, currently, the sustainable practices are legally imposed by governments with a key role for original equipment manufacturers (OEMs). These regulations mainly focus on waste reduction and pollution prevention reducing waste export and increasing recycling of materials. However, the new legislation, such as the EU WEEE Directive introduced in 2007, forces traders and waste treatment businesses to provide better information on their practices. (Zoeteman, Krikke and Venselaar) Several most important directives/initiatives on the management of e-waste are listed in a table below.

Table 2: Initiatives taking e-waste issues from various perspectives

Initiatives	Description
Basel Convention and Basel Plan	A global agreement regulating movements of hazardous wastes, including WEEE, between countries, in force since 1992. However, an Amendment to the Convention, commonly known as the Basel Ban, which calls for prohibiting the export of hazardous waste from OECD to non-OECD countries, is still to come into force.
StEP Initiative (solving the e-	A UN-led initiative started in 2004 at the 'Electronic Goes Green' Conference in

waste problem	Berlin to build an international platform to exchange and develop knowledge on WEEE systems among countries to enhance and coordinate various efforts around the world on the reverse supply chain.
Basel Action Network (BAN) Silicon Valley Toxics Coalition (SVTC) and computer take back campaign	A network of non-governmental organizations (NGOs) in the US working together on WEEE issues, including international advocacy for the Basel Ban, domestic collection and recycling events as well as investigative research to promote national solutions for hazardous waste management.
EPR (Extended Producer Responsibility) = WEEE Directive	A policy approach in which producers accept significant responsibility, financial and/or physical, for the treatment or disposal of products". It has two distinct features: the shifting of responsibility upstream to producer and provision of incentives for producers to include environmental considerations in the design of their products, resulting in a life-cycle approach. (Zoeteman, Krikke and Venselaar)
WEEE Forum	Founded in 2002, the WEEE Forum is a group of representatives of voluntary collective WEEE take-back systems in Europe, taking care of individual producers' responsibility in Europe.
National Electronics Product Stewardship Initiative (NEPSI)	A multi-stakeholder dialogue to develop the framework of a national WEEE management system in the USA. The NEPSI dialogue includes representatives from electronics manufacturers, retailers, state and local governments, recyclers, environmental groups, and others.
Electronics Product Stewardship Canada (EPS Canada)	EPS Canada was created to work with both industry and government to develop a flexible, workable Canadian solution. An industry-led organization, the founding members are 16 leading electronics manufacturers.
EPR (European Recycling Platform)	Set up at the end of 2002 by Hewlett Packard, Sony, Braun and Electrolux to enable the producers to comply with the WEEE directive. It aims to evaluate, plan and operate a pan-European platform for recycling and waste management services.
Seco/Empa e-waste programme	A project set up in 2003 by SECO (Swiss State Secretariat for Economic Affairs) and implemented by Empa (Swiss Federal Laboratories for Materials Testing and Research) in cooperation with a number of local partners and authorities, to assess and improve WEEE recycling systems in different parts of the world by analysing the systems and by exchanging knowledge on recycling techniques and frameworks.
European Union's Restriction on Hazardous Substances (RoHS)	The directive restricts the use of six hazardous materials found in electrical and electronic products. All applicable products in the EU market after July 1, 2006 must pass RoHS compliance. (See 2.2.1) RoHS impacts the entire electronics industry as well as many electrical products. (RoHSGuide, Welcome to RoHS Guide)

(Widmer, Oswald-Krapf and Sinha-Khetriwal 450)

To sum up, in order to become more sustainable the electronics producers also the ones discussed in this research should control and recycle the e-waste flows of their products, should strive for lower amounts of hazardous substances used in the production as well as should adhere to the local/regional, national and global legislation and initiatives.

3.4 *Lifetime of electronics – Consumer use phase*

Another way for the producers of electronics to become more responsible in a sense of the environmental effect of their products is to extend useful lives of the devices through either expanding warranties, or making spare parts available for the products reparations or giving the devices the second lives. Thus, for instance, cell phones are currently one of the few electronic goods that have a relatively well established reuse market in some countries. As a matter of fact more hand sets are reused than recycled in America and the UK. For instance in 2006 65 per cent of all collected cell phones in US and 50 per cent in UK were reused rather than recycled. (Geyer and Blass)

The number of cell phone owners has grown dramatically in the last 15 years: 16 million in 1991, 60 million in 1995, 420 million 1999, 1.33 billion in 2003 and 2.5 billion in 2007. Furthermore, the amount of end-of-use handsets increased even faster than this since phone lifetimes have been decreasing, from 3 years in 1991 to 18 months by 2002. It is estimated that the replacement times of cell phones are now between one and two years, while manufacturers believe that technical lifetime is in the order of ten years. (Geyer and Blass 3) As for the average lifespan of a common PC, it dramatically decreased from 4-6 years in 1997 to approximately 2 years in 2005. (Widmer, Oswald-Krapf and Sinha-Khetriwal 437)

Research done for the U.S. Environmental Protection Agency Office of Resource Conservation and Recovery indicates that in America 20 per cent of mobile phones are at their end-of-life phase at the end of two years, while other 70 per cent are there at the end of 5 years. The report assumes that the rest of the 10 per cent of devices is being kept in households until the end of 10 year period. (Table 9, Appendix 2). Therefore, it can be seen from the table that like mobiles 20 per cent of portable computers reach their end-of-life by the end of 4 years, while Desktop computers reach it by the end of 7 years. (ICF International 14-15)

Furthermore, Table 9 shows the average life of different consumer electronics in the USA. These figures include the years the products spend waiting for the end of life management, in other words, the time that consumers keep the goods before disposing them. Thus, the average life time of a mobile devise is calculated to be 4.9 years, while as mentioned above the real figure is approximately 2 years. However, the life of different TVs (9 to 15.25 years) seems to be more realistic than the one for mobiles. On the other hand the average life of PCs, monitors and other equipment is also not quite realistic (from 5 to 8.75 years), as the consumers tend to discard these products every two to four years nowadays. (Rahman and Akhter)

According to Ronald Geyer and Vered Doctori Blass the reasons for frequent replacements of mobile phones are heavy discounts offered by the airtime providers as well as the constant product innovation by handset manufacturers. (Geyer and Blass 3)

In order to increase the life time of electronic equipment the producers also the organizations discussed in this research should offer longer warranties as well as make the appropriate spare parts available for the reparations. This would increase the probability of reuse by initial owners and/or by the second-hand buyers.

3.5 *Countries most affected by the e-waste – Recycling phase*

The collection and recycling of electronics is most often used to extend the useful lives of electronics. It makes sure those materials can be reused and that potentially hazardous materials do not leak into the environment. “Within the EU as a whole, it is estimated that 25% of the medium-sized appliances and 40% of the larger appliances are collected and treated.” However, the rest, the remaining 60% to 75%, represents what Greenpeace International calls “the hidden flow”, the products that are being exported for reuse, recycling or disposal in, for example, Asia and Africa. (Nordbrand 6-7) However, some sources say that only 50% of the electronics arriving to China for reuse actually work. The same figures have been reported in Nigeria. (Nordbrand 30)

Moreover, Environmental Agency for England and Wales states that even the electronics were collected by the producers they still have a high chance of ending up in the landfills of the developing countries. More specifically, the agency states that waste is gathered by producers as stipulated by the WEEE Directive, but then sold on to brokers in Europe who turn to Asia and Africa where the products are either sold as second-hand products to distributors or to informal recyclers who extract valuable metals from the products in a hazardous manner. (Nordbrand 7)

One of the drivers for illegal export of e-waste from developed countries to developing ones is the difference in recycling costs and thus profit margins on recovered materials. Another reason is the higher market value of component parts in developing world. (van Huijstee and de Haan 8) However, waste export is also the result not just of low labour cost and dumping, but one of the needs in industrially developing countries such as China and India for materials. In other words they recognize the value of the streams that are seen as just waste by the developed world. (Zoeteman, Krikke and Venselaar)

In addition, due to the lower environmental standards and working condition in China, India, Ghana and the rest of West Africa, e-waste is being sent to these countries without a wink on the negative environmental impact on the health of the local population. (Osuaquwu and Ikerionwu)

According to Batiaan C.J. Zoeteman, Harold R. Krikke, and Jan Venselaar in 2005 most waste of electrical and electronic equipment export (50% or 1.9 million tons) was generated in the European Union, with the ports of Rotterdam, Hamburg, and Antwerp playing an important part in the export. Furthermore, most of the total export flow ended up in China (53%) and India (22%). (419-420). This can be seen in the Table 3 below.

(Dayaneni and Doucette)

Despite all of the above, the electronic waste in these countries does not come solely from the developed world. Thus, a great per cent of it is being generated from within the local economies. According to Eric Williams, a professor in the School of Sustainable Engineering at Arizona State University in Tempe, by 2030 people in developing countries could discard between 400 and 700 million obsolete personal computers per year compared to 200 and 300 million in developed countries. (Thilmany 15) Several examples in support of this statement can be found below.

Chile:

As countries in South America start their IT development. It is very likely that the e-waste will not be coming only from the developed countries. For instance ICT sector in Chile has been rapidly developing in the last years and therefore the quantities of generated e-waste are expected to rise See Figure 5, even though there is a high percentage of computer equipment that is being re-used in Chile. (Steubing, Boni and Schluep 473)

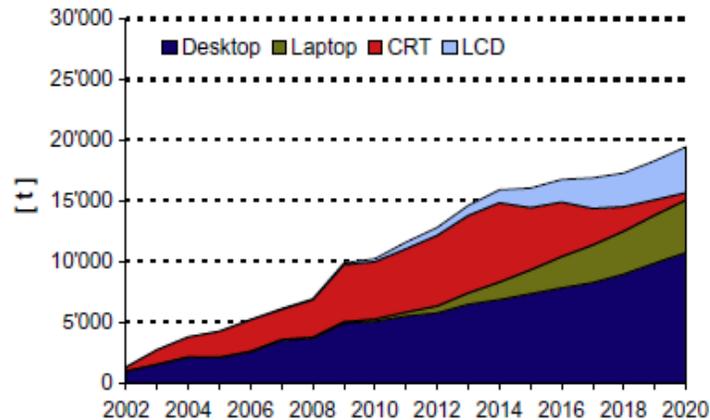


Figure 5: Annual e-waste generation from computer equipment in the baseline scenario (Chile)
(Steubing, Boni and Schluep 479)

From the graph above it can be seen that laptops and LCD-monitors become rapidly increasing fractions of the electronic waste flows from around 2010. However, CRT-monitors in this stream will still increase and reach peak in 2014, from where they almost disappear by 2020. Furthermore, the average annual growth of the e-waste from computer equipment in the upcoming decade is 6 per cent in terms of weight. (Steubing, Boni and Schluep 478)

India:

According to Sushant B. Wath, P.S. Dutt and T.Chakrabarti the problems associated with E-waste in India started surfacing after the first of economic liberalization, after 1990. Thus, due to the cheaper prices, as a result of the intense competition, and increase in the purchasing capacity of the individuals, there was a big boom for the electronic goods industry in India, especially for the home appliance. Furthermore, according to TRAI, 113.26 million new cellular customers were added in 2008 in the country, with an average of 9.5 million customers added every month. Therefore, the preliminary estimates suggest that total Waste Electrical and Electronic Equipment (WEEE) generation in India is expected to exceed 800,000 tonnes by 2012. (Wath, Dutt and Chakrabarti)

China:

In 2005 the domestic e-waste generation in China was equal to the amount generated in Japan. Currently the dramatic increase in the amount of waste brought China on the second place in the world after the USA in landfilling and incineration of e-waste residues. (Zoeteman, Krikke and Venselaar)

On a year-by-year basis average annual scrapping volume of these products grows by 19.9 per cent. More specifically, the volume of personal computers in China increases at the largest rate of 76.3 per cent, while air-conditioners grow at 48.1 per cent, TV sets at 16.7 per cent, washing machines at 10.5 per cent and refrigerators at 7.2 per cent. As there are large groups of people with low income in the country, electronic waste is valuable in China in sense that it is re-circulated into the economy and re-used, instead of recycled and broken down into components or raw materials. However, the study of Albert Veenstra, Cathy Wang, Wenji Fan and Yihong Ru states that at the second-hand markets, only 1 per cent of products is directly sold to consumers, and of the remainder, 54.7 per cent is taken apart, while 44.3 per cent is sold after refurbishment. (Veenstra, Wang and Fan) Therefore, the amount of e-waste generated within the county is still large.

Conclusion:

It can be said that tracing the e-waste disposed in the developing countries back to the producers is quite difficult. Especially when they resell the devices to the brokers who will eventually export them as products for re-use. To become more sustainable with respect to the waste and recycling, the companies including the ones covered by this research must take care of the disposed goods themselves through recycling their products in the appropriately equipped facilities/smelters.

3.6 Energy consumption – Consumer use phase

“In recent years, there has been a dramatic rise in the number of consumer electronics in households. These new technologies and the services that support them enable new highly energy intensive behaviours.” For instance in 2005 OFCOM estimated that amount of television ownership in UK households is going to grow at approximately 6 per cent per year. (Crosbie 2191)

In addition, International Energy Agency stated that the growth of electricity consumption by small electrical and electronic devices has been the most rapid of all appliance categories in both OECD and non-OECD countries. As the global ownership level of information and communication technologies (ICT) and consumer electronics (CE) had been rising, these products accounted for approximately 15 per cent of global residential electricity consumption in 2006. Furthermore, the adoption of larger TVs and digital broadcasting, final residential electricity consumption by ICT and CE equipment grew by 7 per cent per annum between 1990 and 2008. Although the growth is expected to slow down to approximately 4.5 per cent per year in the period up to 2030, the electricity consumption is still expected to rise over 1200 TWh by 2020 and 1700 TWh by 2030. (See Appendix 3 Figure 16) (International Energy Agency 19-21) Further information on the kilowatt consumption per product can be seen in Appendix 3 Figure 15.

In addition, IEA predicts that unless policy measures are introduced to increase energy efficiency of ICT and CE equipment in households, the energy use by those devices will double by 2022 and increase threefold by 2030. This can be seen in Figure 6.

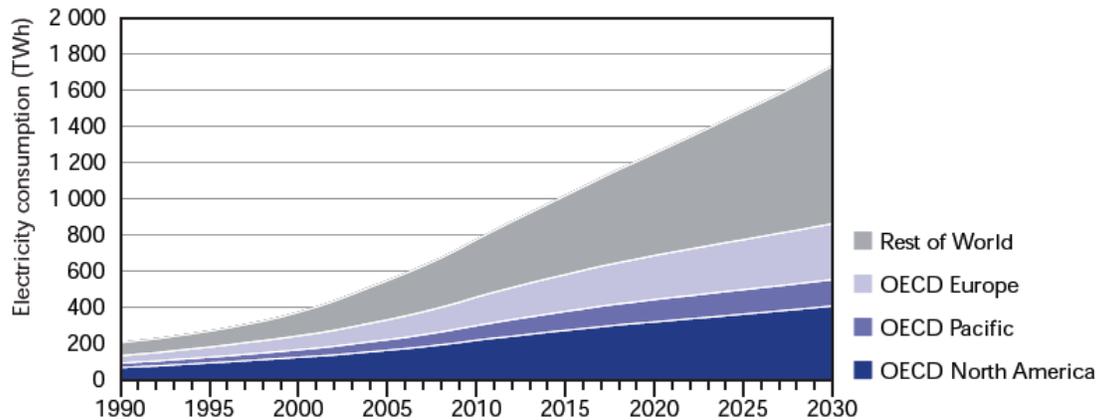


Figure 6: Estimated electricity consumption by ICT and CE equipment in the residential sector, by region, 1990-2030 (International Energy Agency 21)

Although, energy consumption of the electronic equipment has a major impact on climate change because of the burning of fossil fuel generates carbon dioxide (Rahman and Akhter), this is an important topic with regard to the consumer phase of the supply chain of electronics as well. In other words, the less energy efficient the products are the more consumers will have to spend on the electricity bills. Furthermore, it is also highly possible that customers will be willing to switch to less energy intense products eventually, which would cause a possible growth in amount of e-waste.

However, recently, there have been some efforts to improve the efficiency of all appliances including consumer electronics at the European policy level. For instance, as part of its Integrated Product Policy (IPP) the European Parliament adopted a directive on the eco-design of energy-using products, in April 2005, which aims at improving the environmental performance of products throughout their life cycle by the systematic integration of environmental aspects at the earliest stage of their design. (Crosbie 2192)

Furthermore, in the USA an ENERGY STAR initiative has been introduced by US Environmental Protection Agency (EPA) in 1992. It is a voluntary labelling program designed to identify and promote energy-efficient products to reduce greenhouse gas emissions. (U.S. Environmental Protection Agency) Throughout the last 20 years, ENERGY STAR has been the market transformation program catalysing manufacturers to introduce eco-efficient appliances into the market place that significantly benefit the consumer and the environment. (U.S. Environmental Protection Agency 23)

According to EPA, even as energy efficiency has improved substantially, home energy demand continues to climb nationally (USA). This increase in consumption can be tied in part to the growing number of energy-using products that consumers enjoy. (43) The EPA also estimated that providing computers with a sleep mode reduces their energy use by 60-70 per cent. (Rahman and Akhter) In addition, The Climate Group advises users to employ thin-client computers which draw about a fifth of the power of a desktop PC. (The Climate Group 2008)

Therefore, taking into consideration everything said above, it can be concluded that manufacturers of consumer electronics do have to make their products more energy-efficient, as this topic is being discussed publicly more often and more and more consumers turn their attitudes toward the products with low energy consumption.

3.7 *Labour Standards violations in the Electronics supply chain – Manufacturing phase*

In order to have a more sustainable supply chain companies must have the appropriate policy on Labour Standards in place to tackle such issues as health and safety of their own and suppliers' employees, as well as their wages and working hours.

Päivi Pöyhönen and Debby Chan Sze Wan state that currently many consumers believe that it is the brand company that manufactures the electronic devices they purchase. This is, however, not usually true. Outsourcing manufacturing of music player, game console, mobile, computer etc. is very common. (7)

Furthermore, the global supply chain in electronics industry is very complex. "A manufacturer usually has multiple clients and brands always have several suppliers. When rampant labour rights violations are found in a factory, the brands may water down their responsibility". (SACOM)

In twenty first century many producers of electronics have established hardware manufacturing facilities in new (cheaper) locations including Central and Eastern Europe, mainland China, Taiwan, Thailand etc. Furthermore, many centres of engineering design and software were moved to India, Vietnam and elsewhere. (Smith, Sonnenfeld and Pellow 13) Thus, most of the labour violations happen in those remote locations.

When referring to Labour Standards this research speaks about the UN Global Compact Labour principles. More specifically those include:

- 1) The freedom of association and the effective recognition of the right to collective bargaining;
- 2) The elimination of all forms of forced and compulsory labour;
- 3) The effective abolition of child labour;
- 4) Non-discrimination in respect of employment and occupation.

These four labour principles of the Global Compact are directly derived from the International Labour Organization's Declaration on Fundamental Principles and Rights at Work. This Declaration was adopted in 1998 by the International Labour Conference, a yearly tripartite meeting that brings together governments, employers and workers from 177 countries. (United Nations)

The aim of the ILO is to increase the support of the business community for these principles through the Global Compact. The labour principles deal with fundamental issues in the workplace and the challenge for business is to take these universally accepted values and apply them at the company level. (United Nations)

Currently the biggest and most common labour violation that can be seen in the supply chain of electronics is the lack of policy on freedom of association and collective bargaining of the factory workers.

For instance the report released in September 2011 by Finnwatch, Cividep and SOMO entitled Phony Equality, describes the labour conditions in four factories of mobile phones and accessories manufacturers in India. Those four plants belong to Nokia, Salcomp, Flextronics and Foxconn. (All separately)

Therefore, the biggest issues on those facilities were the lack of policy on freedom of association and wage discrimination. More specifically, on Nokia's factory contract workers and trainees are paid significantly less than permanent workers and are exempted from wage rises. (Ferus-Comelo and Pöyhönen) Furthermore, although workers in Nokia's factory had been able to join unions, the rest of the companies still did not allow it.

In addition, the report entitled Game Console and Music Player Production in China by Finnwatch, SACOM and SOMO examines the labour practices in the Foxconn, Flextronics and Multitek facilities in China. It basically reports the same findings: the lack of awareness of trade unions and code of conduct.

The situation in the factories of those manufacturers is quite relevant to this research because they supply some of the companies examined in it. For instance, Nokia and Samsung are Salcomp's customers (Ferus-Comelo and Pöyhönen, page 16); Dell, HP and RIM are customers of Flextronics (Flextronics, 2011 Annual Report, Page 86); Philips and Sony are customers of Multitek (Pöyhönen and Chan Sze Wan, page 12). Furthermore, Foxconn supplies most of the companies that are covered in this paper. Those include HP, Dell, Nokia, Panasonic, Samsung, Sony, Sharp, Apple and Toshiba. (David Pogue)

More than that, the absence of the some labour rights can be seen in the digital camera factories in Vietnam. More specifically, the report published by SOMO in 2011 examined seven digital camera manufacturers, where several belonged to Panasonic and Samsung. Generally speaking, the main issues were the lack of right of freedom of association and collective bargaining and hidden discrimination against women when it comes to the length of the contracts and maternity leave. (Kakuli and Schipper)

Therefore, on the basis of the reports mentioned above it can be seen that currently the most frequently seen labour rights issue in the supply chain of electronics is the lack of a policy on freedom of association and collective bargaining. However, the other violations like discrimination and excessive working hours should not be underestimated.

4. Desk Research

This section describes the main publications used as a basis for the initial assessment of the companies in question on the main issues covered by this research such as 1. Labour conditions of the employees, 2. Health and safety of the consumers and employees, as well as 3. The waste and recycling. It also shows the reasoning used for the firms' selection process, for the grading system and for firms' initial scores, based on the already available publications.

Furthermore, prior to the empirical research the check of the companies' public documents on three main categories mentioned above had to be done. As a result of that this section also shows the changes in companies' scores.

4.1 *EIRIS scoring framework*

EIRIS is a leading global provider of research into corporate environmental, social and governance performance. It is an independent, not-for-profit organization, who works to help their clients to develop the market in ways that benefit investors, asset managers and the wider world. Its mission is to empower responsible investors with independent assessments of companies and advice on integrating them with investment decisions. EIRIS' sector-based research teams provide in-depth coverage of around 3,000 companies globally, covering over 100 different environment, social and governance issues. It has over 100 institutional clients including pension and retail fund managers, banks, private client brokers, charities and religious institutions across Europe, the USA and Asia and Robeco is one of them. (EIRIS, About us)

EIRIS offers reports on over 80 different ESG areas, including board practice, bribery and corruption, managing environmental and climate change impacts, human rights and supply chain labour standards. It uses a wide range of sources to compose the report such as company's public documents, NGO reports, media coverage, trade and other journals and data made public by regulators. Furthermore, EIRIS monitors the organizations periodically on all of these matters and updates the reports on the progress made and publications released. (EIRIS, Data you can trust)

In this research the criteria and grades only for issues relating to labour standards in the supply chain are based on the EIRIS publications. More specifically only Supply chain policy, supply chain systems and supply chain reporting criteria are being used in this paper. EIRIS was chosen because of the reasons mentioned above and Robeco's membership.

4.2 *Greenpeace scoring framework*

Greenpeace is a non-governmental organization, which acts to change attitudes and behaviour, to protect and conserve the environment and promote peace by catalysing an energy revolution, defending the oceans, protecting the world's ancient forests, working for disarmament and peace, creating a toxic free future and campaigning for sustainable agriculture. (Greenpeace, About Greenpeace)

Since 2006 Greenpeace has been annually releasing its Guide to the Greener Electronics, which has become internet's most trusted green electronics ranking. That is why it was chosen to become a basis for this research. The report covers 15 companies including Hewlett Packard, Dell, Nokia, Apple, Philips, Sony Ericsson, Samsung, Lenovo, Panasonic, Sony, Sharp, Acer, LG Electronics, Toshiba and Research In Motion (RIM). In the report NGO points out that all stages of product life – from extracting minerals and using energy to produce GHG emissions during manufacturing, through the end of their life cycling or disposal of a product have an impact on the environment. In order to identify which companies are doing the best and worst, Greenpeace assigns grades to each of them on the scale from 0 to 10 (0 to 100%). With regards to three main assessment categories covered by this research, which are Greener Products and Sustainable Operations not all of Greenpeace's categories were used.

However, some of the categories and their criteria are directly related to three phases of the electronics life-cycle discussed in this research. More specifically, the Greener products and Sustainable operations are both related to all of the issues covered in health and safety of employees and consumers (manufacturing and consumer use phases), and the waste and recycling (recycling phase).

Greener Products

It is known that many environmental impacts associated with electronics are aggravated by the increasingly short product life cycles. The extremely rapid process of putting a new product on the market encourages people to replace electronics faster and faster. (Greenpeace, Introduction To The New Guide) That is why the companies should address four important issues under this category, which are:

- 1) Product energy efficiency,
- 2) Avoidance of hazardous substances,
- 3) Use of recycled plastics
- 4) Product life-cycle.

(Greenpeace, Guide to Greener Electronics: Ranking criteria explained)

Sustainable operations

As mentioned above all the stages of the supply chain of the electronics should be sustainable that is why this category covers such issues as:

- 1) Measure and reduction of energy consumption in the supply chain,
- 2) Chemicals management and advocacy,
- 3) Policy and practice on sustainable sourcing of fibres for paper,
- 4) Policy and practice on avoidance of conflict metals
- 5) Availability of effective voluntary take-back where no-EPR laws.

(Greenpeace, Guide to Greener Electronics: Ranking criteria explained)

For each of the criteria there is a certain amount of points that a company can get (Table 4). The final grade per company is calculated as following: all the points addressed by a firm are summed up first, then divided by the total possible amount of point, and then multiplied by 10 in order to get a grade ranging from 0 to 10. However, after a thorough study of all of the criteria, only 6 out of 13 were chosen for the further assessment, because of their direct relevance to the issue of thee-waste, that this research focuses on. In other words that is because this research does not focus on all matters that Greenpeace covers. Particularly the energy category and its criteria do not relate to the phases of electronics life cycle discussed in this research.

4.3 Companies selection

It is previously mentioned that Greenpeace covers 15 companies in its report. However, the EIRIS database has available profiles only for 11 companies out of these 15. Therefore, the sample size of this research includes only those 11 companies, because otherwise the grading system used is not comparable and reliable. Those firms include Hewlett Packard, Dell, Nokia, Apple, Philips, Samsung, Panasonic, Sony, Sharp, Toshiba and RIM.

In order to make the overall assessment of the firms based on both the EIRIS and the Greenpeace reports valid, the EIRIS grading system was transformed into one with comparable scale levels. Thus, a maximum amount of the issues that have to be addressed were identified for all three EIRIS categories mentioned above.

In addition, all of the criteria were assumed to be equal in their weight, because all of the issues have the same importance for the companies. The Table 4 gives an overview of the criteria, of the life-cycle phases they apply to and of the maximum points a company can score for each of them. Therefore, in order to calculate the combined grade per firm, the same system was used as in Greenpeace report. In other words, all of the points/issues addressed by a company in all of the categories were summed up and divided by the total maximum points possible (64). Based on the overall requirements discussed in Table 5, unaddressed issues per individual company were identified (Appendix 4). The most crucial of them were addressed in dialogues with firms.

Table 4: Overview of the criteria used

<i>Phases – Categories</i>	<i>Criteria</i>	<i>Maximum points</i>
	EIRIS	
Manufacturing phase - Labour conditions of the employees	Supply chain policy	11
Manufacturing phase - Labour conditions of the employees	Supply chain systems	9
Manufacturing phase - Labour conditions of the employees	Supply chain reporting	15

employees		
	Greenpeace	
Consumer use and Recycling phases – Waste and recycling	Product Energy efficiency	5
Consumer use and Recycling phases – Health and safety of consumers and employees, waste and Recycling	Avoidance of Hazardous substances in products	5
Recycling phase – Waste and recycling	Use of recycled plastics in products	3
Recycling phase – Waste and recycling	Product life-cycle	3
Consumer use and Recycling phases – Health and safety of consumers and employees, Waste and Recycling	Chemical management and advocacy	5
Recycling phase – Waste and recycling	Voluntary tack-backs where no EPR laws	8
	Total	64

Table 5: Overall requirements per individual criteria

<i>Criteria</i>	<i>Requirements</i>
<i>Supply chain policy</i>	The policy should cover such issues as 1) child labour, 2) forced labour, 3) discrimination, 4) freedom of association and collective bargaining, 5) health and safety, 6) wages, 7) working hours, 8) disciplinary practices, It also should be 9) publicly available, 10) integrated into the company's procurement process. 11) In addition the company should have membership of a relevant initiative for dealing with labour standards
<i>Supply chain systems</i>	A single company should: 1) communicate of the policy to suppliers globally, 2) visit/audit suppliers to check compliance with the policy, 3) have procedures for addressing non-compliances found, 4) train of relevant employees (either its own employees or those of its suppliers), 5) have senior responsibility for supply chain labour standards, 6) communicate of the policy to supplier employees, 7) demonstrate that its systems are targeted to areas of highest risk or demonstrate comprehensive coverage of its management systems, 8) demonstrate clear links between its supply chain labour standards management systems and its procurement management systems, and 9) engage into extensive auditing and monitoring of suppliers including through the use of external monitors
<i>Supply chain reporting</i>	A company has to : 1) have a publicly available policy, 2) communicate the policy, 3) publish details of visiting/auditing suppliers, 4) publish details of procedures to remedy non-compliance, 5) publish details of training, 6) disclose the number of supplier facilities monitored/audited, 7) disclose the proportion of supply chain monitored/audited, 8) disclose the risk assessment and results, 9) publish details of stakeholder dialogue/engagement, 10) provide examples of the non-compliances found with its policy, 11) disclose the amount of non-compliances found with its policy, 12) publish data on supplier performance, 13) disclose its response to non-compliances found. It also has to address two of the following issues: 14) obtain independent verification of the report, 15) obtain stakeholder verification of the report or evidence that stakeholder engagement has informed report writing and 16) provide an evidence of innovation/leadership in reporting.
<i>Product energy efficiency</i>	An organization needs to: 1) report the percentage of new models (of specified products) that meet the latest Energy Star requirements, 2) report the percentage of those models in (1) that exceed Energy Star requirements and specify by what percentage they exceed the Energy Star standard for the particular mode, 3) list the names and numbers of the models exceeding the latest Energy Star requirements, 4) set the objectives for further energy consumption improvements of its products, 5) not lobby against stricter product efficiency standards. In other words the company should not be a member of a trade association or other business institution that is undermining political support for stronger energy efficiency standards for products.
<i>Avoidance of Hazardous substances</i>	A company has to: 1) make all products on the market free from Poly Vinyl Chloride plastic (PVC) and Brominated flame retardants (BFRs), antimony, beryllium and phthalates, 2) set a time line for phasing these substances out, 3) meet the commitments on time, 4) substitute harmful chemicals in the production of electronics to prevent worker exposure to these sub-

	stances and contamination of communities near production facilities, and 5) eliminate harmful substances to prevent leaching/off-gassing of chemicals such as brominated flame retardants (BFRs) during use, and to enable electronic scrap to be more safely recycled.
<i>Use of recycled plastics in products</i>	A firm should: 1) source at least 5% of all plastics from recycled plastic streams (net), 2) provide information on products that have post-consumer recycled plastics content, with details of the percentage of recycled plastics used in the products and 3) provide a plan and timeline for increasing use of post-consumer recycled plastic to 15% of total plastics used by 2020 (net).
<i>Product life-cycle</i>	A company has to: 1) have above average length of product warranty for best-selling products, 2) provide/demonstrate examples of innovation for life-cycle extension, and 3) report publicly on their websites the average length of product warranty for their three best-selling products or product groups, as well as the length of time of replacement parts availability.
<i>Chemical management advocacy</i>	An organization should: 1) make lists of restricted/banned substances publicly accessible, 2) describe how these requirements are enforced along their supply chain, 3) provide lists of substances being considered for future restriction or elimination, 4) provide information explaining the factors they consider when making these lists, 5) publicly advocate for strong chemicals legislation across the sector, for example, publicly advocating for inclusion of additional substances under Restriction of Hazardous Substances (RoHS).
<i>Voluntary take-back programs where no EPR laws</i>	A company should: 1) take financial responsibility for dealing with the e-waste generated by their products; 2) take back discarded products in all countries where their products are sold. In other words the company should provide free, easy and global take-back and recycling services for all their discarded products, both for business and individual customers, in every country where their products are sold; 3) re-use or recycle those products responsibly, 4) provide easily accessible information to individual customers on what to do with their branded discarded electronics in every country where their products are sold. 5) publish data showing the quantities of e-waste recycled on a regular basis (at least annually), 6) publish data that shows the global amount recycled as % of past sales by product type , 7) achieve over 25% recycling rate needs for at least one specified product group, and 8) support Individual Producer Responsibility initiative.

(EIRIS, Portfolio Manager Supply Chain Policy, 2012) (EIRIS, Portfolio Manager Supply Chain Systems, 2012)
(EIRIS, Portfolio Manager Supply Chain Reporting, 2012) (Greenpeace, Guide to Greener Electronics: Ranking criteria explained, August 2011)

The sections below show the outcomes of the EIRIS and Greenpeace grading separately as well together.

4.4 *EIRIS assessment – Prior to desk & field researches*

As mentioned above with respect to the Labour Standards in the supply chains of electronic producers this research focuses only on three criteria, which are supply chain policies, supply chain systems and supply chain reporting. Using EIRIS database the scores for companies in question were derived. Figure 7 represents the overall picture of the outcomes.



Figure 7: Companies' scores on Labour Standards in Supply Chain (EIRIS)

From the figure above it can be seen that with respect to the labour standards practices in the supply chain, Hewlett Packard performs the best, addressing 74% of the issues, while Research in Motion performs worst with only 34% addressed. In addition, the top four companies have achieved almost full scores for supply chain policy criterion 10 out of 11, and relatively high scores for supply chain systems ranging from 6 to 7 out of 9. However, the supply chain reporting is the one most poorly addressed with scores from 7 to 9 out of 15. A similar picture can be seen in case with the rest seven companies. Thus, the most addressed criterion is the one concerning policy, however, the reporting is the weakest link for them. For deeper understanding of the grades see Appendix 7, Table 11.

4.5 Greenpeace assessment – Prior to desk & field researches

Figure 8 presents the results of the Greenpeace based on the selected criteria. Thus, a quite different picture in companies' order can be seen in comparison to the EIRIS' scores in Figure 7. According to Greenpeace Apple is the leader with 69% addressed issues with regards to the environmental aspect of the life cycle of electronics covered in this research. However, RIM is still on the last position with only 14% of the requirements addressed.

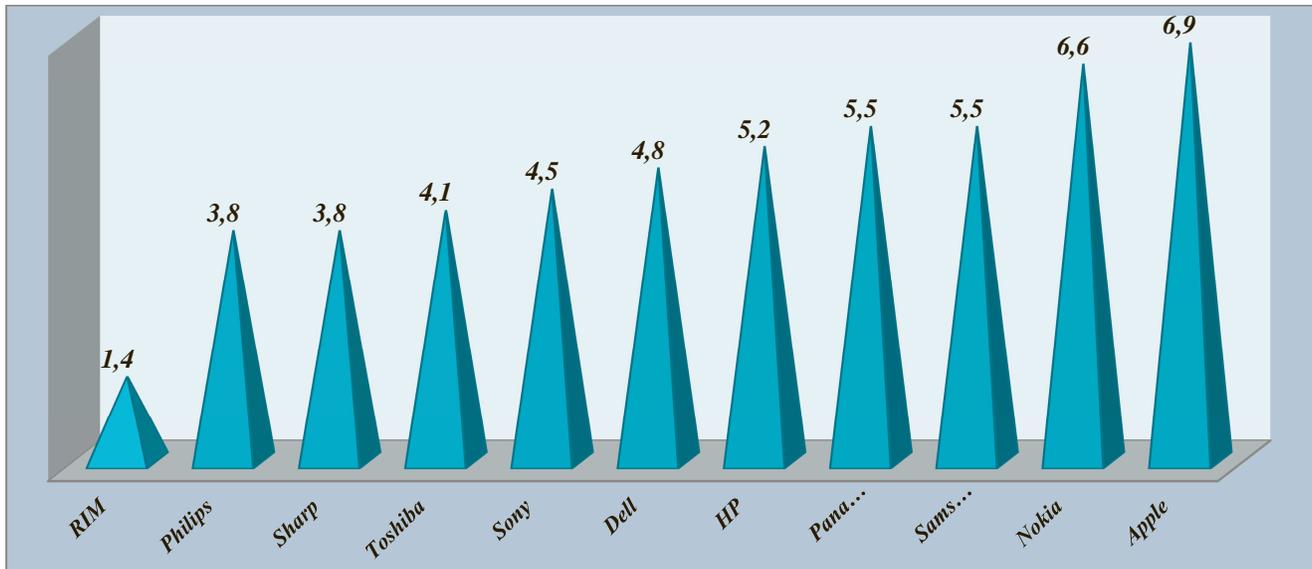


Figure 8: Greenpeace selected criteria rating

It can also be seen that only one company (Nokia) stayed in the top four reflected in the EIRIS and Greenpeace assessments. However, the other three changed. Therefore, these top two firms managed to achieve the highest grade for product energy efficiency criterion and almost a full grade (7 out of 8) for voluntary take-backs where no EPR laws. However, the least addressed criteria are the use of recycled plastics and product life cycle.

A similar picture can be seen with regards to the worst performers (RIM and Philips). The best addressed criterion is Product efficiency and the worst is product life cycle. For more detailed overview of the grades see Appendix 7 Table 10.

4.6 Overall assessment – Prior to desk & field research

On the separate EIRIS and Greenpeace scores, the combined results were acquired. Thus, the overall picture of how a single company is doing with regards to all of the three phases of electronics supply chain can be seen in the Figure 9. Therefore, as Nokia was one of the best performers according to the NGOs, it turned out to be a leader in a combined ranking with 69% of the criteria addressed. Moreover, RIM still stayed on the last position with only 25% of the issues addressed.

At the same time, Hewlett Packard and Apple managed to stay on the top as well, whereas Samsung, one of the best performers according to Greenpeace, moved to the bottom four.

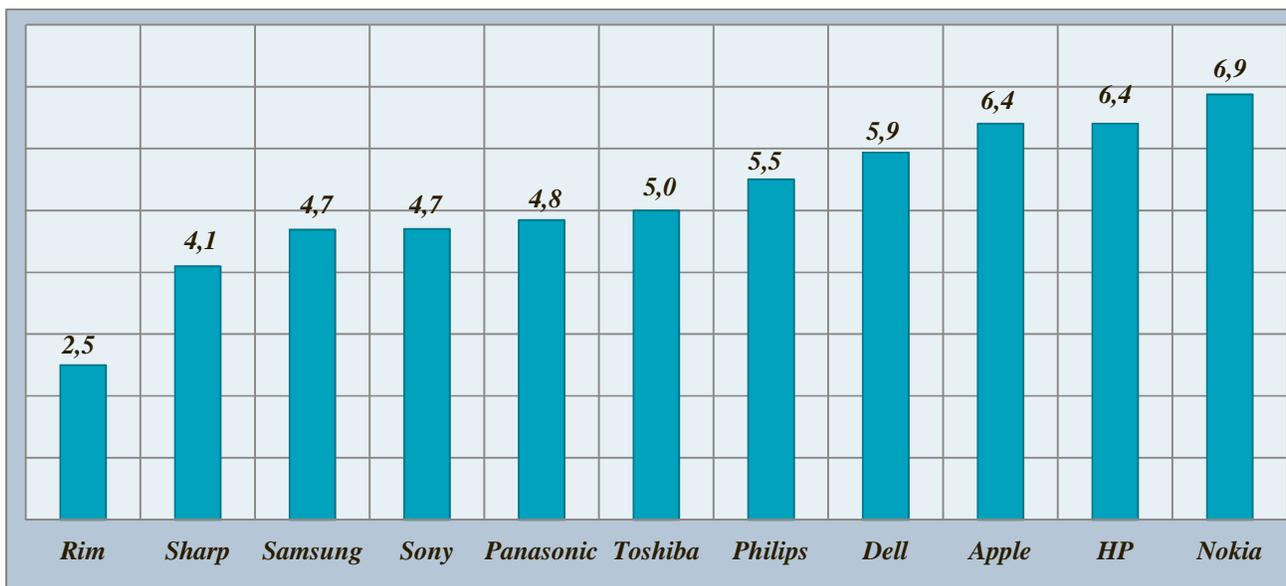


Figure 9: Total Companies' scores, Greenpeace and EIRIS combined

As it was already discussed in sections 4.4 and 4.5 in general all of the companies perform best with regards to criteria such as supply chain policy, supply chain systems and product energy efficiency. While at the same time on average the least addressed criteria are product life-cycle, supply chain reporting and use of recycled plastics. For more insight on the grades please see Appendix 7 Table 12.

At this point in the assessment it is possible to say that Robeco might be more willing to engage into a dialogue on the life cycle of electronics with the least performing companies such as RIM, Sharp, Samsung, Sony and Panasonic.

In the next sections of the research, the points that have not yet been addressed by the companies are researched in depth and the results are integrated into the grading system for better understanding of the companies' current positions.

4.7 Companies assessment based on desk research

Before addressing all the requirements the companies in question should fulfil, a desk research of their publicly available documents took place. On the basis of it some companies received additional points to the initial overall assessment. Those points were calculated as follows: $1/64 = 0.16$ per 1 addressed issue required by either Greenpeace or EIRIS.

Therefore, only 3 out of 11 companies managed to progress on the issues described below.

Sony:

- 1) Effective voluntary take-back programs where no EPR laws – 0.16 points. The company expanded the corporate take-back and recycling program to more non-OECD countries, which include China, Taiwan, and Thailand. (SONY Corporation 248-261)

Toshiba:

- 1) Effective voluntary take-back programs where no EPR laws – 0.16 points. The Corporate recycling programs now include medical equipment, air conditioners, business use equipment, washing machines, dryers, refrigerators, freezers, TV sets and PCs. (Toshiba 30).

Apple:

- 1) Chemical management advocacy – 0.16 points. Apple publicly acknowledged its support for RoHS (Apple, Apple TV 2)
- 2) Product life-cycle – $0.16/2 = 0.08$ points. The company made only information about warranties for its products publicly available (Apple, Hardware Warranties).

Therefore, the Figure 10 presents the initial combined scores (inner circle) which are also shown in Figure 9 and the ones modified as a result of the research of companies' public documents (external circle). The figure shows that generally the picture of the ranking did not change dramatically. In other words most of the companies stayed on the same places in the rank. Nevertheless, Sony managed to move one position up and now being at the same level as Panasonic.

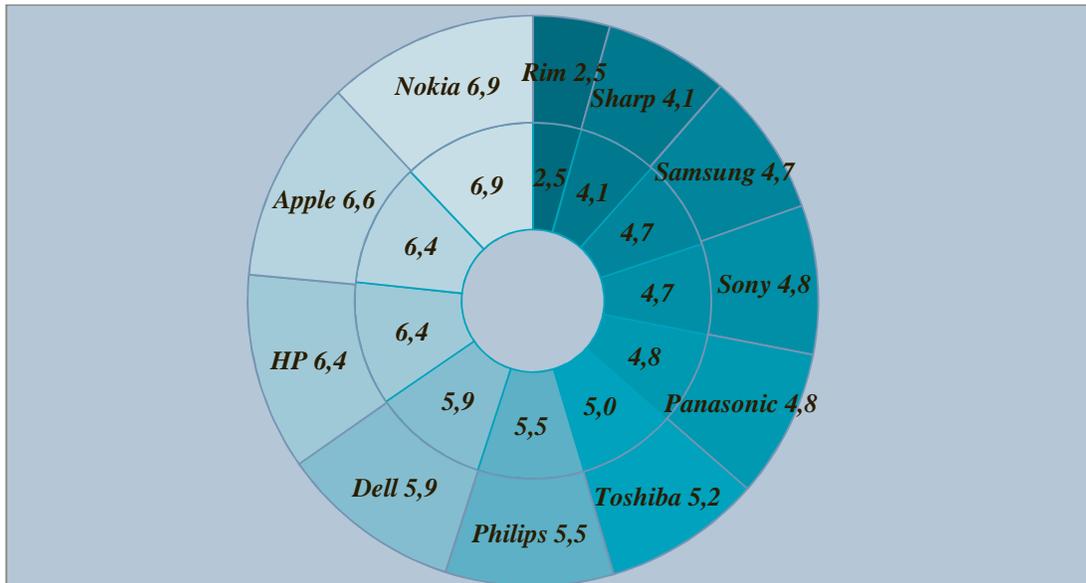


Figure 10: Changes in grades based on the companies' public documents

Moreover, from the description above it can be seen that the companies most often managed to address one of the requirements from criterion covering voluntary take-backs where no EPR laws. However, most of the other criteria stayed the same. For better understanding of how the scores were calculated see Appendix 9 Table 13.

Consequently the doughnut chart above indicates that even if the companies have made some progress on the three phases of supply chain, most of them might not publish it. That is why it is crucial to conduct an empirical research, which is described in depth in section 5.

5. Field research

This chapter briefly discusses the results of analysis of the companies' responses gathered either via emails or phone interviews as well as it shows the qualitative outcomes (scores) of the dialogues and their impact on the companies' final scores. In addition, this section describes the engagement objectives that Robeco should use for this upcoming theme on life-cycle of the electronics and the financial overview of the chosen companies.

5.1 *Results of the field research*

The empirical research was held in through semi structured questionnaires that were sent to each of the companies' Investor Relations (IR) or CSR departments via e-mails. In total 11 departments were contacted, one per company. If there was no reply for a week the re-minder e-mails were sent out. Most of the organizations responded relatively quickly, while the others kept silent for at least a month. That is why it was decided that unless a firm replies to the questionnaires within two months its answers would not be incorporated in this research. Therefore, all companies have responded and 10 managed to show the progress made in either manufacturing or consumer use or recycling phases of their products life cycles. The primary data was received either via e-mails or phone interviews with 11 corporate representatives, one per company.

For each fully addressed matter a company gets $1/64 = 0.16$ points, which is incorporated into the final grade by adding the point to the scores obtained as a result of Desk research (see Figure 10, external circle). However, if an issue was not fully achieved a half of the point is assigned then. Thus, below the summaries of the questions that each company has managed to address up till now are shown. These outcomes were the result of the personal assessment.

Dell:

- 1) Supply chain systems – 0.16 points. Dell communicates its supply chain policies to its suppliers and their employees globally.
- 2) Supply chain reporting – 0.16 points. The company reports on the examples of non-compliance found during the audits of its suppliers
- 3) Product life-cycle – 0.16 points. Publicly available the length of warranty and the spare parts for the corporate products.

Hewlett Packard:

- 1) Product energy efficiency – 0.16 points. Although, Hewlett Packard does not publish the percentage of its products that are Energy Star qualified, it does disclose all the devices that are qualified. Thus, there are more than 600 goods listed on the corporate website: (Hewlett-Packard, ENERGY STAR). Consequently, it is considered by Robeco to be a positive achievement.

Research in Motion:

- 1) Avoidance of hazardous substances – 0.16 points. That is because RIM has met its target of phasing out the phthalates from all its accessory products, and removing beryllium from all its devices and making Blackberry handsets PVC free

Nokia:

- 1) Supply chain systems – 0.16 points. Nokia communicates the Corporate Labour Conditions Standards and Code of Conduct to its suppliers and their employees globally.
- 2) Chemical management and advocacy – 0.16 points. The Company has made its Corporate Supplier Requirements for Environmental Management publicly available.

Samsung:

- 1) Supply chain policies – 0.16 points The Company requires its suppliers to meet core ILO convention area of freedom of association and collective bargaining.
- 2) Supply chain systems – 0.16 points. Samsung communicates its policies to suppliers and their employees globally.
- 3) Supply chain reporting – 0.16 points. It reports on the number of facilities of its suppliers monitored – 0.16 points

- 4) Supply chain reporting – 0.16 points. The company discloses examples of non-compliance found during the audits.
- 5) Avoidance of hazardous substances – 0.16 points. Samsung has reached its goal of phasing out phthalates from all its mobile phones and MP3.

Sharp Corporation:

- 1) Chemical management advocacy – 0.16 points. The company requires its suppliers to report on use of certain BFRs. More specifically, it demands reports on use of Polybrominated biphenyls (PBBs) and Polybrominated diphenyl ethers (PBDEs).
- 2) Supply chain reporting – 0.16 points. Sharp discloses information on the trainings of its own employees and the ones of its suppliers.

Toshiba:

- 1) Product life-cycle – $0.16/2=0.08$ points. The length of warranties for every corporate product is publicly available.
- 2) Effective voluntary take-back where no EPR laws – 0.16 points. The company now offers recycling programs in non-OECD countries that cover not only TV sets.

Sony:

- 1) Supply chain policy– 0.16 points. The policy covers disciplinary principles through prohibiting harsh or inhumane treatment.
- 2) Thirds party audits of the corporate suppliers – 0.16 points.
- 3) Product life-cycle – $0.16/2=0.08$ points. Publicly available length of warranties for the main product groups.
- 4) Supply chain systems – 0.16 points. The procedures for addressing non-compliance are publicly available.

Philips:

- 1) Supply chain reporting – 0.16 points. Philips reports on the amount of suppliers audited. For instance, in 2011 300 audits took place, while the company has around 10 000 suppliers.
- 2) Chemical management and advocacy – 0.16 points. Phillips made its Classified Substance list publicly available.

Panasonic

- 1) Supply chain systems – 0.16 points. Communication of the policies on labour standards to suppliers and their employees.
- 2) Supply chain reporting – 0.16 points. Publicly available procedures to remedy non-compliance.
- 3) Avoidance of Hazardous substances – 0.16 points. Elimination of BFRs from new smartphones as of the beginning of 2012.
- 4) Chemical Management advocacy – 0.16 points. The list of restricted substances is publicly available.
- 5) Voluntary take-backs – 0.16 points. The collection rate is represented as a percentage of past sales.
- 6) Voluntary take-backs – 0.16 points. Targets for the future collections are set.

The interview with Apple, showed that the company did not improve on any of the points required. Therefore, its score stays unchanged.

The full description of the notes can be found in Appendix 6.

The quantitative results of the desk and field researches can be seen in Figure 11. In addition, this bar chart presents the progress made in each of the stages of the research. The scores are presented in such a way that on the right side the initial grades can be seen, in the middle the scores after desk research are shown and on the left the final grades that include the empirical research are presented.

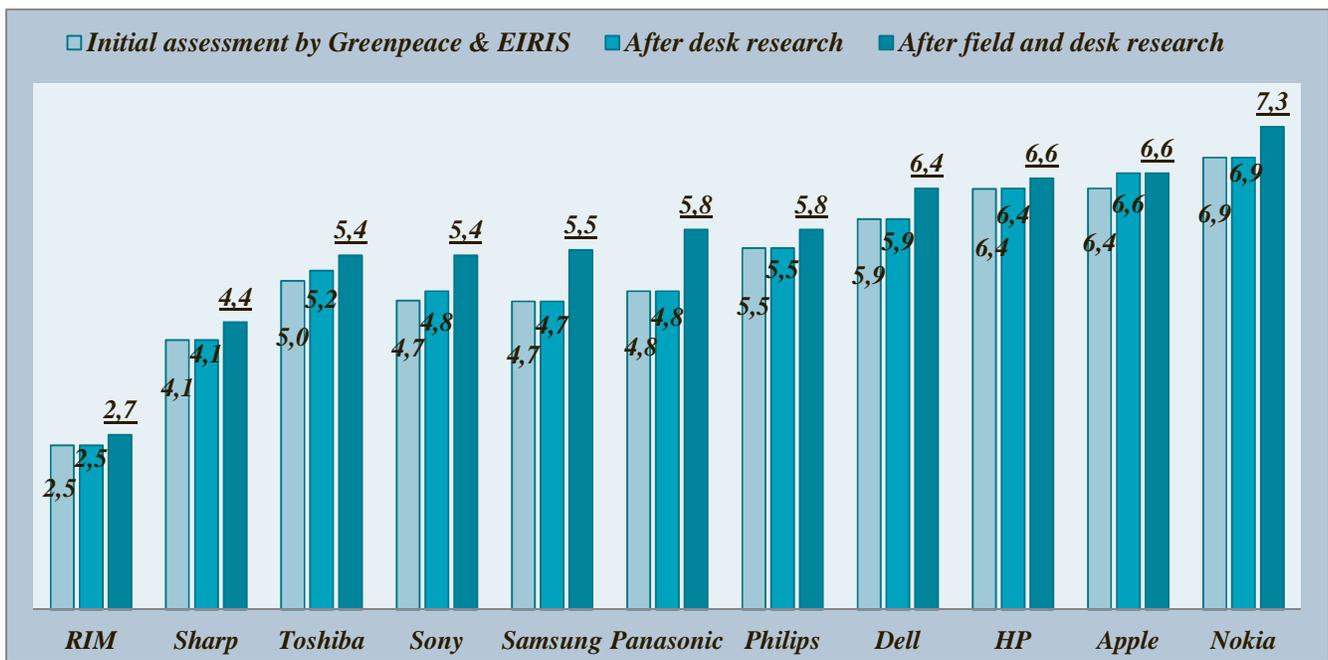


Figure 11: Initial, after Desk research and after Empirical research Grades per company

From the figure above it can be seen that Nokia is still a leader with 73% of the requirements addressed with regard to the waste and recycling, the health and safety of the employees and consumers, and labour conditions of employees. Generally speaking almost all of the companies stayed in the same place in ranking. However, Sony, Samsung and Panasonic did manage to show the improvements made and to move from 9th, 8th and 7th positions to the 8th, 7th and 6th, respectively, by addressing 54%, 55% and 58% of the requirements. For more in-depth understanding of the scores calculation see Appendix 7 Table 14.

On the basis of the Figure 11 several companies will be chosen for the upcoming Robeco’s engagement on life-cycle of electronics. In other words, the firms which got the lower scores will have more chances to be selected. That is why Research in Motion, Sharp, Toshiba, Sony, and Samsung are the most appealing candidates.

5.2 Engagement objectives for Robeco

After the choice of companies has been made Robeco will start contacting the firms again in order to engage in a more in depth dialogue on the still outstanding issues. That is why the next step for Robeco would be defining the universal objectives it can set for this engagement.

The Figure 12 represents all of the criteria used in this research and their average degree of completion by all the companies before the research and after. The calculations supporting this information can be found in Appendix 7 tables 15, 16 and 17. Thus, it can be seen that the most addressed matters have been and still are the supply chain policies, product energy efficiency and supply chain systems. On the other hand, the use of recycled plastic, product life-cycle and supply chain reporting still are the least addressed issues. That is why it is most likely that the focus of the engagement will be directed towards them.

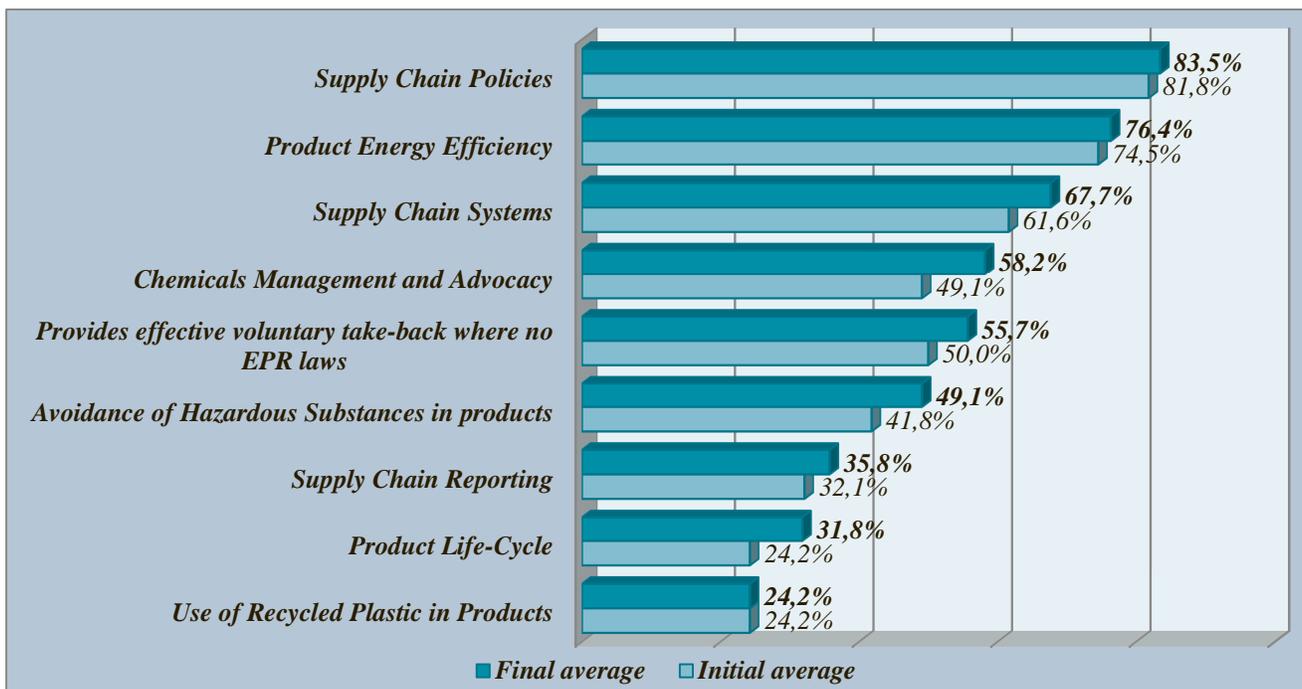


Figure 12: Average degree of completion per criterion

Usually Robeco tries to restrict the number of objectives per theme to 3-6. That is why for the theme of life-cycle of electronics several criteria should be combined in such a way that their importance will not be diminished. Therefore, the Table 6 presents the combined objectives.

Table 6: Robeco's engagement objectives

Name	Description
Labour issues in the Supply chain	The company should have a public supply chain policy in place with explicit reference to health and safety of employees, child labour, forced labour, non-discrimination and freedom of association & collective bargaining. In addition the company should be transparent on the way it implements the supply chain policy, including the results of independent verifications conducted at the suppliers' sites.
Energy efficiency	The company should have a public strategy which includes targets for lower energy use of the company's (new) products.
Hazardous substances and recycled plastics management	The company should have a public policy with explicit reference to <ol style="list-style-type: none"> 1) The use of recycled plastics in its products, 2) The banning of Poly Vinyl Chloride plastic (PVC) and Brominated flame retardants (BFRs), and antimony, beryllium and phthalates, 3) The active identification of new chemicals for elimination or restriction in its own operations.
Chemical management transparency	The company should be transparent on the way it implements the policy under objective no. 3 including the results of independent verifications conducted at the company's site.
Product life-cycle management	The company should have a public strategy which refers to lengthening the life cycle of the company's electronic products (including the length of warranties and spare parts availability) and the implementation of take-back programs worldwide.

These objectives will most likely be adopted by Robeco for the new thematic engagement on life cycle of electronics.

5.3 Financial overview of the selected companies

After the selection of companies for the new engagement has been made, it is good to have a look at their financial performance. Table 7 presents the averages of Debt to Assets, Quick and Net Profit Margin ratios for all 5 selected

companies. The figures were calculated on basis of the period from 2005 to 2011. For deeper understanding of the calculations see Appendix 8 Table 18.

Therefore, from the table below it can be seen that the worst performing company (RIM) with regards to Manufacturing, Consumer use and Recycling phases of supply chain covered by this research, on average has been performing better than the other firms. In other words, only 24% of RIM's total assets are financed through debt. The company's high quick ratio indicates that in case of unexpected liquidation RIM would be able to pay off all its short-term debts. Lastly, the positive and relatively high Net Profit margin figure indicates that the company has enough profits after all the expenses to reinvest into internal growth. That is why, RIM does not have big debts, as it can support growth with internally generated funds.

In case with the rest of the companies presented in the table, it can be seen that even though they perform considerably better than RIM with regards to the supply chain management (Figure 11), their financial performance is not very promising for the investors.

Table 7: Average Debt to Assets, Quick and Net profit margin ratios per selected company

<i>Company</i>	<i>Debt to assets</i>	<i>Quick ratio</i>	<i>Net Profit margin</i>
Samsung	38%	1,19	8,2%
Sony	72%	0,90	0,6%
Toshiba	79%	1,05	0,3%
Sharp	60%	0,84	1,3%
RIM	24%	2,56	18,2%

Generally it is quite difficult for an investor to link any kind of sustainability improvements per company to the financial returns/performance. Thus, Robeco is not an exception to this rule. Currently, the in-house investment analysts do not have any quantitative prove of the connection, but the different ESG indexes like Dow Jones shows that in some industries the link can be made. For instance the market value per share of British Petroleum still has not recovered after the oil spill in Gulf of Mexico. Although, some correlations can be seen in various industries, it is still very difficult to make a clear link between company's ESG and financial performance due to the other factors influencing the organization. Those can include regulations, investors, and market business cycle etc.

Nevertheless, lately Robeco has been experiencing the value destruction with regards to Sony and Sharp. This is because of low barriers for entry, fierce competition, low/negative profitability, poor free cash flow generation and poor returns on invested capital. Similar picture is seen in case of RIM, Toshiba and Samsung. Therefore, Robeco does not plan to invest in these companies any time soon. In addition, the Table 8 presents the forecasted Net Profit Margin per company, provided by one of Robeco's broker in Deutsche Bank. Thus, it can be seen that outlook is not very optimistic with regards to future investments.

Table 8: Forecasted Net profit margin per selected company

<i>Company</i>	<i>Average for last 6 years</i>	<i>2012</i>	<i>2013</i>
Samsung	8,2%	10,8%	11,0%
Sony	0,6%	-7,9%	0,9%
Toshiba	0,3%	1,2%	2,2%
Sharp	1,3%	-15,3%	-3,6%
RIM	18,2%	6,3%	8,3%

(Deutsche Bank Group) (Deutsche Bank)

Consequently, even though Robeco has no intention of acquiring more stocks of the 5 companies selected, it still holds a certain amount of shares in them. That is why it still should initiate the new engagement on life cycle of electronics, because generally the companies are more willing to respond to shareholder's concerns other than to concerns of non-shareholders.

6. Conclusion

This research focused on the ways of how the electronics manufacturers worldwide can improve with respect to their supply chains and products in order to minimize the impact their products have on the environment, the health of the employees and of the consumers. Therefore three phases and topics in the supply chain of electronics were touched upon. Those phases were Manufacturing, Consumer use and Recycling. The categories included the labour conditions of the employees at the factories, the health and safety of consumers and employees, and the waste and recycling of the devices.

It was identified that the ways for electronics producers to manage their supply chain in sustainable manner were:

- 1) Controlling and recycling the e-waste flows of the corporate products, striving for lower amounts of hazardous substances used in the production and adhere to the local, regional and global legislation and initiatives.
- 2) Offering longer warranties as well as making the appropriate spare parts available for the reparations in order to increase the life time of electronic devices.
- 3) Taking care of the disposed goods themselves through recycling their products in the appropriately equipped facilities/smelters.
- 4) Making the products more energy-efficient.
- 5) Adopting policies for suppliers allowing for freedom of association and collective bargaining, prohibiting basic labour standards violations such as discrimination, excessive working hours etc.

This research also investigated the current statuses of 11 producers of electronics with regard to the manufacturing, consumer use and recycling phases.

The desk and field researches showed that most of the companies managed to improve in taking responsibility with respect to several issues. The companies that achieved the highest progress were Sony, Panasonic and Samsung each moving one position up in the ranking. However, the best and least performing companies did not change as a result of this research. In other words, Nokia is still on the top of the list, while RIM is at the very last position.

In addition, the research examined which of the assessment categories used, were addressed by companies the most. Thus, it was shown that the firms have met most of the requirements concerning supply chain policies, product energy efficiency, and supply chain systems. While at the same time they still had to address most of the matters with respect to use of recycled plastic in products, product life-cycle, and supply chain reporting.

Furthermore, the criteria used in this research were transformed into the engagement objectives for Robeco's new engagement theme on life cycle of electronics. Due to a smaller amount of objectives used by Robeco several criteria were combined. Therefore, 5 objectives were created: Labour issues in the supply chain, Energy efficiency, Hazardous substances and recycled plastics management, Chemical management transparency, and Product life-cycle management.

Lastly, the research looked at several financial criteria for the 5 companies proposed for the new Robeco's engagement. Thus, currently no link between the financial and ESG performance could have been found. RIM, as a worst performing company had the best average financial parameters for the last 6 years. Furthermore, due to many various factors affecting the companies, it is very difficult for an investor to connect any kind of sustainability improvements made by a firm to its financial results. In addition, Robeco's internal as well as external forecast showed a record of value destruction for all 5 companies. That is why it is not going to invest in any of those organizations in the nearest future.

7. Recommendations

On the basis of this research, it can be stated that nowadays producers of electronics should take more initiative in respect to expanding their responsibility over the supply chain, as the labour, chemical management and waste issues become more and more urgent.

More specifically, the investigated companies should direct their focus mostly toward the use of recycled plastics in the products, the extension of the life-cycles of the devices, the supply chain reporting, the avoidance of hazardous substances in products, the world wide take-back programs, and the chemical management.

That is why it is recommended for Robeco to open a new thematic engagement on life-cycle of the electronics. However, not all of the companies researched should be engaged with and not all the initial criteria should be used for the assessment. On the basis of the results of this research RIM, Sharp, Toshiba, Sony, and Samsung should be under the engagement.

In addition, the objectives for this theme should incorporate all aspects, which one deem important of the basis of this research. That is why it presented the potential combined criteria that Robeco may use. Those include Labour issues in the supply chain, Energy efficiency, Hazardous substances and recycled plastics management, Chemical management and transparency, and Product life-cycle management.

Furthermore, Robeco needs to set a threshold in order to consider a single engagement to be successfully closed. That is why in my personal opinion it would be reasonable to require a company to address 4 out of 5 objectives mentioned above. This way, the investment manager can be sure that most of the requirements have been successfully achieved.

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9. Appendix 1: Sales of Electronic products in USA

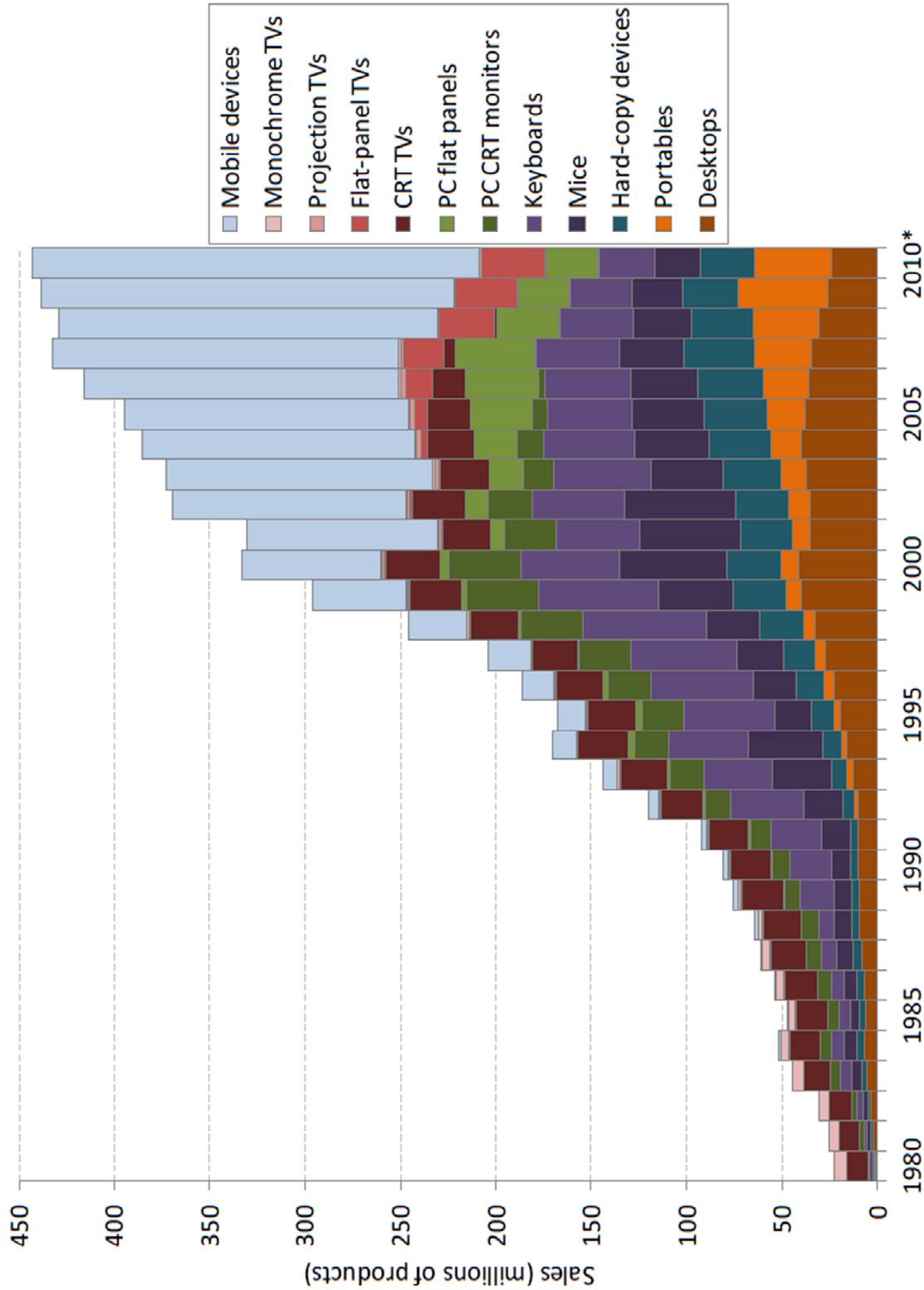


Figure 13: Sales of electronic products by model year, in number of units sold. * Results for 2010 are projected based on estimates from previous years

(ICF International 9)

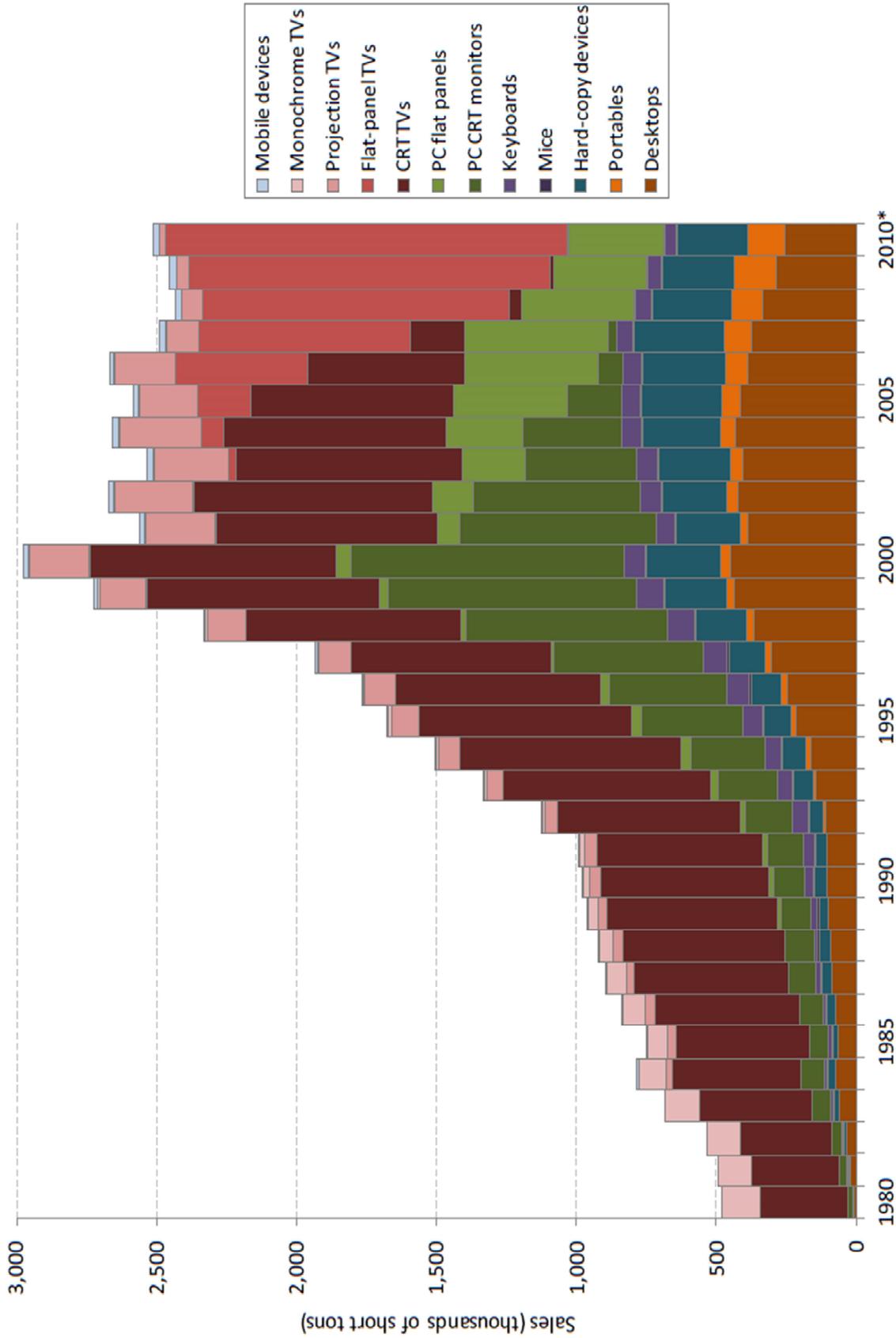
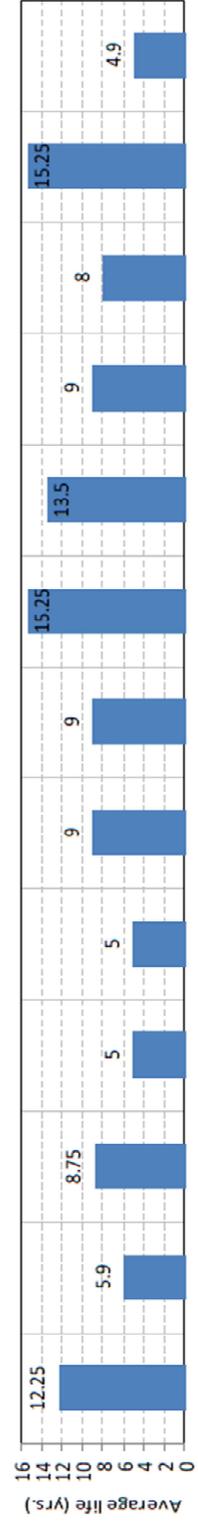


Figure 14: Sales of electronic products by model year, short tons of products sold. * Results for 2010 are projected based on estimates from previous years.

10. Appendix 2: Life time assumption of Electronics in the USA

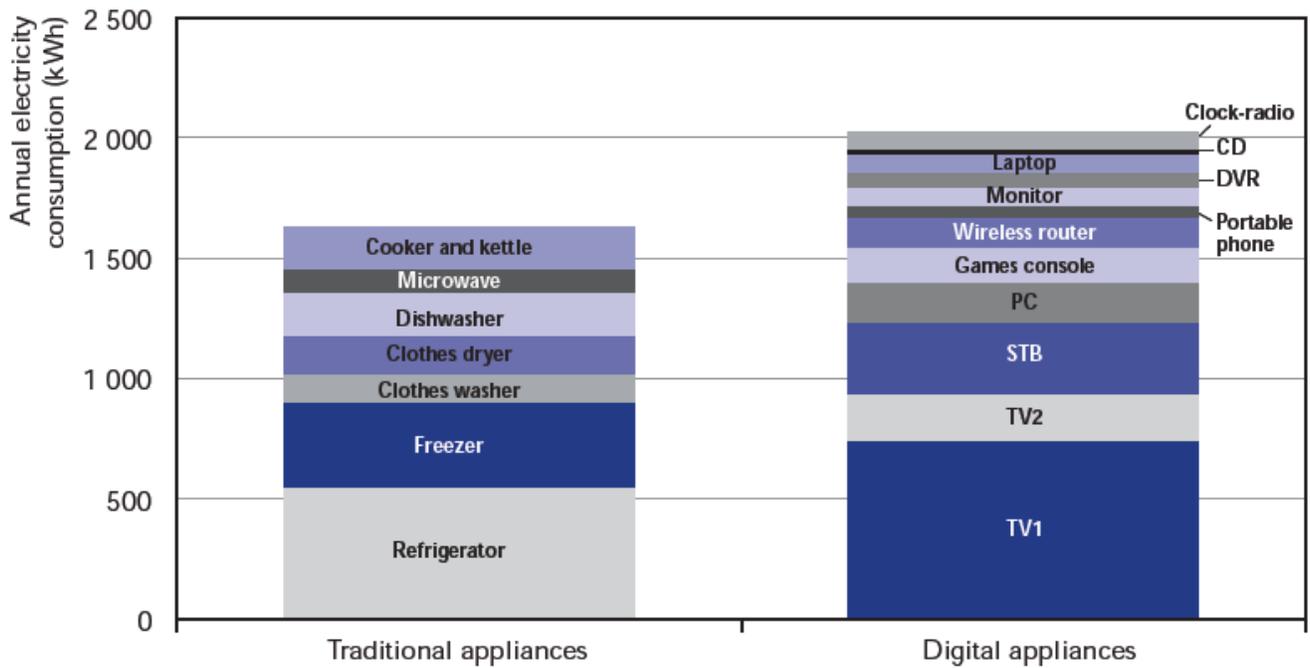
Table 9: Cumulative percentage of each product type sent to end-of-life management at a given age for residential products. Average life of each product type shown in bar chart.

Age (years)	RESIDENTIAL ELECTRONIC PRODUCTS													
	Computers			Computer Peripherals			Computer Displays		Televisions				Mobile devices	
	Desktop CPUs	Portables		Hard-copy devices	Mice	Keyboards	PC CRT monitors	PC flat panels	CRT TVs < 19"	CRT TVs >= 19"	Flat-panel TVs	Projection TVs	Monochrome TVs	
0														
1														
2														20%
3														
4		20%		25%										
5		35%		50%	100%	100%	25%							90%
6		55%		75%										
7	25%	100%		100%					25%					
8							50%		25%			100%	25%	
9							75%	100%			100%			
10	50%													100%
11														
12									50%					
13							100%						50%	
14	75%			100%										
15														
16														
17									75%				75%	
18	100%													
19														
20										100%				
21														
22														
23										100%			100%	



(ICF International 16)

11. Appendix 3: Electricity consumption



Note : The information presented above is illustrative, based on annual usage for a typical OECD household. Electricity used for water heating, space conditioning and lighting are not included.

Key:

TV1	Primary television	DVR	DVD player with integral hard disk
TV2	Secondary television	CD	Compact disc player
STB	Set-top box	PC	Personal computer

Figure 15: Typical OECD household electricity consumption of major traditional and digital appliances (International Energy Agency 235)

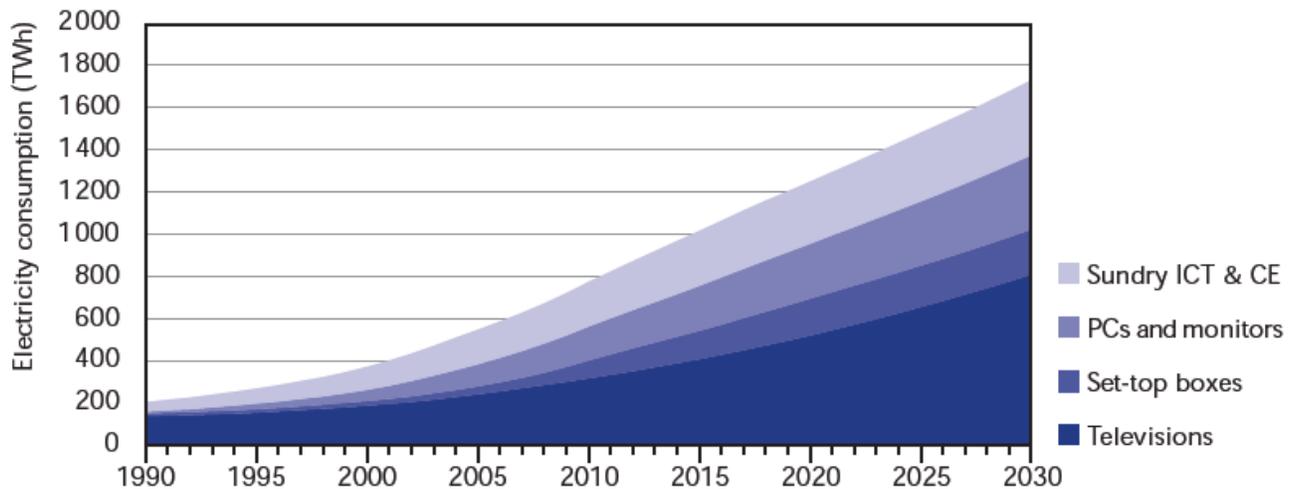


Figure 16: Estimated global electricity consumption from ICT and CE equipment, 1990-2030 (International Energy Agency 238)

12. Appendix 4: Requirements for the companies

On the basis of the EIRIS and Greenpeace's reports for each of the companies the general requirements were set out. Therefore, by addressing the issues below, each of the companies can obtain the highest grades for the overall assessment (Labour Standards and Greenpeace criteria). In addition, these issues were used as the primary questions to the companies during the interviews. Moreover, the companies below are ranked from the lowest to the highest score.

12.1 *Research in Motion*

Supply chain policy

- 1) RIM does not require its suppliers and sub-contractors to meet the core ILO convention areas of collective bargaining; does not show evidence of being clearly integrated into its procurement process. (the Company does state in its supplier code of conduct that 'in selecting and retaining Suppliers, RIM will take into consideration whether a Supplier can in an open and objective manner demonstrate its active pursuit of compliance with the Code'. However, this is not sufficient information to meet this element)
- 2) It does not show evidence of being reinforced by the Company's membership of a relevant initiative dealing with supply chain labour standards.

(EIRIS, Research In Motion Profile)

Supply chain Systems

- 1) It does not communicate it to the suppliers' employees globally;
- 2) Does not disclose procedures for monitoring the suppliers for compliance with the policy;
- 3) Does not disclose procedures or visiting/auditing its suppliers;
- 4) Does not demonstrate extensive auditing and monitoring of its supply chain through external monitors;
- 5) Does not disclose procedures for addressing non-compliance
- 6) Does not disclose info on the training of relevant employees(both own and suppliers');
- 7) Does not have a clearly-defined senior person responsible for supply chain labour standards;
- 8) Does not demonstrate that its systems are targeted to the areas of highest risk or demonstrate comprehensive coverage of its management systems;
- 9) Does not demonstrate clear links between its supply chain labour standards management systems and its procurement management systems

(EIRIS, Research In Motion Profile)

Supply chain reporting

- 1) No indication that the Company publicly reports on communication of its policy or on details of its systems for monitoring/auditing.
- 2) No indication that it reports details of its procedures for remedying non-compliance or its systems for training employees/suppliers.

(EIRIS, Research In Motion Profile)

Product Energy efficiency

- 1) RIM does not report on the energy efficiency of its chargers as a percentage of all external power devices
- 2) RIM needs to set objectives to continue to improve the energy efficiency of its products, to aim for a greater percentage of energy efficiency improvements, as well as report on the energy efficiency of its chargers as a percentage.
- 3) It needs to reiterate its support wherever possible for more stringent energy efficiency standards for all electronic products. It needs to distance itself from such regressive positions or risk incurring a penalty point in future editions of the Guide. (RIM is a member of CEA, an industry association that recently made comments against the battery chargers systems regulation in the California Appliance Efficiency Regulations)

(Greenpeace, Guide to Greener Electronics: RIM)

Avoidance of Hazardous substances

- 1) RIM has no products that are free from hazardous substances such as BFRs, PVC, phthalates, antimony/antimony compounds and beryllium/beryllium compounds.
- 2) RIM needs to set timelines to phase out the use of these substances in all of its products.

(Greenpeace, Guide to Greener Electronics: RIM)

Use of recycled plastic in products

- 1) RIM needs to provide any data or examples of its use of post-consumer recycled plastic. “Continually investigating alternative and more sustainable materials that have higher recycled content or that are more easily recyclable”

(Greenpeace, Guide to Greener Electronics: RIM)

Product life-cycle

- 1) RIM needs to provide information on the average length of warranty or availability of product replacement parts.
- 2) RIM needs to publicly disclose the length of warranty and spare parts availability for its main product lines
- 3) It also needs to show some innovative measures that increase lifespan and durability of whole product systems, rather than only individual parts.

(Greenpeace, Guide to Greener Electronics: RIM)

Chemical Management and Advocacy

- 1) No evidence of advocacy for strong chemicals legislation.
- 2) No information on its chemicals management program for products or manufacturing, or the criteria it uses for identifying new chemicals for elimination/restriction.

(Greenpeace, Guide to Greener Electronics: RIM)

Effective voluntary take backs where no EPR laws

- 1) RIM has no take-back programs outside of North America and does not report on the quantities of e-waste it collects and recycles.
- 2) It needs to set targets to increase its take-back and recycling activities.

(Greenpeace, Guide to Greener Electronics: RIM)

12.2 *Sharp*

Supply chain policy

- 1) Sharp does not require its suppliers and sub-contractors to meet the core ILO convention area of collective bargaining.
- 2) It does not show evidence of being clearly integrated into its procurement process
- 3) It does not show evidence of being reinforced by the Company's membership of a relevant initiative dealing with supply chain labour standards

(EIRIS, Sharp Corporation Profile)

Supply chain Systems

The Company does not:

- 1) Communicate its policy to its suppliers' employees globally
- 2) Disclose procedures for visiting/auditing its suppliers
- 3) Disclose information on the training of both its own employees and those of its suppliers - the Company has indicated that it trains its major suppliers in Japan annually but needs to provide information on the training of its overseas suppliers in order to meet this element
- 4) Demonstrate that its systems are targeted to the areas of highest risk or demonstrate comprehensive coverage of its management systems
- 5) Demonstrate clear links between its supply chain labour standards management systems and its procurement management systems

(EIRIS, Sharp Corporation Profile)

Supply chain reporting

The Company does not:

- 1) Report on visiting/auditing of suppliers
- 2) Report on procedures to address non-compliances
- 3) Report on the number of facilities monitored/audited
- 4) Report on the proportion of its supply chain monitored/audited
- 5) Disclose details of risk assessments 'disclose details of stakeholder dialogue/engagement
- 6) Provide examples of the non-compliances found

- 7) Report on the amount of non-compliances found with its policy
- 8) Provide data on supplier performance
- 9) Demonstrate independent verification of its report
- 10) Demonstrate stakeholder verification of its report and/or demonstrates that stakeholder engagement has informed report writing
- 11) Demonstrate innovation/leadership in reporting
(EIRIS, Sharp Corporation Profile)

Product Energy efficiency

- 1) Sharp needs to reiterate its support wherever possible for more stringent energy efficiency standards for all electronic products. It needs to distance itself from such regressive positions or risk incurring a penalty point in future editions of the Guide. (However, Sharp is a member of CEA, an industry association that recently made comments against the battery chargers systems regulation in the California Appliance Efficiency Regulations)
(Greenpeace, Guide to Greener Electronics:Sharp)

Avoidance of Hazardous substances

- 2) Sharp needs to communicate the dates when new products and components will be free from PVC, phthalates, BFRs and antimony in order to complete its phase out. (Sharp's commitment was to phase out the use of PVC, phthalates, BFRs and antimony by fiscal year 2010, provided it can find suitable alternatives. Not all products are free from PVC and phthalates; BFRs and antimony have only been removed from casings in the majority of products such as LCD TVs. However, as Sharp has now gone past its timeline without fully meeting its commitment)
- 3) The company has already banned beryllium oxide, but there are many exemptions for which Sharp needs to find substitutes. Sharp's internal certification standards for its green products include "uses no halogenated flame retardants, uses polyvinyl chloride substitutes".
(Greenpeace, Guide to Greener Electronics:Sharp)

Use of recycled plastic in products

- 1) Sharp needs to present its postconsumer plastics use and targets as a percentage of total plastics used. Currently, Sharp's objective is to use 1,500 tons of post-consumer plastic in 2012.
(Greenpeace, Guide to Greener Electronics:Sharp)

Product life-cycle

- 1) Sharp needs to publicly disclose the length of warranty and spare parts availability for its main product.
- 2) It needs to show some innovative measures that increase lifespan and durability of whole product systems, rather than only individual parts.
(Greenpeace, Guide to Greener Electronics:Sharp)

Chemical Management and Advocacy

- 1) Sharp's list of substances no longer presents criteria for identifying future substances for elimination. In addition, "other BFRs" are listed as "managed substances" and not "banned, depending on the application" as PVC and phthalates are. Antimony is not listed at all. This contradicts Sharp's statement that it is making moves to "eliminate BFRs and antimony compounds from new products put on the market since the end of fiscal 2010".
- 2) Suppliers are not required to report on their use of all BFRs or antimony.
- 3) Sharp has a Manual for Survey of Chemical Substances Contained in Parts and Materials; however, it is no longer available to the public.
(Greenpeace, Guide to Greener Electronics:Sharp)

Effective voluntary take backs where no EPR laws

- 1) Total figures are provided for amounts of e-waste collected in 3 European countries and in the US, but not as a percentage of sales.
(Greenpeace, Guide to Greener Electronics:Sharp)

12.3 Samsung

Supply chain policy

The Company's policy does not:

- 1) Require its suppliers and sub-contractors to meet the core ILO convention areas of freedom of association and collective bargaining
 - 2) Show evidence of being clearly integrated into its procurement process
 - 3) Show evidence of being reinforced by the Company's membership of a relevant initiative dealing with supply chain labour standards - the Company is a member of the EICC, however this does not count towards this element as it is not a fully multi-stakeholder initiative
- (EIRIS, Samsung Electronics Profile)

Supply chain Systems

The Company does not:

- 1) Communicate its policy to its suppliers globally
- 2) Disclose information on the training of both its own employees and those of its suppliers - its own employees are not trained
- 3) Demonstrate extensive auditing and monitoring of its supply chain
- 4) Disclose procedures for addressing non-compliance
- 5) Disclose information on the training of relevant employees (either its own or those of its suppliers)
- 6) Have a clearly-defined senior person responsible for supply chain labour standards
- 7) Demonstrate that its systems are targeted to the areas of highest risk or demonstrate comprehensive coverage of its management systems - Samsung Electronics prohibits the use of coltan from Congo in all of its business units and has distributed a letter recommending suppliers for the semiconductor business refrain from using coltan, tin and tantalum from regions of conflict. However, in order to meet this element the Company would need to provide information on how it targets its audits to high risk areas within its supply chain and provide information on how it determines what these high risk areas are.
- 8) Demonstrate clear links between its supply chain labour standards management systems and its procurement management systems

(EIRIS, Samsung Electronics Profile)

Supply chain reporting

The Company does not:

- 1) Report on communication of its policy to suppliers
- 2) Report on visiting/auditing of suppliers
- 3) Report on procedures to address non-compliances
- 4) Report on the number of facilities monitored/audited
- 5) Report on the proportion of its supply chain monitored/audited
- 6) Disclose details of risk assessments
- 7) Disclose details of stakeholder dialogue/engagement
- 8) Provide examples of the non-compliances found
- 9) Report on the amount of non-compliances found with its policy
- 10) Provide data on supplier performance
- 11) Demonstrate independent verification of its report
- 12) Demonstrate stakeholder verification of its report and/or demonstrate that stakeholder engagement has informed report writing
- 13) Demonstrate innovation/leadership in reporting

(EIRIS, Samsung Electronics Profile)

Product Energy efficiency

- 1) Samsung needs to reiterate its support wherever possible for more stringent energy efficiency standards for all electronic products. It needs to distance itself from such regressive. (Samsung is a member of CEA, an industry association that recently made comments against the battery chargers systems regulation in the California Appliance Efficiency Regulations).

(Greenpeace, Guide to Greener Electronics: Samsung)

Avoidance of Hazardous substances

Samsung no longer plans to phase out the use of BFRs and all PVC in its TVs and household appliances and the timelines beyond 2010 are not acceptable. All new models of all products will be free from beryllium from January 2013. There is an exemption for the use of beryllium in connectors and certain electronic components. Phthalates are now to be phased out in mobile phones and MP3 players by January 2011 and otherwise in the same

applications as PVC from January 2013. New models of the same list of products and applications will be free from Antimony trioxide from January 2013, but with 2 exemptions.

1) Samsung needs to eliminate these substances from its whole product portfolio, as well as antimony and compounds.

(Greenpeace, Guide to Greener Electronics: Samsung)

Use of recycled plastic in products

1) Samsung needs to set an intermediate target for the recycled plastic content. Because currently it had set had a target of 25% recycled plastic content (from post-industrial as well as post-consumer sources) out of total plastics used by 2025 and intended to maximise the use of post-consumer recycled plastics over post-industrial plastics

(Greenpeace, Guide to Greener Electronics: Samsung)

Product life-cycle

1) Samsung needs to show some innovative measures that increase lifespan and durability of whole product systems, rather than only individual parts

(Greenpeace, Guide to Greener Electronics: Samsung)

Chemical Management and Advocacy

1) Samsung needs to create a list of restricted substances for its manufacturing.

2) Although Samsung states that RoHS 2.0 has an important role in the phase out of PVC and BFRs it does not specifically state that RoHS 2.0 needs to adopt a ban on organochlorine and bromine compounds (at least PVC, CFRs, and BFRs within 3-5 years), as well as an end-of-life focused methodology for adding future substance restrictions.

(Greenpeace, Guide to Greener Electronics: Samsung)

Effective voluntary take backs where no EPR laws

1) Samsung needs to continue to extend its voluntary take-back for all products to non- OECD countries.

2) Recycling rates need to be provided globally.

(Greenpeace, Guide to Greener Electronics: Samsung)

12.4 SONY

Supply chain policy

1) Sony does not require its suppliers and sub-contractors to meet the core ILO convention area of collective bargaining,

2) Its policy does not cover other labour standards including disciplinary practices,

3) The company does not show evidence of being reinforced by the Company's membership of a relevant initiative dealing with supply chain labour standards - although the Company is a member of the Electronic Industry Code of Conduct (EICC)

(EIRIS, Sony Corporation Profile)

Supply chain Systems

1) The Company does not demonstrate extensive auditing and monitoring of its supply chain, including through the use of external monitors,

2) It does not disclose procedures for addressing non-compliance,

3) It does not demonstrate that its systems are targeted to the areas of highest risk,

4) It does not demonstrate comprehensive coverage of its management systems

5) It does not demonstrate clear links between its supply chain labour standards management systems and its procurement management systems

(EIRIS, Sony Corporation Profile)

Supply chain reporting

1) Sony does not report on procedures to address non-compliances,

2) It does not report on training of relevant employees,

3) It does not report on the number of facilities monitored/audited,

4) It does not report on the proportion of its supply chain monitored/audited,

5) It does not disclose details of risk assessments,

6) It does not disclose details of stakeholder dialogue/engagement.

- 7) The Company does not report on the amount of non-compliances found with its policy,
 - 8) It does not provide data on supplier performance,
 - 9) It does not provide examples of the non-compliances found.
 - 10) Sony does not demonstrate independent verification of its report,
 - 11) It does not demonstrate stakeholder verification of its report
 - 12) It does not demonstrate that stakeholder engagement has informed report writing, demonstrate innovation/leadership in reporting
- (EIRIS, Sony Corporation Profile)

Product Energy efficiency

Sony is a member of ITI and CEA, industry associations that recently made comments against stricter energy efficiency standards (a. the inclusion of computers and servers; b. Comments against battery chargers systems regulation, respectively) in the scope of the California Appliance Efficiency Regulations.

- 1) Sony needs to reiterate its support wherever possible for more stringent energy efficiency standards for all electronic products. It needs to distance itself from such regressive. Still a member
- (Greenpeace, Guide to Greener Electronics: SONY)

Avoidance of Hazardous substances

- 1) Sony is working to eliminate specific phthalates, namely DEHP, DBP, BBP and DIBP as plasticizers in cables and cords beginning in 2014, but not all phthalates are banned and the deadline is unreasonable.
- 2) Sony has banned beryllium oxide from April 2008 with exemptions, although beryllium copper is listed as a controlled substance with no timeline for elimination. Antimony is not listed.

(Greenpeace, Guide to Greener Electronics: SONY)

Use of recycled plastic in products

- 1) Sony needs to provide information on its use of recycled plastics as a percentage of total plastics used no info
- (Greenpeace, Guide to Greener Electronics: SONY)

Product life-cycle

- 1) Sony needs to publicly disclose the length of warranty and spare parts availability for its main product lines.
- 2) It also needs to show some innovative measures that increase lifespan and durability of whole product systems, rather than only individual parts.

(Greenpeace, Guide to Greener Electronics: SONY)

Chemical Management and Advocacy

- 1) Sony needs to mention of the need for RoHS 2.0 to adopt a ban on organo- chlorine and bromine compounds (at least PVC, CFRs, and BFRs within 3-5 years) as well as an end-of-life focused methodology for adding future substance restrictions.
- 2) Greenpeace says that the Company's approach does not fully implement the precautionary principle.

(Greenpeace, Guide to Greener Electronics: SONY)

Effective voluntary take backs where no EPR laws

- 1) Sony needs to expanded its take-back program in non-OECD countries (although it now links to a third party recycling company in Columbia).
- 2) Sony published the collection rate only for Japan and there is no differentiation for TVs and PCs. Thus, it needs to differentiate between Collection of TVs and PCs in the other countries as well.

(Greenpeace, Guide to Greener Electronics: SONY)

12.5 *Panasonic*

Supply chain policy

- 1) Panasonic does not require its suppliers and sub-contractors to meet the core ILO convention areas of freedom of association and collective bargaining
- 2) Its policy does not cover other labour standards including disciplinary practices.
- 3) It does not show evidence of being clearly integrated into its procurement process,
- 4) The company does not show evidence of being reinforced by the Company's membership of a relevant initiative dealing with supply chain labour standards

(EIRIS, Panasonic Profile)

Supply chain Systems

- 1) The Company does not communicate its policy to its suppliers' employees globally,
- 2) It does not demonstrate extensive auditing and monitoring of its supply chain, including through the use of external monitors,
- 3) It does not demonstrate clear links between its supply chain labour standards management systems and its procurement management systems

(EIRIS, Panasonic Profile)

Supply chain reporting

- 1) Panasonic does not report on visiting/auditing of suppliers,
- 2) It does not report on procedures to address non-compliances,
- 3) It does not report on training of relevant employees,
- 4) It does not report on the number of facilities monitored/audited,
- 5) It does not report on the proportion of its supply chain monitored/audited,
- 6) It does not disclose details of risk assessments,
- 7) It does not disclose details of stakeholder dialogue/engagement.
- 8) The company does not report on the amount of non-compliances found with its policy and does not provide data on supplier performance.

(EIRIS, Panasonic Profile)

Product Energy efficiency

Panasonic is a member of ITI and CEA, industry associations that recently made comments against stricter energy efficiency standards (a. the inclusion of computers and servers; b. comments against battery chargers systems regulation, respectively) in the scope of the California Appliance Efficiency Regulations.

- 1) Panasonic needs to reiterate its support wherever possible for more stringent energy efficiency standards for all electronic products. It needs to distance itself from such regressive.

(Greenpeace, Guide to Greener Electronics: Panasonic)

Avoidance of Hazardous substances

- 1) Panasonic needs to show progress by bringing new PVC and BFR free products onto the market. Panasonic still plans to eliminate the use of PVC in notebooks by the end of 2011 globally, but notes that there are technical issues to do with the development of PVC-free AC cords.
- 2) All new models of mobile phones and computers should be free of BFRs by end of 2011, but there is no commitment to eliminate BFRs and PVC from Panasonic's whole product portfolio. Panasonic states that its commitment to eliminating PVC will reduce or eliminate the use of phthalates, used primarily as softeners in PVC. But what about other applications of phthalates e.g. in adhesives? Likewise, use of antimony trioxide will be reduced as BFRs are eliminated.
- 3) Panasonic needs to define the time lines.
- 4) It needs to reference to or plan to phase out the use of beryllium and compounds.

(Greenpeace, Guide to Greener Electronics: Panasonic)

Use of recycled plastic in products

- 1) Panasonic needs to clarify whether its use of recycled plastic for its products (approx. 6000 tons in 2011) also includes post-industrial recycled plastics.
- 2) Panasonic needs to provide a target and timeline specifically for increasing use of post-consumer recycled plastic and clarify the proportion of post-consumer recycled plastics used in its data.

(Greenpeace, Guide to Greener Electronics: Panasonic)

Product life-cycle

- 1) Panasonic's warranties need to be longer;
- 2) It also needs to show some innovative measures that increase lifespan and durability of whole product systems, rather than only individual parts.

(Greenpeace, Guide to Greener Electronics: Panasonic)

Chemical Management and Advocacy

- 1) Panasonic needs to mention of the need for RoHS 2.0 to adopt a ban on organo- chlorine and bromine compounds (at least PVC, CFRs, and BFRs within 3-5 years), as well as an end-of-life focused methodology for adding future substance restrictions.

- 2) It has to list substances restricted for use in products (eg. PVC). Also, beryllium alloys are listed for 'reduction' and beryllium is 'prohibited', whereas it is not listed in the Guidelines for Products. (Greenpeace, Guide to Greener Electronics: Panasonic)

Effective voluntary take backs where no EPR laws

- 1) Panasonic needs to make Voluntary take-back program worldwide
 - 2) It needs to make those programs to cover all Panasonic's product groups, mainly mobiles, PCs, TVs and toner cartridges.
 - 3) It needs to make the information on how to recycle easily accessible to customers. (No information is available to consumers about the recycling program in China and Japan).
 - 4) Panasonic needs to calculate the quantities recycled in relation to past sales for other regions – the US and Korea as a minimum
 - 5) It needs to establish a target to increase the quantities recycled
- (Greenpeace, Guide to Greener Electronics: Panasonic)

12.6 *Toshiba*

Supply chain policy

- 1) Toshiba does not require its suppliers and sub-contractors to meet the core ILO convention area of collective bargaining. (the Company has indicated to EIRIS that its policy on freedom of association covers the right to collective bargaining, but this is not sufficient to improve the assessment)
 - 2) Toshiba does not show evidence of being clearly integrated into its procurement process;
 - 3) It does not show evidence of being reinforced by the Company's membership of a relevant initiative dealing with supply chain labour standards (the Company is a member of the Japan Electronics and Information Technology Industries Association (JEITA). However EIRIS does not count this as a multi-stakeholder initiative).
- (EIRIS, Toshiba Corporation Profile)

Supply chain Systems

- 1) Toshiba does not communicate its policy to its suppliers' employees globally;
 - 2) It does not demonstrate extensive auditing and monitoring of its supply chain, including through the use of external monitors
 - 3) It does not demonstrate clear links between its supply chain labour standards management systems and its procurement management systems
- (EIRIS, Toshiba Corporation Profile)

Supply chain reporting

- 1) The Company does not demonstrate that its systems are targeted to the areas of highest risk.
 - 2) Toshiba does not provide examples of the non-compliances found
 - 3) It needs to report on the amount of non-compliances found with its policy.
 - 4) The Company does not demonstrate independent verification of its report
 - 5) Needs to demonstrate stakeholder verification of its report and/or demonstrates that stakeholder engagement has informed report writing
 - 6) Needs to demonstrate innovation/leadership in reporting
- (EIRIS, Toshiba Corporation Profile)

Product Energy efficiency

- 1) Toshiba needs to report on the percentage of its products that meet and exceed ES standards for each product range. NO
 - 2) Toshiba is a member of CEA, an industry association that recently made comments against the battery chargers systems regulation in the California Appliance Efficiency Regulations. It needs to reiterate its support wherever possible for more stringent energy efficiency standards for all electronic products. It needs to distance itself from such regressive positions or risk incurring a penalty point in future editions of the Guide
- (Greenpeace, Guide to Greener Electronics: Toshiba)

Avoidance of Hazardous substances

- 1) The timeline of 2015 in Toshiba's new commitment to phase out PVC, BFRs, antimony and compounds, beryllium and compounds and phthalates by from ALL its consumer products is unreasonable. Toshiba will be

rewarded with more points when more products come onto the market in line with its new objectives. Not published (however, page 42-43 in the environmental report)
(Greenpeace, Guide to Greener Electronics: Toshiba)

Use of recycled plastic in products

- 1) There is no public information available any longer on Toshiba's guideline for every note PC to use recycled plastic (Its planned to increase the ratio of recycled plastics to up to 25% of total plastics use as part of its next voluntary plan, which will be after FY 2012)
(Greenpeace, Guide to Greener Electronics: Toshiba)

Product life-cycle

- 1) Toshiba needs to publicly disclose the length of warranty and spare parts availability for its main product lines for more points.
- 2) It also needs to show some innovative measures that increase lifespan and durability of whole product systems, rather than only individual parts.
(Greenpeace, Guide to Greener Electronics: Toshiba)

Chemical Management and Advocacy

- 1) Toshiba needs to mention the need for RoHS 2.0 to adopt a ban on organochlorine and bromine compounds (at least PVC, CFRs, and BFRs within 3-5 years), as well as an end-of-life focused methodology for adding future substance restrictions.
(Greenpeace, Guide to Greener Electronics: Toshiba)

Effective voluntary take backs where no EPR laws

- 1) Toshiba needs to include Toshiba products other than PCs in its recycling programs.
- 2) Toshiba needs to expand its TV take back program to non-OECD countries.
- 3) Toshiba needs to clarify how it calculates EU recycling rates.
(Greenpeace, Guide to Greener Electronics: Toshiba)

12.7 Philips

Supply chain policy

The Company's policy does not:

- 1) Show evidence of being reinforced by the Company's membership of a relevant initiative dealing with supply chain labour standards - the Company is a member of the EICC however this is not sufficient for this indicator.
(EIRIS, Koninklijke Philips Electronics Profile)

Supply chain Systems

The Company does not:

- 1) Communicate its policy to its suppliers' employees globally
- 2) Demonstrate extensive auditing and monitoring of its supply chain, including through the use of external monitors - the Company reports that in 2009 the Company undertook 878 audits. However, this cannot be considered to be 'extensive' auditing because the Company has around 25,000 suppliers.
(EIRIS, Koninklijke Philips Electronics Profile)

Supply chain reporting

The Company does not:

- 1) Report on the proportion of its supply chain monitored/audited
- 2) Disclose details of stakeholder dialogue/engagement
- 3) Demonstrate stakeholder verification of its report and/or demonstrates that stakeholder engagement has informed report writing
(EIRIS, Koninklijke Philips Electronics Profile)

Product Energy efficiency

Philips is a member of CEA, an industry association that recently made comments against the battery chargers systems regulation in the California Appliance Efficiency Regulations.

- 1) It needs to reiterate its support wherever possible for more stringent energy efficiency standards for all electronic products. It needs to distance itself from such regressive.
(Greenpeace, Guide to Greener Electronics: Philips)

Avoidance of Hazardous substances

- 1) Philips needs to provide a timeline for overcoming the exemptions on beryllium
- 2) It needs to clarify why other types of phthalates (beyond the six specified) are not scheduled for elimination. (not going to ask the company about it)
(Greenpeace, Guide to Greener Electronics: Philips)

Use of recycled plastic in products

- 1) Philips needs to mention/clarify the use of post-consumer plastics.
(Greenpeace, Guide to Greener Electronics: Philips)

Product life-cycle

- 1) Philips needs to publicly disclose the length of warranty and spare parts availability for its main product lines.
- 2) It also needs to show some innovative measures that increase lifespan and durability of whole product systems, rather than only individual parts.
(Greenpeace, Guide to Greener Electronics: Philips)

Chemical Management and Advocacy

- 1) Philips needs to clarify whether the Restricted Substances in Processes document (refers to a Classified Substance List) is publically available. And if not, it needs to make it available.
(Greenpeace, Guide to Greener Electronics: Philips)

Effective voluntary take backs where no EPR laws

- 1) Philips needs to institutionalize the pilot projects
- 2) It needs to expand its take-back program to other countries.
- 3) It needs to provide details of its recycling rate as a % of past sales. (Philips reports that in 2009 the total amount of WEE recycled waste in EU countries was over 100,000 tons (up from 69,818 tons in 2008).
(Greenpeace, Guide to Greener Electronics: Philips)

12.8 *Dell*

Supply chain policy

- 1) The Company needs to show evidence of the policy being reinforced by the Company's membership of a relevant initiative dealing with supply chain labour standards.[the Company is a member of the EICC however this is not sufficient for this element as the EICC does not clearly outline the role of external stakeholders in engagement processes. The EICC code does not fully cover collective bargaining and the EICC does not currently publish annual reports on companies' progress and audit results]
(EIRIS, Dell Profile)

Supply chain Systems

- 1) The company needs to communicate its policy to its suppliers' employees globally
- 2) It needs to demonstrate extensive auditing and monitoring of its supply chain
- 3) It needs to disclose information on the training of both its own employees and those of its suppliers
- 4) It needs to have a clearly-defined senior person responsible for supply chain labour standards
- 5) It needs to demonstrate clear links between its supply chain labour standards management systems and its procurement management systems
(EIRIS, Dell Profile)

Supply chain reporting

- 1) The Company needs to report on training of relevant employees
- 2) It needs to report on the proportion of its supply chain monitored/audited
- 3) It needs to provide examples of the non-compliances found
- 4) It needs to report on the amount of non-compliances found with its policy
- 5) It needs to demonstrate independent verification of its report
- 6) It needs to demonstrate stakeholder verification of its report and/or demonstrates that stakeholder engagement has informed report writing

- 7) It needs to demonstrate innovation/leadership in reporting (EIRIS, Dell Profile)

Product Energy efficiency

- 1) Dell needs to provide figures on the percentage of their products that meet and exceed the latest Energy Star standard.
- 2) Dell needs to reiterate its support wherever possible for more stringent energy efficiency standards for all electronic products. It needs to distance itself from such regressive positions. Dell is a member of ITI and CEA, industry associations that recently made comments against stricter energy efficiency standards (a. the inclusion of computers and servers; b. comments against battery chargers systems regulation, respectively) in the scope of the California Appliance Efficiency Regulations.
(Greenpeace, Guide to Greener Electronics: Dell)

Avoidance of Hazardous substances

- 1) Dell needs to commit to removing its new target for eliminating PVC and BFRs from all products (not only computing ones).
- 2) Dell needs to set another, more reasonable timeline for the target.
(Greenpeace, Guide to Greener Electronics: Dell)

Use of recycled plastic in products

- 1) Dell needs to set a public target for increasing use of post-consumer recycled plastic.
(Greenpeace, Guide to Greener Electronics: Dell)

Product life-cycle

- 1) Dell needs to publicly disclose the length of warranty and spare parts availability for its main product lines
- 2) It also needs to show some innovative measures that increase lifespan and durability of whole product systems, rather than only individual parts.
(Greenpeace, Guide to Greener Electronics: Dell)

Chemical Management and Advocacy

- 1) Dell needs to make the substance restrictions to apply to manufacturing processes for most substances, with the exception of fluorinated greenhouse gases.
(Greenpeace, Guide to Greener Electronics: Dell)

Effective voluntary take backs where no EPR laws

- 1) Dell needs to provide the same amount of information on recycling/take back possibilities all over the countries it practices this activity. (Information is provided to Dell's individual customers, although there are still gaps, particularly in Africa and Central & South America)
(Greenpeace, Guide to Greener Electronics: Dell)

12.9 *Apple*

Supply chain policy

- 1) Apple needs to show evidence of that the policy is clearly integrated into its procurement process
- 2) It needs to show evidence of being reinforced by the Company's membership of a relevant initiative dealing with supply chain labour standards
(EIRIS, Apple Profile)

Supply chain Systems

- 1) The Company needs to demonstrate extensive auditing and monitoring of its supply chain
- 2) It needs to demonstrate that its systems are targeted to the areas of highest risk or demonstrate comprehensive coverage of its management systems - the Company has indicated that a risk management process is in place but has not provided further details
- 3) It needs to demonstrate clear links between its supply chain labour standards management systems and its procurement management systems
(EIRIS, Apple Profile)

Supply chain reporting

- 1) The Company needs to report on the proportion of its supply chain monitored/audited

- 2) It needs to disclose details of risk assessments
 - 3) It needs to disclose details of stakeholder dialogue/engagement
 - 4) It needs to provide data on supplier performance
 - 5) It needs to demonstrate independent verification of its report
 - 6) It needs to demonstrate stakeholder verification of its report and/or demonstrates that stakeholder engagement has informed report writing
 - 7) It needs to demonstrate innovation/leadership in reporting
- (EIRIS, Apple Profile)

Product Energy efficiency

Nothing

Avoidance of Hazardous substances

- 1) Apple needs to mention antimony and refer to beryllium.
- (Greenpeace, Guide to Greener Electronics: Apple)

Use of recycled plastic in products

- 1) Apple needs to provide information on its use of post-consumer recycled plastics.
- (Greenpeace, Guide to Greener Electronics: Apple)

Product life-cycle

- 1) Apple needs to publicly disclose the length of warranty and spare parts availability for its main product lines.
 - 2) It also needs to show some innovative measures that increase lifespan and durability of whole product systems, rather than only individual parts.
- (Greenpeace, Guide to Greener Electronics: Apple)

Chemical Management and Advocacy

- 1) Apple needs to provide a public position on its support for immediate restrictions in RoHS 2.0 on at least PVC, BFRs and CFRs organo- chlorine and bromine compounds (at least within 3-5 years), as well as an end-of-life focused methodology for adding future substance restrictions.
 - 2) Although Apple clearly implements its chemicals policy through its supply chain, it needs to be more transparent and disclose its Regulated Substances Specification.
- (Greenpeace, Guide to Greener Electronics: Apple)

Effective voluntary take backs where no EPR laws

- 1) Apple needs to provide a breakdown of the recycling quantities of its various products (eg. iPods, PCs) that make up the total figures for recycled products the company publishes.
- (Greenpeace, Guide to Greener Electronics: Apple)

12.10 *Hewlett-Packard*

Supply chain policy

- 1) The Company needs to show evidence of its policy being reinforced by the Company's membership of a relevant initiative dealing with supply chain labour standards - the Company is a supporting member of Social Accountability International (SAI) but as it is not a signatory level member, the element cannot be awarded.
- (EIRIS, Hewlett-Packard Profile)

Supply chain Systems

The Company does not:

- 1) Communicate its policy to its suppliers' employees globally
 - 2) Demonstrate extensive auditing and monitoring of its supply chain - the Company has over 1,000 production suppliers and thousands of non-production suppliers (who provide goods and services not linked to the production of electronic products). In 2010, the Company conducted 77 supplier site audits, which is an insufficient number to award this element.
- (EIRIS, Hewlett-Packard Profile)

Supply chain reporting

The Company does not:

- 1) Show evidence of having responded to non-compliances found by external organisations in the last year - for example China Labour Watch published a report in July 2011 called Electronic Sweatshops which contained allegations of excessive working hours in Hewlett-Packard's supply chain. However, as far as EIRIS has been able to ascertain, there is no evidence that the Company has responded publicly to these allegations on its website.
- 2) Demonstrate independent verification of its report
- 3) Demonstrate stakeholder verification of its report and/or demonstrate that stakeholder engagement has informed report writing - the Citizenship report details the findings of a Massachusetts Institute of Technology (MIT) project on the effectiveness of the Company's SER programme but this is not sufficient to award this element

(EIRIS, Hewlett-Packard Profile)

Product Energy efficiency

- 1) HP needs to provide information on the percentage of its products that are ES qualified in a more transparent and accessible way.
- 2) HP needs to reiterate its support wherever possible for more stringent energy efficiency standards for all electronic products. It needs to distance itself from such regressive positions. (HP is a member of ITI and CEA, industry associations that recently made comments against stricter energy efficiency standards (a. the inclusion of computers and servers; b. comments against battery chargers systems regulation, respectively in the scope of the California Appliance Efficiency Regulations)).

(Greenpeace, Guide to Greener Electronics: HP)

Avoidance of Hazardous substances

- 1) HP needs to set a limit or an objective for other forms of antimony apart from the antimony trioxide.
- 2) It also needs to set a goal to phase out all phthalates, although HP says it 'may require additional future restrictions'.

(Greenpeace, Guide to Greener Electronics: HP)

Use of recycled plastic in products

- 1) HP needs to publish overall figures on the overall quantities of recycled plastics used as a percentage of total plastics use.

(Greenpeace, Guide to Greener Electronics: HP)

Product life-cycle

- 1) HP needs to publicly disclose the length of warranty and spare parts availability for its main product lines.
- 2) It also needs to show some innovative measures that increase lifespan and durability of whole product systems, rather than only individual parts.

(Greenpeace, Guide to Greener Electronics: HP)

Chemical Management and Advocacy

- 1) HP needs to demonstrate proactive advocacy.

(Greenpeace, Guide to Greener Electronics: HP)

Effective voluntary take backs where no EPR laws

- 1) HP needs to prove energy recovery (aka incineration) is not part of the 16% recycling performance figure and if so, exclude it from future calculations.
- 2) HP needs to fill the gaps in its hardware recycling services in Africa and South America.

(Greenpeace, Guide to Greener Electronics: HP)

12.11 Nokia

Supply chain policy

- 1) Nokia needs to demonstrate membership of a relevant initiative dealing with supply chain labour standards such as the ETI - although the Company has stated that it became a full member of the Global e-Sustainability Initiative (GeSI) in 2007. This Group works closely with the Electronics Industry Citizenship Coalition (EICC), this is not sufficient to award this element.

(EIRIS, Nokia Corporation Profile)

Supply chain Systems

- 1) The Company needs to communicate its policy to its suppliers' employees globally
- 2) Needs to demonstrate extensive auditing and monitoring of its supply chain, including through the use of external monitors
- 3) It needs to demonstrate clear links between its supply chain labour standards management systems and its procurement management systems
(EIRIS, Nokia Corporation Profile)

Supply chain reporting

- 1) The Company needs to report on the proportion of its supply chain monitored/audited
- 2) Needs to provide data on supplier performance
- 3) Needs to report on the amount of non-compliances found with its policy
- 4) Needs to demonstrate stakeholder verification of its report and/or demonstrates that stakeholder engagement has informed report writing
- 5) Needs to demonstrate innovation/leadership in reporting
(EIRIS, Nokia Corporation Profile)

Product Energy efficiency

Nothing

Avoidance of Hazardous substances

- 1) Nokia needs to set a target for phasing out other antimony compounds. (it has a goal of phasing out brominated compounds, chlorinated flame retardants and antimony trioxide)
(Greenpeace, Guide to Greener Electronics: Nokia)

Use of recycled plastic in products

- 1) Nokia needs to add more examples of products using recycled plastics
- 2) It also needs to publish overall figures on the overall quantities of recycled plastics used as a percentage of total plastics use.
(Greenpeace, Guide to Greener Electronics: Nokia)

Product life-cycle

- 1) Nokia needs to publicly disclose the length of warranty and spare parts availability for its main product lines.
- 2) It also needs to show some innovative measures that increase lifespan and durability of whole product systems, rather than only individual parts.
(Greenpeace, Guide to Greener Electronics: Nokia)

Chemical Management and Advocacy

- 1) Nokia needs to make its list of restricted/banned components to be generally applied to raw materials and process chemicals. (Greenpeace says that Nokia does not openly support restrictions on at least PVC, CFRs and BFRs in the next 3-5 years in RoHS 2.0. New version (2011) of Nokia's substance list specifies a ban on use of certain restricted substances by suppliers but is not to be generally applied to raw materials and process chemicals
- 2) Nokia needs to make its Supplier Requirements for Environmental Management publicly available.
(Greenpeace, Guide to Greener Electronics: Nokia)

Effective voluntary take backs where no EPR laws

- 1) Nokia needs to list its program in Argentina on the corporate website.
- 2) It also needs to report the e-waste collection as a percentage of sales.
(Greenpeace, Guide to Greener Electronics: Nokia)

13. Appendix 5: Interview questionnaires to the companies

The letters were composed on the basis of the requirements still outstanding for each of the company. Therefore, only the most reasonable issues, which could be checked by the investors, were asked.

13.1 *Research in Motion*

Dear Sir/Madam,

I am sending this email on behalf of Robeco, a Dutch asset manager with approximately 170 billion euro assets under management, and one of RIM's shareholders.

Robeco is currently doing a research concerning labour standards, hazardous substances and their management and recycling in the supply chain of electronics. We have already researched RIM on the basis of public documents, but still do not seem to be able to find any information on the matters listed below. We hope that you may be willing to help us in regard to the following matters.

- 1) Do you require your suppliers and sub-contractors to meet core International Labour Organization convention area of collective bargaining?
- 2) Do you communicate the policies on Labour standards to supplier's employees (globally)?
- 3) Do you disclose procedures of monitoring of the suppliers for compliance with the policies? (If not, would you consider doing it?)
- 4) Do you disclose the procedures to address non-compliance? (If not, would you consider doing it?)
- 5) We know that RIM does not report on the energy efficiency of its chargers as a percentage of all external power devices. Is this right? Do you intend to report it in the future?
- 6) Do you have a set of objectives concerning improvement of energy efficiency of your products?
- 7) Do you report on the energy efficiency of your chargers?
- 8) Do you intend to eliminate/ban the use of hazardous substances in your products? (such as BFRs, PVC, phthalates, antimony/antimony compounds and beryllium/beryllium compounds)
- 9) Have you already produced a product free from these hazardous substances (Q8)?
- 10) (Q8) If you have already committed to it, have you set a time line for the phasing out?
- 11) Could you provide any data or examples of the use of post-consumer recycled plastic in your products?
- 12) Could you provide us information on the average warranty of your products and the product replacement parts availability?
- 13) Would you consider disclose this information (Q11) publicly?
- 14) Could you provide some information on your chemical management program for products and manufacturing and on the criteria you use to identify new chemicals for elimination/restriction?
- 15) Do you intend to introduce the take-back programs outside the North American region?
- 16) Would you consider reporting the quantities of e-waste collected and recycled?
- 17) Have you already set targets to increase the take-back and recycling activities?

We would really appreciate an opportunity to discuss these matters with you via a conference call, which might only take 15-20 minutes of your time.

If you need any further information, please do not hesitate to contact me by phone or via email.

I look forward to hearing from you.

Best regards,

Nadezda Kurilets
Responsible Investing
+31-10-224-33-81
Robeco

13.2 *Sharp*

Dear Sir/Madam,

I am sending this email on behalf of Robeco, a Dutch asset manager with approximately 170 billion euro assets under management, and one of Sharp's shareholders.

Robeco is currently doing a research concerning labour standards, hazardous substances and their management and recycling in the supply chain of electronics. We have already researched Sharp on the basis of public documents, but still do not seem to be able to find any information on the matters listed below. We hope that you may be willing to help us in regard to the following matters.

- 1) Do you communicate the policies on Labour standards to suppliers and their employees (globally)?
- 2) Do you disclose information on the training of both your own employees and those of your suppliers? (If not, do you intend to do so?)
- 3) Do you report on proportions of supply chain monitored/audited? (If not, would you consider doing it?)
- 4) Could you provide us with examples of the non-compliances found?
- 5) Do you report on the amount of non-compliance found?
- 6) Is this information publicly available? (Q4 and 5) (If not, would you consider publishing it?)
- 7) Could you provide us with figures on the percentage of your products that meet and exceed the latest Energy Star standard?
- 8) Do you have a new timeline for eliminating PVC and BFRs from your computing products?
- 9) Do you consider eliminating those hazardous substances from your products other than computing? (If so, do you have a time line for that?)
- 10) It is known that Sharp had an attempt to phase out PVC, phthalates, BFRs and antimony from its products by 2010. Thus, could you please elaborate on the new timeline for eliminating these substances?
- 11) Could you provide us with a figure showing Sharp's post-consumer plastics use as a percentage of total plastics used? (Would you consider publishing this information on your website?)
- 12) Could you also present a future target for this ratio? (Q9)
- 13) Do you consider publicly disclosing the spare parts availability for your main products? (If it is already publicly available, could you please send us a link to it?)
- 14) Unfortunately, we were not able to find any information on Sharp's criteria for identifying future substances for elimination. Therefore, does Sharp have this criteria publicly available? (If so, could you please send us a link or a document itself?)
- 15) Could you please clarify whether your suppliers are required to report their use of BFRs or antimony?
- 16) Would you consider publishing the amount of e-waste collected as a percentage of total sales? (If it is already published, could you direct us to it?)

We would really appreciate an opportunity to discuss these matters with you via a conference call, which might only take 15-20 minutes of your time.

If you need any further information, please do not hesitate to contact me by phone or via email.

P.S. We would really appreciate if you could reply to us as soon as possible.

I look forward to hearing from you.

Best regards,

Nadezda Kurilets
Responsible Investing
+31-10-224-33-81
Robeco

13.3 *Samsung*

Dear Sir/Madam,

I am sending this email on behalf of Robeco, a Dutch asset manager with approximately 170 billion euro assets under management, and one of Samsung's shareholders.

Robeco is currently doing a research concerning labour standards, hazardous substances and their management and recycling in the supply chain of electronics. We have already researched Samsung on the basis of public

documents, but still do not seem to be able to find any information on the matters listed below. We hope that you may be willing to help us in regard to the following matters.

- 1) Do you require your suppliers and sub-contractors to meet core International Labour Organization convention area of freedom of association and collective bargaining?
- 2) Do you communicate the policies on Labour standards to suppliers and their employees (globally)?
- 3) Do you audit and monitor your suppliers with the help of external monitors? (If not, would you consider doing it?)
- 4) Do you report on the number of facilities monitored/audited?
- 5) Do you report on procedures to address non-compliance?
- 6) Could you provide us with some examples of non-compliance found during the audits?
- 7) Do you report on amount of non-compliance found? (If not would you consider doing it?)
- 8) We know that Samsung had a target of phasing out Phthalates from Mobile phones and MP3 by January 2011. Did Samsung meet this goal?
- 9) It is also known that Samsung has set a target of using 25% of recycled plastics as of the total plastic content used by 2025. Thus, Does Samsung have an intermediate goal?
- 10) Does Samsung have a list of restricted substances for your manufacturing? (If yes, could you please give us a link to the document?)
- 11) It is known that Samsung offers take back and recycling programs in India (as a non- OECD country). Do you intend to extend your take-back programs to other non-OECD countries?
- 12) Currently you publish recycling rates only for Korea. Could you provide us with the global recycling rates of Samsung?
- 13) Do you consider making them publicly available? (Q12)

We would really appreciate an opportunity to discuss these matters with you via a conference call, which might only take 15-20 minutes of your time.

If you need any further information, please do not hesitate to contact me by phone or via email.

I look forward to hearing from you.

Best regards,

Nadezda Kurilets
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Robeco

13.4 **SONY**

Dear Sir/Madam,

I am sending this email on behalf of Robeco, a Dutch asset manager with approximately 170 billion euro assets under management, and one of Sony's shareholders.

Robeco is currently doing a research concerning labour standards, hazardous substances and their management and recycling in the supply chain of electronics. We have already researched Sony on the basis of public documents, but still do not seem to be able to find any information on the matters listed below. We hope that you may be willing to help us in regard to the following matters.

- 1) Do you require your suppliers and sub-contractors to meet core International Labour Organization convention area of collective bargaining?
- 2) Does your supply policy cover disciplinary practices?
- 3) Do you audit and monitor your supply chain with the help of external monitors?
- 4) Do you disclose procedures of monitoring of the suppliers for compliance with the policies? (If not, would you consider doing it?)
- 5) Do you disclose the procedures to address non-compliance? (If not, would you consider doing it?)
- 6) Do you report on number of facilities monitored/audited? (If not, would you consider doing it?)
- 7) Could you provide us with examples of non-compliance found in your supply chain?
- 8) Do you have a time line for elimination of beryllium oxide?

- 9) Do you intend to phase out or ban antimony?
- 10) Could you provide us information on Sony's use of recycled plastics as a percentage of the total plastics used?
- 11) Could you provide us information on the average warranty of your products and the product replacement parts availability?
- 12) Would you consider disclose this information (Q11) publicly?
- 13) Do you consider mentioning the need for RoHS 2.0 to adopt a ban on organo-chlorine and bromine compounds (at least PVC, CFRs, and BFRs within 3-5 years) as well as an end-of-life focused methodology for adding future substance restrictions?
- 14) Would you consider reporting the quantities of e-waste collected and recycled for each product type in the countries other than Japan? (PCs separately from TVs)

We would really appreciate an opportunity to discuss these matters with you via a conference call, which might only take 15-20 minutes of your time.

If you need any further information, please do not hesitate to contact me by phone or via email.

P.S. We also faced a problem while assessing a joint venture that you are in (Sony Ericsson). Could you please tell us how we can contact the company and where we can find its annual reports (if possible)? If this is not possible, which of two companies (Sony or Ericsson) we would have to contact to address the issues?

I look forward to hearing from you.

Best regards,

Nadezda Kurilets
Responsible Investing
+31-10-224-33-81
Robeco

13.5 *Panasonic*

Dear Sir/Madam,

I am sending this email on behalf of Robeco, a Dutch asset manager with approximately 170 billion euro assets under management, and one of Panasonic's shareholders.

Robeco is currently doing a research concerning labour standards, hazardous substances and their management and recycling in the supply chain of electronics. We have already researched Panasonic on the basis of public documents, but still do not seem to be able to find any information on the matters listed below. We hope that you may be willing to help us in regard to the following matters.

- 1) Do you require your suppliers and sub-contractors to meet core International Labour Organization convention area of freedom of association and collective bargaining? (If not, Do you intend to introduce this policy?)
- 2) Does your supply policy cover disciplinary practices?
- 3) Do you communicate the polies on labour standards to suppliers and their employees (globally)?
- 4) Do you audit and monitor your supply chain with the help of external monitors?
- 5) Do you disclose procedures of monitoring of the suppliers for compliance with the policies? (If not, would you consider doing it?)
- 6) Do you disclose the procedures to address non-compliance? (If not, would you consider doing it?)
- 7) Do you report on number of facilities monitored/audited? (If not, would you consider doing it?)
- 8) It is known that Panasonic has planned to eliminate the use of PVC in the notebooks by the end of 2011. Has the company achieved this goal?
- 9) Furthermore, we wonder whether the company's goal for phasing out BFRs from new models of mobile phones by the end of 2011 was achieved?
- 10) Does Panasonic have time lines for phasing out the hazardous substances? (Could you please send us a link, or a document with them?)
- 11) Do you plan to phase out the use of beryllium and compounds in the manufacturing?
- 12) Could you please clarify whether the amount of recycled plastics used in 2011 (approx. 6000 tons) includes the post-industrial recycled plastics?

- 13) Could you provide us with Panasonic's target and timeline for increasing the use of post-consumer recycled plastics?
- 14) Do you consider mentioning the need for RoHS 2.0 to adopt a ban on organo-chlorine and bromine compounds (at least PVC, CFRs, and BFRs within 3-5 years) as well as an end-of-life focused methodology for adding future substance restrictions?
- 15) Does Panasonic intend to list hazardous substances that are restricted for use? (If it has already done it, could you please send us a link to the document or the document itself?)
- 16) Currently Panasonic's take-back programs cover mainly mobile phones, PCs, TVs and toner cartridges. Thus, Does Panasonic intend to expand the range of products that can be given back for the recycling?
- 17) Could you please provide us with the information on quantities recycled in a relation to past sales for The US, Korea and other regions? (Would you consider publishing this information on your website?)
- 18) Does Panasonic have a target to increase the quantities recycled?

We would really appreciate an opportunity to discuss these matters with you via a conference call, which might only take 15-20 minutes of your time.

If you need any further information, please do not hesitate to contact me by phone or via email.

I look forward to hearing from you.

Best regards,

Nadezda Kurilets
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+31-10-224-33-81
Robeco

13.6 *Toshiba*

Dear Sir/Madam,

I am sending this email on behalf of Robeco, a Dutch asset manager with approximately 170 billion euro assets under management, and one of Toshiba's shareholders.

Robeco is currently doing a research concerning labour standards, hazardous substances and their management and recycling in the supply chain of electronics. We have already researched Toshiba on the basis of public documents, but still do not seem to be able to find any information on the matters listed below. We hope that you may be willing to help us in regard to the following matters.

- 1) Do you require your suppliers and sub-contractors to meet core International Labour Organization convention area of collective bargaining?
- 2) Do you communicate the policies on Labour standards to supplier's employees (globally)?
- 3) Do you audit and monitor your suppliers with the help of external monitors? (If not, would you consider doing it?)
- 4) Could you provide us with some examples of non-compliance found during the audits?
- 5) Do you report on amount of non-compliance found? (If not would you consider doing it?)
- 6) Do you report on the percentage of Toshiba's products that meet and exceed Energy Star standards for each product range? (If not would you consider doing it?)
- 7) We do know that Toshiba has a new commitment of phasing out some hazardous substances from all your consumer products by 2015. Thus, could you tell us, whether there has been any products produced already that does not contain the hazardous substances?
- 8) It is not quite clear to us whether Toshiba still aims at increasing the ratio of recycled plastics used in the production to up to 25%? Would you consider publicly disclosing this information?
- 9) Do you publicly disclose information on the average warranty of your products and the product replacement parts availability?
- 10) Would you consider disclosing this information (Q9) publicly?
- 11) Do you consider/intend mentioning the need for RoHS 2.0 to adopt a ban on organo-chlorine and bromine compounds (at least PVC, CFRs, and BFRs within 3-5 years), as well as an end-of-life focused methodology for adding future substance restrictions?

12) Could you clarify whether your take back programs in non-OECD countries cover products other than TVs?
(It is not quite clearly stated in the latest environmental report)

We would really appreciate an opportunity to discuss these matters with you via a conference call, which might only take 15-20 minutes of your time.

If you need any further information, please do not hesitate to contact me by phone or via email.

I look forward to hearing from you.

Best regards,

Nadezda Kurilets
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+31-10-224-33-81
Robeco

13.7 *Philips*

Dear Sir/Madam,

I am sending this email on behalf of Robeco, a Dutch asset manager with approximately 170 billion euro assets under management, and one of Philips' shareholders.

Robeco is currently doing a research concerning labour standards, hazardous substances and their management and recycling in the supply chain of electronics. We have already researched Philips on the basis of public documents, but still do not seem to be able to find any information on the matters listed below. We hope that you may be willing to help us in regard to the following matters.

- 1) Do you communicate the policies on Labour standards to suppliers and their employees (globally)?
- 2) Do you audit and monitor your supply chain with the help of external monitors? (If yes, please give some examples or links to where it can be seen)
- 3) Do you report on proportions of supply chain monitored/audited? (If not, would you consider doing it?)
- 4) Does Philips have a timeline for overcoming the exemption of beryllium? (If yes, is it publicly available?)
- 5) Could you clarify on the use and proportion of post-consumer plastics out of the total use of plastics? (Would you consider publishing this information on your website?)
- 6) Do you publicly disclose spare parts availability for your main products?
- 7) (Q6) If yes, could you send us a link referring to that information? If not, would you consider doing it?
- 8) Do you intend making your Classified Substance list publicly available? (If yes, when?)
- 9) Could you provide us with details of your recycling rate as a percentage of past sales? (Would you consider making this information publicly available?)

We would really appreciate an opportunity to discuss these matters with you via a conference call, which might only take 15-20 minutes of your time.

If you need any further information, please do not hesitate to contact me by phone or via email.

P.S. We would really appreciate if you could reply to us as soon as possible.

I look forward to hearing from you.

Best regards,

Nadezda Kurilets
Responsible Investing
+31-10-224-33-81
Robeco

13.8 *Dell*

Dear Sir/Madam,

I am sending this email on behalf of Robeco, a Dutch asset manager with approximately 170 billion euro assets under management, and one of Dell's shareholders.

Robeco is currently doing a research concerning labour standards, hazardous substances and their management and recycling in the supply chain of electronics. We have already researched Dell on the basis of public documents, but still do not seem to be able to find any information on the matters listed below. We hope that you may be willing to help us in regard to the following matters.

- 1) Do you communicate the policies on Labour standards to suppliers and their employees (globally)?
- 2) Do you disclose information on the training of both your own employees and those of your suppliers? (If not, do you intend to do so?)
- 3) Do you report on proportions of supply chain monitored/audited? (If not, would you consider doing it?)
- 4) Could you provide us with examples of the non-compliances found?
- 5) Do you report on the amount of non-compliance found?
- 6) Is this information publicly available? (Q4 and 5) (If not, would you consider publishing it?)
- 7) Could you provide us with figures on the percentage of your products that meet and exceed the latest Energy Star standard?
- 8) Do you have a new timeline for eliminating PVC and BFRs from your computing products?
- 9) Do you consider eliminating those hazardous substances from your products other than computing? (If so, do you have a time line for that?)
- 10) Does Dell have a target for increasing use of post-consumer recycled plastics? (If so, is it publicly available?)
- 11) Does Dell publicly disclose the length of warranty for its main product lines?
- 12) Do you also publicly disclose the spare parts availability for your main products?

We would really appreciate an opportunity to discuss these matters with you via a conference call, which might only take 15-20 minutes of your time.

If you need any further information, please do not hesitate to contact me by phone or via email.

P.S. We would really appreciate if you could reply to us as soon as possible.

I look forward to hearing from you.

Best regards,

Nadezda Kurilets
Responsible Investing
+31-10-224-33-81
Robeco

13.9 *Apple*

Dear Sir/Madam,

I am sending this email on behalf of Robeco, a Dutch asset manager with approximately 170 billion euro assets under management, and one of Apple's shareholders.

Robeco is currently doing a research concerning labour standards, hazardous substances and their management and recycling in the supply chain of electronics. We have already researched Apple on the basis of public documents, but still do not seem to be able to find any information on the matters listed below. We hope that you may be willing to help us in regard to the following matters.

- 1) Do you report on proportion of your supply chain monitored/audited? (If not, would you consider doing it?)
- 2) Do you disclose details of stakeholder dialogues/engagements? (If not, would you consider doing it?)
- 3) Do you provide data on performance of your suppliers? (If not, would you consider doing it?)
- 4) It is known, that Apple does not mention antimony and neither refers to beryllium in its list of substances for elimination. Would you consider mentioning them?
- 5) Could you provide us with information on your use of post-consumer recycled plastics?
- 6) Would you consider publishing this information on your website? (Q5)

- 7) Do you intend to make the information on the spare parts availability for your main products publicly available?
- 8) Would you consider publicly disclosing your Regulated Substances Specification document? (if it is already available, could you please send us a link to it?)
- 9) Could you provide a breakdown of the recycling quantities of your various products (so per product group)?

We would really appreciate an opportunity to discuss these matters with you via a conference call, which might only take 15-20 minutes of your time.

If you need any further information, please do not hesitate to contact me by phone or via email.

P.S. We would really appreciate if you could reply to us as soon as possible.

I look forward to hearing from you.

Best regards,

Nadezda Kurilets
Responsible Investing
+31-10-224-33-81
Robeco

13.10 *Hewlett-Packard*

Dear Sir/Madam,

I am sending this email on behalf of Robeco, a Dutch asset manager with approximately 170 billion euro assets under management, and one of HP' shareholders.

Robeco is currently doing a research concerning labour standards, hazardous substances and their management and recycling in the supply chain of electronics. We have already researched HP on the basis of public documents, but still do not seem to be able to find any information on the matters listed below. We hope that you may be willing to help us in regard to the following matters.

- 1) Do you communicate the policies on Labour standards to suppliers and their employees (globally)?
- 2) Have PH responded to non-compliance found by external organizations last year? (For instance, China Labour Watch published a report in July 2011 called Electronic Sweatshops which contained allegations of excessive working hours in Hewlett-Packard's supply chain)
- 3) Do you have independent verification of HP's reports?
- 4) Could you provide us with information on the percentage of your products that are Energy Star qualified?
- 5) (Q4) Is this information publicly available? (If yes, please give us a link to it) (If not, would you consider making it so?)
- 6) Do you have a set limit or an objective for forms of antimony other than antimony trioxide? (If yes, is this information publicly available?)
- 7) Do you have a goal to phase out **all** phthalates? (Is this information public? If so, please give us a link) (If not, would you consider making it public?)
- 8) Could you provide us with the overall figures on the overall quantities of recycled plastics used as a percentage of total plastics used?
- 9) (Q8) Is this information publicly available? If not, would you consider making it so?
- 10) Is the length of warranty for your main product lines publicly available? (If so, could you please send us a link?)
- 11) Is the availability of spare parts for your main product lines publicly available? (If so, could you please send us a link?)
- 12) Do you offer the same amount of hardware recycling services of the same quality in Africa and South America in comparison to the US?

We would really appreciate an opportunity to discuss these matters with you via a conference call, which might only take 15-20 minutes of your time.

If you need any further information, please do not hesitate to contact me by phone or via email.

P.S. We would really appreciate if you could reply to us as soon as possible.

I look forward to hearing from you.

Best regards,

Nadezda Kurilets
Responsible Investing
+31-10-224-33-81
Robeco

13.11 *Nokia*

Dear Sir/Madam,

I am sending this email on behalf of Robeco, a Dutch asset manager with approximately 170 billion euro assets under management, and one of Nokia' shareholders.

Robeco is currently doing a research concerning labour standards, hazardous substances and their management and recycling in the supply chain of electronics. We have already researched Nokia on the basis of public documents, but still do not seem to be able to find any information on the matters listed below. We hope that you may be willing to help us in regard to the following matters.

- 1) Do you communicate the polies on Labour standards to suppliers and their employees (globally)?
- 2) Do you audit and monitor your supply chain with the help of external monitors? (Could you please, send us a link to the examples stating this?)
- 3) Do you report on proportions of supply chain monitored/audited? (If not, would you consider doing it?)
- 4) Do you report on the amount of non-compliance found? (Could you send us the link to this information?)
- 5) It is know that Nokia has a goal of phasing out brominated compounds, chlorinated flame retardants and anti-mony trioxide. Thus, do you have a set target for phasing out other antimony compounds?
- 6) (Q5) If yes, could you send us a link or the document stating it? If not, would you consider setting this target?
- 7) Could you provide us with the overall figures on the overall quantities of recycled plastics used as a percentage of total plastics used?
- 8) (Q7) Is this information publicly available? If not, would you consider making it so?
- 9) Is the length of warranty for your main product lines publicly available? (If so, could you please send us a link?)
- 10) Is the availability of spare parts for your main product lines publicly available? (If so, could you please send us a link?)
- 11) As far as we know, your Supplier Requirements for Environmental Management is not publicly available. Do you intend to make it public? If yes, then when?
- 12) Do you intend to list your recycling program in Argentina on the corporate website?
- 13) Could you provide us with information on your e-waste collection as a percentage of sales?
- 14) (Q13) Would you consider making this information public?

We would really appreciate an opportunity to discuss these matters with you via a conference call, which might only take 15-20 minutes of your time.

If you need any further information, please do not hesitate to contact me by phone or via email.

P.S. We would really appreciate if you could reply to us as soon as possible.

I look forward to hearing from you.

Best regards,

Nadezda Kurilets
Responsible Investing
+31-10-224-33-81
Robeco

14. Appendix 6: Companies' responses

14.1 *Dell*

In response to the questionnaire Dell stated that:

- 1) It does communicate its policies on labour standards to suppliers and employees globally. For instance the Company requires its Tier-1 suppliers to achieve and maintain certification on two important, international standards: the ISO 14001 environmental management system standards and the OHSAS 18001 occupational health and safety management system standard (or similar standard). (Dell, Supplier Accountability Approach and Standards)
In addition, Dell offers Social and Environmental Responsibility (SER) workshops which give its supply chain the opportunity to learn and share best practices. Key topics include the Carbon Disclosure Project, management of working hours and corporate responsibility performance evaluation tools. (Dell, Supplier Accountability Approach and Standards)
- 2) Dell discloses information on training of both its own suppliers and those of its employees. It pointed out that Company's supplier audits resulted in improved training programs to raise awareness across its supply chain.
- 3) Furthermore, in 2011 Dell launched its first global health and safety course which was offered globally. More than that, Dell also launched its global, executive-led Leadership Imperative training designed to build alignment and engagement around our purpose, values, strategy and brand in support of our business transformation. So far more than 51,000 team members participated in this training in-person or online since its launch — and Dell has a goal of reaching all team members around the world. (Dell, How does Dell steward Corporate Responsibility and Report on our progress?) As for the employees of Dell's suppliers the company brought training resources from Carbon Disclosure Project (CDP) and Global Reporting Initiative (GRI) as well as Dell helped with HR-type training for managers.
- 4) As for the proportions of supply chain monitored/audited, Dell reports only the total number of the audits and not as a percentage of all the suppliers. Therefore, the Company audited 46, 62 and 119 suppliers in 2009, 2010 and 2011 respectively. (Dell, How does Dell steward Corporate Responsibility and Report on our progress?)
- 5) The Company also asked to pay attention to its CSR report for the examples of non-compliance found as a result of supplier audits. Thus, according to Dell the Excessive working hours remains one of the most common issues found in our audits, especially in China. That is why the Company makes a concerted effort to reduce the instances of working hour infractions. More specifically, Dell has asked suppliers with significant issues to regularly report key performance indicators. In February 2011, Dell engaged with the EICC Working Hours Work Group to determine how the industry can collaborate to identify the root causes of excessive working hours and how to address them with suppliers. (Dell, How does Dell steward Corporate Responsibility and Report on our progress?)
- 6) Furthermore, Dell stated that it does not report on the amount of the non-compliance found. However, it pointed out that this information is shared only with selected customers and partners under Non-disclosure agreement (NDA). Moreover, the company is currently considering a possibility of making this information publicly available.
- 7) Dell was not able to provide us with a figure on the percentage of its products that meet and exceed the latest Energy Star standard.
- 8) The Company could not give us its timeline for eliminating PVC and BFRs from its computing products. Furthermore, Dell has no intention so far to eliminate these hazardous substances from products other than computing.
- 9) Neither Dell has a target for increasing the use of post-consumer recycled plastics.
- 10) The Company also confirmed that it publicly discloses the length of warranty for its product lines. This information can be found here (Dell, Warranty Information). However, this website requires the Dell computers personal tag, so I could not get the personalized information for any of the products. Furthermore, Dell directed me to its page concerning the spare parts availability for its product lines. On the page (Dell, Parts & Upgrades) all possible spare parts for products can be found and purchased by customers.

(Dalton)

14.2 *Hewlett-Packard*

During the call HP representatives gradually went through all the questions I sent them before hands. Therefore here are the outcomes:

- 1) HP stated that they do engage with its suppliers (communicate code of conduct, assess and audit). Furthermore, the company has implemented the employee trainings for the suppliers' workers in order to increase their awareness of the code of conduct. Nevertheless, in the corporate annual report for 2012, nothing is mentioned about the trainings held or available to the suppliers and their employees
- 2) HP also pointed out that it does respond to all of the allegations in its annual reports. However, there was no response published in reference to the report published in July 2011 by China Labour Watch, which was called Electronic Sweatshops.
- 3) As for the third party verification of the reports, the company stated that they do have this practice, but then the auditors mainly do not check content. In other words these auditors do not audit the factories themselves.
- 4) Hewlett Packard does not publish the percentage of its products that are Energy Star qualified. However, the company's representatives pointed out that currently HP has over 600 goods exceeding the ES standard. Moreover as it can be seen on the corporate website, HP lists all the product groups and the individual models that are Energy star qualified. See the source (Hewlett-Packard, ENERGY STAR)
- 5) In reference to the hazardous substances such as antimony in other forms than trioxide and phthalates, HP constantly evaluates possibilities of reductions or even the prohibition of those chemicals from the products. Nevertheless, none of them have been eliminated yet. For deeper information on the chemical composition of HP products and the substitution timeline see the corporate website. (Hewlett-Packard, Materials)
- 6) Although no information is being published by the company on the percentage of post-consumer recycled plastics used out of all plastics used in the production, the company's representatives stated that this portion would be approximately 5% for the year 2011.
- 7) Furthermore, it was pointed out that all information on warranties and spare parts availability was published on the corporate website. In addition, it was mentioned that for consumer products HP offers one year warranty and for commercial goods three year warranty is available. Therefore, for the personal information on warranties and spare parts see two webpages. (Hewlett-Packard, HP Total Care) (Hewlett-Packard, HP Parts Store)
- 8) Last but not least, Hewlett Packard indicated that it had consistent recycling/take-back policies globally. From the corporate webpage entitled "Product recycling" it can be seen that hardware recycling program does not cover many countries in South America and Africa. (Hewlett-Packard, Product recycling) (Fallon, Catriona. Conference call. 17 Apr. 2012)

14.3 *Research in Motion*

The interview with Research in Motion took place via conference call on 20th of April. The main outcomes of the conversation are listed below:

- 1) RIM does not specifically require its suppliers and sub-contractors to meet core ILO convention area of collective bargaining.
- 2) The company does communicate its Suppliers Code of Conduct to its suppliers. However, it does not have any practices of educating their sub-contractors' employees about this code.
- 3) The company representative also pointed out that RIM conducts risk assessment of its suppliers and in case of non-compliances they have to develop and implement corrective plan. (This however is not to be found in the public documents)
- 4) At this point in time Research in Motion does not report on the energy efficiency of its chargers as a whole and neither on its energy efficiency as a percentage of all external power devises. Furthermore, currently the company does not have the objectives for improvement no either of these matters.
- 5) It was pointed out that as of 2011 phthalates were removed from RIM's all accessory products. Moreover, starting January 2012 all the goods produced are beryllium free and all the blackberry hands sets are PVC – free. As for the rest of the hazardous substances RIM conducts active investigation on further banning and eliminations.
- 6) It was also clearly communicated that Blackberry devises do not contain post-consumer recycled plastics, because this component makes the handsets less durable. Therefore, RIM does not want its products to be fragile.
- 7) Currently the Company offers take back programs through individual carriers in areas other than North America. Therefore, as those collectors are established as separate entities, the quantities of e-waste collected are not available for RIM's assessment and reporting. In addition, the Company does not have well acknowledged take-back/recycling targets.

- 8) Last but not least, the warranty information for individual goods can be found only in the product manuals, and not on the corporate website. As for the spare parts availability, information on only the basic parts can be found through vendors and corporate website.
(RIM's CSR representative. Conference call. 20 Apr. 2012)

14.4 *Nokia*

In its response to the questionnaires Nokia stated that:

- 1) The company does communicate its policies on labour standards to suppliers and their employees globally. This is done as a part of Nokia Supplier requirements. Thus, training of the factory workers on the Corporate Labour Conditions Standards and Code of Conduct is the way Nokia communicates these policies at a factory level. (Nokia, Employment practices)
- 2) The corporation usually monitors its 1st tier suppliers and sometimes the lower levels through its own trained professionals. In addition, Nokia occasionally works with third parties for specific expertise or investigations, or as part of joint industry assessments. (Nokia, Supply chain)
- 3) The company reports on the proportions of supply chain monitored on the subject of Nokia Supplier Requirements (NSR) and Environmental & Ethical assessments all. For instance in relation to the environmental management Nokia audited 96% of its direct suppliers in 2010.
- 4) Nokia's representatives pointed out that so far no figures on the amount of non-compliance found in the supply chain have been reported. However, the company discloses the types of non-compliance that occur most of all. Those include disciplinary actions, freedom of association, health and safety requirements, overtime hours, pay structure, sub-supplier monitoring system and waste management. (Tony Nysten)
- 5) Currently the company is conducting research on the alternatives for antimony compounds other than antimony trioxide. The substitution of those chemicals will take place in 2012-2013.
- 6) Nokia does not publish figures on the overall quantities of recycled plastics used as a percentage of total plastics used.
- 7) According to the company the length of warranties and spare parts availability greatly depend on the devices and country of purchase. Therefore, the specific information on this matter can be found in user guides for each individual product or on the website which would show those user guides.
- 8) As for the disclosure of the Corporate Supplier Requirements for Environmental Management, it is now publicly available. (the link: (Nokia, Nokia Supplier Requirements: excerpts relating to management, human resources and environment))
- 9) Furthermore, the company indicated that it is now in the process of upgrading its recycling map. Thus the take-back program in Argentina will be publicly acknowledged.
- 10) Nokia does not report its e-waste collection as a percentage of sales. Nevertheless, the company does report on the amounts collected in tons.

(Nysten)

14.5 *Samsung*

In response to Robeco's inquiry for CSR issues Samsung stated that:

- 1) Samsung Electronics requires its suppliers not only to adhere to its Code of Conduct but also the EICC Code of Conduct to commit social responsibility in supply chain. In Code of Conduct, freedom of association and collective bargaining in ILO is included. Furthermore, Through the EICC Self-Assessment Questionnaire (SAQ) and audit, Samsung monitors the level of its suppliers' commitment to the EICC Code of Conduct.
- 2) Since 2009, Samsung has been providing CSR training to both suppliers and their employees. Moreover, for Korean, Chinese and Asian suppliers, Corporate Social Responsibility trainings were held for a better understanding of CSR among the supplier employees. In addition, Samsung explains to its suppliers the supplier CSR policy and the EICC system through Samsung's supplier CSR supporting system and provides them with the self-assessment system to monitor their management. Furthermore, although, the company stated that it does monitor some of its suppliers with the help of external auditors, it did not give any examples of that.
- 3) Samsung pointed out that in 2011, 1945 1st-tier suppliers had completed SAQ, and six suppliers had undergone The VAP audit. This information was promised to be published in the next Sustainability report.
- 4) It was also stated that for high-risk suppliers in sense of non-compliance found, the company requires each individual supplier to carry out a corrective plan and conduct re-audit of the issues. Moreover, Samsung provided me with several examples of non-compliance most often found at their suppliers' facilities. Those include failure to observe rules relating to maximum work hour, rest day, fire drill, and fill alarm. The Company indicated that it had asked the suppliers to eliminate those non-compliances and it is currently monitoring the progress. However, Samsung does not report on amount of non-compliances found.

- 5) In reference to its target of phasing out phthalates from all mobile phones and MP3, the Company stated that it did achieve this target. In other words, since January 2011 Samsung produces phthalates free Mobile phones and MP3.
- 6) Samsung does not have any intermediate targets for post-consumer (PCP) and post-industrial (PIP) recycled plastics use other than the 2.62% of PCP by 2013.
- 7) In addition, the company is currently considering launching a take-back program in Cambodia in collaboration with UNIDO.
- 8) Last but not least, Samsung pointed out that it is difficult for them to provide global recycling rates as the take-back programs are very complicated in consideration with the product categories. Therefore, the corporation does not intend to publish these figures in the nearest future.

(Kwon)

14.6 *Sharp Corporation*

In its response to the questionnaire Sharp Corporation stated that:

- 1) It requires its suppliers to meet core ILO convention area of collective bargaining. However, it is not stated anywhere on the website or in public documents. Thus, only the freedom of association right is listed.
- 2) The company communicates its policies on Labour Standards to its suppliers and their employees. More specifically, Sharp communicates them to approximately 2000 suppliers. It also stated that it requires its suppliers to provide training/education regarding Human Rights and Labour Standards to all employees who need to know.
- 3) The information on trainings of own and supplier's employees is publicly available on the corporate website. More specifically, Sharp conducts trainings for its own employees on human rights issues at each site. Specifically for 2010 approximately 60 sessions were held. (SHARP, Creating a Fair, Positive and Progressive Workplace) In addition, the company provides training possibilities for supplier's employees on health and safety management via Health and Safety Council Meetings. (SHARP, Environmental and Social Report 2011 99)
- 4) Sharp does not report on the percentage of supply chain monitored, but it does mention that up to date 2000 suppliers have been audited and that it intends to expand the monitoring further. (SHARP, Environmental and Social Report 2011 88)
- 5) The company does not publish the examples of non-compliance found with regards to labour practices. Nevertheless, several other non-compliances are mentioned in the corporate public documents. For instance, price-fixing of LCDs (December 2006).
- 6) Sharp has not set a new timeline for eliminating PVC and BFRs from its computing products. Neither it publishes or has a figure showing its post-consumer plastics use as a percentage of total plastics used. Thus, there is not target for this use either.
- 7) The company does not publicly disclose the spare parts availability for its main product groups. Furthermore, Sharp stated that it does not intend to publish information on its plans for future hazardous substances for elimination and to publish the amount of e-waste collected as a percentage of total sales.
- 8) In addition, Sharp's Manual for Survey of Chemical Substances Contained in Parts and Materials is available only for the corporate suppliers and the company does not intend to disclose this document publicly.
- 9) Sharp requires its suppliers to report on their use of Polybrominated biphenyls (PBBs) and Polybrominated diphenyl ethers (PBDEs), which are a part of BFRs group. (Sharp Corporation) However, so far the antimony has not been a subject to requirement, because the Corporation tries to be in line with "Joint Industry Guide - Material Composition Declaration for Electro technical Products - JIG-101 Ed.4.0" which was released by Consumer Electronics Association (CEA), DIGITALEUROPE and Japan Green Procurement Survey Standardization.

(Nakamura)

14.7 *Apple*

The information acquired as a result of the interview with Apple is presented below:

- 1) The Company reports only on the number of audits it performs in its annual Supplier Responsibility progress reports.
- 2) Apple reports extensively on their supplier responsibility progress each year on their website. The Company has also recently joined the Fair Labour Association, who has independently reported on results of its audits of Apple's supply chain.
- 3) In reference to the issue of listing antimony and beryllium Apple did not respond directly. However, the information they gave us was: "Apple goes well beyond the strictest standards for the restriction of hazardous materials. This includes Sb2O3. Apple was the first company in the industry to eliminate all BFRs across

portables, desktops and handheld devices. Concentrations of BeCu are maintained at levels close to non-detectable limits”.

- 4) As for the information on the corporate use of post-consumer recycled plastics, Apple provided several links to its website saying that there will be some information about this issue, but I did not see to be able to find any relevant information.
- 5) Apple also pointed out that the information about the spare parts availability for its products is available only to qualified service repair centres.
- 6) Moreover, Apple did not give any relevant information on the public availability of its Regulated Specification Document and neither did it provide any information on the recycling quantities of its various products, as broken down per product group.

Nevertheless the exact answers for the last questions were:

“One of the environmental challenges facing our industry today is the presence of toxic substances such as arsenic, brominated flame retardants (BFRs), mercury, phthalates, and polyvinyl chloride (PVC) in products. Although most countries still allow use of these substances, we have worked with our manufacturing partners to eliminate them from our products. Not only is every product we sell free of BFRs and other harmful toxins, we have also qualified thousands of components to be free of elemental bromine and chlorine, putting us years ahead of anyone else in the industry. In addition, every display we make — whether it’s built into a system or available as a stand-alone — features mercury-free LED backlighting and arsenic-free glass.” (Investor Relations)

“Apple has instituted recycling programs in cities and college campuses in 95 per cent of the countries where our products are sold, diverting more than 115,504 metric tons of equipment from landfills since 1994. Our goal in 2010 was to achieve a worldwide recycling rate of 70 per cent. (To calculate this rate, we use a measurement proposed by Dell that assumes a seven-year product lifetime. The weight of the materials we recycle each year is compared to the total weight of the products Apple sold seven years earlier.) We met and exceeded that goal in 2010. This far surpasses the last reported numbers from Dell and HP, which were each lower than 20 per cent. In 2011, Apple global recycling once again exceeded our 70 per cent goal, and we are confident that we will maintain this level through 2015.” (Investor Relations)

14.8 *Toshiba*

In response to the questionnaires sent, Toshiba stated that:

- 1) It requires its suppliers and sub-contractors to respect Toshiba Group Procurement Policy which states to comply with laws, regulations and social customs and also to respect human rights, labour, health and safety. However, the core International Labour Organization convention area of collective bargaining was not explicitly mentioned by the company.
- 2) At the time of contract, the company distributes Toshiba Group Procurement Policy to its suppliers. It also holds seminars for the suppliers to explain and receive understanding about Toshiba Group Procurement Policy.
- 3) In respect to external auditing of the suppliers, Toshiba pointed out that it currently assesses them based on the internal company’s format, but in the future the company plans to use EICC assessment tool.
- 4) Toshiba has found several non-compliance practices during the audits. Those include compliance with water discharge standards from the water outlet facilities, segregation of storage with regard to hazardous and non-hazardous substances, establishment of rules for the environmental management of storage facilities, compliance with safe operating practices, dealing with emergencies, education on health maintenance and complying with safe and proper methods at the time of unloading of goods
- 5) Although Toshiba does not report on the amount of non-compliance found, it discloses some of their statuses on the corporate website.
- 6) Regarding the energy star compliant products, all Toshiba note PCs developed since 2009 (as of September, 2010) comply with ENERGY STAR Version 5.0 for all configuration except particular products such as no-OS models. (TOSHIBA, Environmental Product Design: Life Cycle Approach) Also, 88% of the above mentioned products exceed more than 30 % of the standard. As for the external power supplies of PCs, as it is a requirement for ENERGY STAR of PC, 100% of the external power supplies of the above PCs have achieved Level V rating on the International Efficiency Marking Protocol for External Power Supplies. In addition, 69% of Toshiba’s TV models comply with ENERGY STAR Version 5.3 as of April 2012. Nevertheless, I did not seem to find this information in any corporate public documents.
- 7) In line with its commitment of phasing out some hazardous substances from all the consumer products by 2015 the company has introduced PVC/BFR free notebook PC model, Tecra A11-EV1 in 2011. (TOSHIBA,

Environmental Product Design: Life Cycle Approach) However, since 2011 no other products were freed from hazardous substances.

- 8) Toshiba has been recycling waste plastic materials generated from end-of-life products, and in FY2009, it used about 800 tons of recycled plastic materials in total for the base plates of TVs, notebook PCs and some other products. Currently the company is making efforts to expand the use of recycled materials. Thus, it has an internal rule to use recycled plastic to at least a part of every product. However, the goal for the percentage of recycled plastics used in the production is still not publicly available.
- 9) Regarding the product warranty, in case of PCs, Toshiba sets the basic warranty period from 1 to 2 years, and provides extended warranties of 3 to 5 years as an option. The company believes that this surpasses the industry standard. As for the life-cycle extension measures, it has various efforts and but the ones mentioned in communication were the Protection of PC Hard Disc Drives from accidental shock, Honeycombed rib structure for PC case and Adoption of SSD (Solid State Drive). (TOSHIBA, Environmental Product Design: Resource Saving Design) In addition, Toshiba pointed out that it discloses the information on warranties on each separate product website. For instance the warranties for PCs can be found here: (TOSHIBA, Portege)
- 10) The company does mention the fact that it adheres to the RoHS Directive. However, it does not specifically mention the need for RoHS 2.0 to adopt a ban on organo-chlorine and bromine compounds (at least PVC, CFRs, and BFRs within 3-5 years), as well as an end-of-life focused methodology for adding future substance restrictions. (TOSHIBA, Management of Chemicals for Products)
- 11) The company stated that it has a global PCs recycling program, which covers several non-OECD countries such as China, Singapore, Thailand, Indonesia, Malaysia, Vietnam, Philippines and India. (TOSHIBA, PC Product Recycling) Apart from the PCs, Toshiba takes back Medical equipment in Asia, Oceania and Americas. Furthermore, in Americas the company also collects Business-use equipment, and TV sets. (TOSHIBA, Global Recycling)
(Soma)

14.9 **SONY**

In response to the questionnaire Sony pointed out that:

- 1) Corporate code of conduct does cover only rights of workers to associate freely in accordance with the local laws. Thus, the right for collective bargaining is still not required to be fulfilled. In addition, Sony bases its Supplier Code of Conduct on EICC code, but disclosed the disciplinary principles under the policy prohibiting harsh or inhumane treatment. “ There is to be no harsh and inhumane treatment, including any sexual harassment, sexual abuse, corporal punishment, mental or physical coercion or verbal abuse of workers: nor is there to be the threat of any such treatment” (SONY, SONY SUPPLIER CODE OF CONDUCT)
- 2) Sony’s suppliers have undergone Audits based on EICC standards through the EICC’s shared audit programs. In other words the Company monitors its supply chain with the third party auditors certified by EICC. (SONY, Supply Chain Management) On its website the Company mentions that suppliers’ audits are done through several tools such as manuals and checklists. Sony stated that it uses the manuals and checklists provided by EICC. Which can be found here: (Electronics Industry Citizenship Coalition)
- 3) In the case of non-compliance found as a result of audit, Sony’s policy states that the company should reconsider its business relationship with the suppliers in the event of a major violation of the Supplier Code of Conduct or when the suppliers do not exhibit an appropriate level of cooperation to studies and audits. Furthermore, in case the violation has been confirmed by the third party, Sony asks first tier suppliers to take corrective actions and report back on the progress. When a violation has been made by a secondary supplier, the company works in cooperation with relevant primary supplier to urge the corrective action. (SONY, Supply Chain Management)
- 4) Sony reports only on the proportion of the supply chain monitored. More specifically it has audited more than 90 per cent of the suppliers. The company does not disclose the particulars of the non-compliances found. For instance it says that the most common violations occur in Labour and Ethics Management System, Health and Safety, and Labour.
- 5) Although Sony is replacing the BFRs where antimony is used, the latter substance is still not banned.
- 6) Currently the company is working on methodology on how to collect data on recycled plastics used in production, and as soon as the exact rate is found it will publicly available. However, the company’s representative pointed out that for FY 2010 the rate was approximately 8 per cent.
- 7) In a dialogue Sony stated that warranties for its main product groups vary from 1 to 3-5 years, when 1 is a basic manufacturer’s coverage and 3-5 is the one customer can get is needed. In addition, all this information is publicly available. (SONY, Peace of mind: Sony's got you covered with Extended Service Plans)

- 8) The corporation still does not mention the need for RoHS to adopt a ban on organo-chlorine and bromine compounds (at least PVC, CFRs, and BFRs within 3-5 years) as well as an end-of-life focused methodology for adding future substance restrictions.
- 9) Sony still does not report on the quantities of e-waste collected and recycled for each product type in countries other than Japan. It stated: “We are disclosing the quantities of TVs and PCs collected and recycled in Japan separately since we have those data in hand. The infrastructure and scheme for collection and recycling vary between countries and regions. For example in Europe, the European WEEE Directive mandates collection/recycling of any kind of WEEE, but does not specify the collection groups. Those are defined by the country or the operating producer compliance schemes. As both the collection groups and the level of details such schemes disclose to their members differ substantially, it is not possible to harmonize the disclosure of such information on country level which will hinder us to provide a comprehensive result with the requested breakdown in the future”. (Yamamoto)

14.10 *Philips*

During a phone interview with two Philips representatives they stated that:

- 1) First of all it is difficult to assess Philips with the help of the same criteria used for companies from ICT industry. That is mainly because Philips has around 300 000 products, and 10 000 suppliers.
- 2) Nevertheless, Philips does communicate its policies on labour standards to all of its suppliers via asking them to sign Supplier General Purchasing Agreement and Suppliers Sustainability Declaration, which is based on EICC. (Philips) However, it was pointed out that the company is simply not able to communicate those policies to the employees of the suppliers, as there are around 10 000 of them (suppliers).
- 3) All of the Company’s audits are done through a third party monitoring, for instance SGS. In addition, in 2011 300 audits took place.
- 4) Philips does not have a timeline for overcoming the exemption of beryllium. It was also stated that the current technologies worldwide do not allow a complete elimination of this substance.
- 5) As the Company has around 300 000 products it is difficult to say the overall proportion of post-consumer plastic used in production. That is why, Philips still does not report on the quantities of post-consumer plastics it used. However, it did state that for 2011 it used 160 tons of recycled plastics, mainly in vacuum cleaners, irons, coffee machines, and that the Company has a target of 4 000 tons usage by 2015. Furthermore, currently Philips negotiating with suppliers of plastic on exclusive agreements with smaller and more specialized suppliers.
- 6) As for the products warranties, they are included in the manuals. Furthermore the spare parts availability for company’s goods is not publicly disclosed; however all its customers receive extensive information on it. Despite this, it is difficult for Philips to offer the spare parts for the products, because they vary very much. (from lamps to medical equipment)
- 7) The Classified Substance List is publicly available on the corporate website.
- 8) And once more again it was stated that due to a huge amount of products it is difficult for the Company to calculate and publish its recycling rates as a percentage of past sales. However, Philips indicated that annually approximately 50% of consumer electronics out of the total sales for that year was collected. In addition, the percentage for lightning, health care and TV sets is 30-35%, 10% and 50%, respectively. The healthcare present is low due to the long useful life of the goods. (Scheijgrond and Braaksma)

14.11 *Panasonic*

A conference call with people from Panasonic’s CSR, IR and Environmental departments resulted in clarification on all of the questions asked in the email. The answers can be found below:

- 1) Panasonic communicates its policies on labour standards to suppliers via either a contract or the corporate website. However, with reference to the issues of freedom of association and collective bargaining and disciplinary principles, the company does not explicitly mention them to the suppliers. This is due to the differences in per country regulations. However, the representative pointed out that Panasonic does support these 2 principles and considers them to be crucial. In addition as for the freedom of association and collective bargaining in the contracts Panasonic mentions that it expects the management teams per supplier to freely communicate with the workers.
- 2) The company stated that it arranges seminars for the employees of their suppliers in order to educate them on the matter of policies.

- 3) Panasonic indicated that it mainly assesses the suppliers with the help of the external auditors, and very rarely via onsite visits.
 - 4) It was also mentioned that Panasonic does assessments on the yearly basis, but not specifically stated that for labour practices it has separate, publicly available procedures guidelines. However, the corporate website contains the procedures for addressing non-compliance found. More specifically, when non-compliance occurs, Panasonic tries to work together with a supplier to fix the matter, and if the efforts turn out to be fruitless, the Company either reduces the quantity purchased from that particular supplier or stop the contract.
 - 5) Panasonic pointed out that it does not report on the number of facilities monitored on the yearly basis.
 - 6) The Company is still working on the elimination of PVC from its notebooks. The chemical is used in installations, wiring and AC cords and it was stated that the most difficult issue is to find a substitute for PVC in cords. Therefore, Panasonic currently produces notebooks that contain PVC only in the AC cords. In addition, organization has a target of phasing out PVC from cords and wiring by the end of 2012.
 - 7) As for the BFRs, the Company stated that the starting from January 2012 the new smart phones are BFRs free.
 - 8) Panasonic is currently considering eliminating beryllium and compounds from its products but it is very difficult to find a substitute for Beryllium Copper, because it is light and that is what needed from the newest devices. In addition, the Company makes sure that none of the workers at their beryllium suppliers' factories are affected by the chemical.
 - 9) The amount of recycled plastics published by Panasonic in 2011 includes the post-industrial recycled plastics. However, it was mentioned that the company does not differentiate the post-consumer and post-industrial recycled plastics. Therefore, there is no specific target for the post-consumer plastics.
 - 10) The Company does not publicly state the need for RoHS 2.0.
 - 11) Panasonic has lists of restricted and prohibited substances publicly disclosed on its website. (Panasonic)
 - 12) Panasonic gave an example of its US recycling program which is done through Manufacturing & Recycling Management (MRM) Company managed by the organization. It was stated that in US and Europe the Company collects TVs, PCs, DVD players, Cameras etc. disregarding the rules in different states.
 - 13) Panasonic provided several figures with regard to the quantities recycled as a per cent of past sales. Thus, for instance in Japan in 2011 344 000 tons were sold and 340 000 tons collected and treated, while in USA 106 000 tons were sold and 50 000 tons collected. Moreover in Germany for example 20 000 tons of electronics were sold in 2011 and 15 000 tons were collected and treated. Therefore, the rate is around 99% in Japan, 46% in USA and 75% in Germany.
 - 14) Panasonic is trying to expand its recycling programs globally and it predicts that in 2012 it will collect and treat 300 000 tons of electronics. It is 100 000 tons less than what has been gathered in 2011. That is mainly because the TV sales in Japan are predicted to drop. Nevertheless, in the fiscal year 2013 the Company intends to gather 400 000 tons. More than that, it was pointed out that Panasonic strives for technology development in order to make the collection and treatment of the products easier.
- (IR)

15. Appendix 7: Scores calculations

Table 10: Companies scores for selected criteria (Greenpeace)

Criteria	RIM	Toshiba	Sharp	Sony	Panasonic	Samsung	Philips	Apple	Nokia	Dell	HP
Product Energy Efficiency	2	2	5	5	5	4	3	5	5	2	3
Avoidance of Hazardous Substances in products	0	1	1	1	2	2	3	4	4	2	3
Use of Recycled Plastic in Products	0	0	1	2	1	1	1	0	0	1	1
Product Life-Cycle	0	1	1	0	2	2	0	1	0	0	1
Chemicals Management and Advocacy	1	3	0	2	2	2	3	3	3	4	4
Provides effective voluntary take-back where no EPR laws	1	5	3	3	4	5	1	7	7	5	3
Total	4	12	11	13	16	16	11	20	19	14	15
Score (Total*10/29)*	<u>1,4</u>	<u>4,1</u>	<u>3,8</u>	<u>4,5</u>	<u>5,5</u>	<u>5,5</u>	<u>3,8</u>	<u>6,9</u>	<u>6,6</u>	<u>4,8</u>	<u>5,2</u>

*29 is the maximum points that companies can receive by addressing the selected criteria from Greenpeace.

Table 11: EIRIS scores

Criteria	RIM	Toshiba	Sharp	Sony	Panasonic	Samsung	Philips	Apple	Nokia	Dell	HP
Supply Chain Policies	9	9	8	9	7	8	10	9	10	10	10
Supply Chain Systems	3	6	4	5	6	4	7	6	7	6	7
Supply Chain Reporting	0	5	3	3	2	2	7	6	8	8	9
Total	12	20	15	17	15	14	24	21	25	24	26
Score (Total*10/35)	<u>3,4</u>	<u>5,7</u>	<u>4,3</u>	<u>4,9</u>	<u>4,3</u>	<u>4,0</u>	<u>6,9</u>	<u>6,0</u>	<u>7,1</u>	<u>6,9</u>	<u>7,4</u>

*The maximum amount of points that can be awarded for these three criteria is 35

Table 12: Combined EIRIS and Greenpeace filtered scores

<i>Criteria</i>	<i>RIM</i>	<i>Toshiba</i>	<i>Sharp</i>	<i>Sony</i>	<i>Panasonic</i>	<i>Samsung</i>	<i>Philips</i>	<i>Apple</i>	<i>Nokia</i>	<i>Dell</i>	<i>HP</i>
Product Energy Efficiency	2	2	5	5	5	4	3	5	5	2	3
Avoidance of Hazardous Substances in products	0	1	1	1	2	2	3	4	4	2	3
Use of Recycled Plastic in Products	0	0	1	2	1	1	1	0	0	1	1
Product Life-Cycle	0	1	1	0	2	2	0	1	0	0	1
Chemicals Management and Advocacy	1	3	0	2	2	2	3	3	3	4	4
Provides effective voluntary take-back where no EPR laws	1	5	3	3	4	5	1	7	7	5	3
Supply Chain Policies	9	9	8	9	7	8	10	9	10	10	10
Supply Chain Systems	3	6	4	5	6	4	7	6	7	6	7
Supply Chain Reporting	0	5	3	3	2	2	7	6	8	8	9
Total	16	32	26	30	31	30	35	41	44	38	41
Score (Total*10/64)	<u>2.5</u>	<u>5.0</u>	<u>4.1</u>	<u>4.7</u>	<u>4.8</u>	<u>4.7</u>	<u>5.5</u>	<u>6.4</u>	<u>6.9</u>	<u>5.9</u>	<u>6.4</u>

*The maximum possible points the companies can get for addressing all of the chosen criteria. (29+35=64)

Table 13: Scores after the Desk research

Criteria	RIM	Toshiba	Sharp	Sony	Panasonic	Samsung	Philips	Apple	Nokia	Dell	HP
Product Energy Efficiency	2	2	5	5	5	4	3	5	5	2	3
Avoidance of Hazardous Substances in products	0	1	1	1	2	2	3	4	4	2	3
Use of Recycled Plastic in Products	0	0	1	2	1	1	1	0	0	1	1
Product Life-Cycle	0	1	1	0	2	2	0	1,5	0	0	1
Chemicals Management and Advocacy	1	3	0	2	2	2	3	4	3	4	4
Provides effective voluntary take-back where no EPR laws	1	6	3	4	4	5	1	7	7	5	3
Supply Chain Policies	9	9	8	9	7	8	10	9	10	10	10
Supply Chain Systems	3	6	4	5	6	4	7	6	7	6	7
Supply Chain Reporting	0	5	3	3	2	2	7	6	8	8	9
Total	16	33	26	31	31	30	35	42,5	44	38	41
Score (Total*10/64)	<u>2,5</u>	<u>5,2</u>	<u>4,1</u>	<u>4,8</u>	<u>4,8</u>	<u>4,7</u>	<u>5,5</u>	<u>6,6</u>	<u>6,9</u>	<u>5,9</u>	<u>6,4</u>

Table 14: Scores based on the Desk and Field researches

Criteria	RIM	Toshiba	Sharp	Sony	Panasonic	Samsung	Philips	Apple	Nokia	Dell	HP
Product Energy Efficiency	2	2	5	5	5	4	3	5	5	2	4
Avoidance of Hazardous Substances in products	1	1	1	1	3	3	3	4	5	2	3
Use of Recycled Plastic in Products	0	0	1	2	1	1	1	0	0	1	1
Product Life-Cycle	0	1,5	1	0,5	2	2	0	1,5	0	1	1
Chemicals Management and Advocacy	1	3	1	2	3	2	4	4	4	4	4
Provides effective voluntary take-back where no EPR laws	1	7	3	4	6	5	1	7	7	5	3
Supply Chain Policies	9	9	8	10	7	9	10	9	10	10	10
Supply Chain Systems	3	6	4	7	7	5	7	6	8	7	7
Supply Chain Reporting	0	5	4	3	3	4	8	6	8	9	9
Total	17	34,5	28	34,5	37	35	37	42,5	47	41	42
Score (Total*10)/64	<u>2,7</u>	<u>5,4</u>	<u>4,4</u>	<u>5,4</u>	<u>5,8</u>	<u>5,5</u>	<u>5,8</u>	<u>6,6</u>	<u>7,3</u>	<u>6,4</u>	<u>6,6</u>

Table 15: Percentage completion per criterion per company before any analysis

<i>Criteria</i>	<i>Maximum</i>	<i>Rim</i>	<i>Toshiba</i>	<i>Sharp</i>	<i>Sony</i>	<i>Panasonic</i>	<i>Samsung</i>	<i>Philips</i>	<i>Apple</i>	<i>Nokia</i>	<i>Dell</i>	<i>HP</i>	<i>Average</i>
Product Energy Efficiency	5	2	2	5	5	5	4	3	5	5	2	3	
<i>Percentage</i>		40%*	40%	100%	100%	100%	80%	60%	100%	100%	40%	60%	75%**
Avoidance of Hazardous Substances in products	5	0	1	1	1	2	2	3	4	4	2	3	
<i>Percentage</i>		0%	20%	20%	20%	40%	40%	60%	80%	80%	40%	60%	42%
Use of Recycled Plastic in Products	3	0	0	1	2	1	1	1	0	0	1	1	
<i>Percentage</i>		0%	0%	33%	67%	33%	33%	33%	0%	0%	33%	33%	24%
Product Life-Cycle	3	0	1	1	0	2	2	0	1	0	0	1	
<i>Percentage</i>		0%	33%	33%	0%	67%	67%	0%	33%	0%	0%	33%	24%
Chemicals Management and Advocacy	5	1	3	0	2	2	2	3	3	3	4	4	
<i>Percentage</i>		20%	60%	0%	40%	40%	40%	60%	60%	60%	80%	80%	49%
Provides effective voluntary take-back where no EPR laws	8	1	5	3	3	4	5	1	7	7	5	3	
<i>Percentage</i>		13%	63%	38%	38%	50%	63%	13%	88%	88%	63%	38%	50%
Supply Chain Policies	11	9	9	8	9	7	8	10	9	10	10	10	
<i>Percentage</i>		82%	82%	73%	82%	64%	73%	91%	82%	91%	91%	91%	82%
Supply Chain Systems	9	3	6	4	5	6	4	7	6	7	6	7	
<i>Percentage</i>		33%	67%	44%	56%	67%	44%	78%	67%	78%	67%	78%	62%
Supply Chain Reporting	15	0	5	3	3	2	2	7	6	8	8	9	
<i>Percentage</i>		0%	33%	20%	20%	13%	13%	47%	40%	53%	53%	60%	32%
Total		16	32	26	30	31	30	35	41	44	38	41	

*The percentage per criterion per company was calculated as follows: points earned for the criteria divided by the maximum possible points and multiplied by 100%

** The average was calculated by taking an average of all percentages of completion per each criterion.

Table 16: Percentage completion per criterion per company after the analysis

<i>Criteria</i>	<i>Maximum</i>	<i>Rim</i>	<i>Toshiba</i>	<i>Sharp</i>	<i>Sony</i>	<i>Panasonic</i>	<i>Samsung</i>	<i>Philips</i>	<i>Apple</i>	<i>Nokia</i>	<i>Dell</i>	<i>HP</i>	<i>Average</i>
Product Energy Efficiency	5	2	2	5	5	5	4	3	5	5	2	4	
<i>Percentage</i>		40,0%*	40,0%	100,0%	100,0%	100,0%	80,0%	60,0%	100,0%	100,0%	40,0%	80,0%	76,4%**
Avoidance of Hazardous Substances in products	5	1	1	1	1	3	3	3	4	5	2	3	
<i>Percentage</i>		20,0%	20,0%	20,0%	20,0%	60,0%	60,0%	60,0%	80,0%	100,0%	40,0%	60,0%	49,1%
Use of Recycled Plastic in Products	3	0	0	1	2	1	1	2	0	0	1	1	
<i>Percentage</i>		0,0%	0,0%	33,3%	66,7%	33,3%	33,3%	33,3%	0,0%	0,0%	33,3%	33,3%	24,2%
Product Life-Cycle	3	0	1,5	1	0,5	2	2	0	1,5	0	1	1	
<i>Percentage</i>		0,0%	50,0%	33,3%	16,7%	66,7%	66,7%	0,0%	50,0%	0,0%	33,3%	33,3%	31,8%
Chemicals Management and Advocacy	5	1	3	1	2	3	2	4	4	4	4	4	
<i>Percentage</i>		20,0%	60,0%	20,0%	40,0%	60,0%	40,0%	80,0%	80,0%	80,0%	80,0%	80,0%	58,2%
Provides effective voluntary take-back where no EPR laws	8	1	7	3	4	6	5	1	7	7	5	3	
<i>Percentage</i>		12,5%	87,5%	37,5%	50,0%	75,0%	62,5%	12,5%	87,5%	87,5%	62,5%	37,5%	55,7%
Supply Chain Policies	11	9	9	8	10	7	9	10	9	10	10	10	
<i>Percentage</i>		81,8%	81,8%	72,7%	90,9%	63,6%	81,8%	90,9%	81,8%	90,9%	90,9%	90,9%	83,5%
Supply Chain Systems	9	3	6	4	7	7	5	7	6	8	7	7	
<i>Percentage</i>		33,3%	66,7%	44,4%	77,8%	77,8%	55,6%	77,8%	66,7%	88,9%	77,8%	77,8%	67,7%
Supply Chain Reporting	15	0	5	4	3	3	4	8	6	8	9	9	
<i>Percentage</i>		0,0%	33,3%	26,7%	20,0%	20,0%	26,7%	53,3%	40,0%	53,3%	60,0%	60,0%	35,8%
Total		17	34,5	28	34,5	37	35	37	42,5	47	41	42	

*The percentage per criterion per company was calculated as follows: points earned for the criteria divided by the maximum possible points and multiplied by 100%

** The average was calculated by taking an average of all percentages of completion per each criterion.

Table 17: Average completion of each criterion

<i>Criteria</i>	<i>Final average (Table 15)</i>	<i>Initial average (Table 14)</i>
Use of Recycled Plastic in Products	24,2%	24,2%
Product Life-Cycle	31,8%	24,2%
Supply Chain Reporting	35,8%	32,1%
Avoidance of Hazardous Substances in products	49,1%	41,8%
Provides effective voluntary take-back where no EPR laws	55,7%	50,0%
Chemicals Management and Advocacy	58,2%	49,1%
Supply Chain Systems	67,7%	61,6%
Product Energy Efficiency	76,4%	74,5%
Supply Chain Policies	83,5%	81,8%

Data presented in Table 16 is the short summary of the information given in Tables 14 and 15.

16. Appendix 8: Financial data

Table 18: Calculations of ratios per company selected for the engagement

<i>Sharp</i>	2005	2006	2007	2008	2009	2010	2011	<i>Average</i>
Debt to assets	58%	57%	60%	60%	61%	62%	64%	60%
Quick ratio	0,84	0,89	0,89	0,83	0,76	0,82	0,83	0,84
Net profit margin	3,0%	3,2%	3,3%	3,0%	-4,4%	0,2%	0,6%	1,3%
<i>Samsung</i>	2005	2006	2007	2008	2009	2010	2011	
Debt to assets	44%	41%	40%	40%	35%	33%	35%	38%
Quick ratio	1,11	1,11	1,14	1,23	1,30	1,20	1,26	1,19
Net profit margin	9,5%	9,3%	8,0%	4,9%	7,2%	10,4%	8,3%	8,2%
<i>Toshiba</i>	2005	2006	2007	2008	2009	2010	2011	
Debt to assets	79%	75%	76%	77%	86%	79%	78%	79%
Quick ratio	1,09	1,10	1,06	0,98	0,89	1,11	1,12	1,05
Net profit margin	0,8%	1,3%	2,0%	1,7%	-5,3%	-0,3%	2,2%	0,3%
<i>Sony</i>	2005	2006	2007	2008	2009	2010	2011	
Debt to assets	70%	69%	71%	70%	73%	74%	77%	72%
Quick ratio	1,04	0,93	1,02	0,99	0,74	0,86	0,76	0,90
Net profit margin	2,3%	1,7%	1,5%	4,2%	-1,3%	-0,6%	-3,6%	0,6%
<i>RIM</i>	2005	2006	2007	2008	2009	2010	2011	
Debt to assets	24%	14%	20%	29%	27%	25%	31%	24%
Quick ratio	2,27	4,51	3,04	2,09	1,97	2,13	1,89	2,56
Net profit margin	15,8%	18,5%	20,8%	21,5%	17,1%	16,4%	17,1%	18,2%

The information presented in Table for these calculations was derived from companies' annual reports.