

OUT OF CONTROL

E-waste trade flows from the EU to developing countries

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makeITfair is a European wide project on consumer electronics, aiming to inform young consumers about human rights, social and environmental issues along the supply chain. The work is co-ordinated by the Dutch organisation SOMO. Project partners are IRENE in the Netherlands, SwedWatch, Fair Trade Center, Church of Sweden from Sweden, FinnWatch and Finnish Association for Nature Conservation from Finland; Germanwatch and Verbraucher Initiative from Germany, KARAT from CEE; ACIDH from the DR Congo, CIVIDEP from India and SACOM from China. Website: www.makeitfair.org



SwedWatch is a non-governmental organisation whose task is to critically examine Swedish business relations with developing countries focusing on environmental and social concerns. SwedWatch consists of five member organisations: The Swedish Society for Nature Conservation, Church of Sweden, UBV/Latin America, Friends of the Earth Sweden and Fair Trade Center. The work is mainly financed by the Swedish Development Aid Agency, Sida. Website: www.swedwatch.org

Church of Sweden

Church of Sweden works for a just world without hunger, poverty or oppression. Church of Sweden works to exert an influence on public opinion in Sweden and with development cooperation and emergency relief together with local partners in about 40 countries. Website: www.svenskakyrkan.se

FAIR TRADE CENTER

Fair Trade Center is a Swedish non-governmental organisation (NGO) that has been promoting fair trade with developing countries since 1996. Its intention is to increase consumer and company awareness of social and environmental responsibility. Website: www.fairtradecenter.se

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EXECUTIVE SUMMARY

As the consumption of electronics has increased rapidly the last years, so has the waste made up of discarded products. The UN estimates that up to 50 million tonnes of e-waste may be generated in the world each year, which is enough to fill a line of trucks stretching half way around the entire globe. A Western European household is expected to generate around 900 kilos of e-waste over a 20 year period. Electronic products improve and intensify our lives in many different ways, but their afterlives remain, to a large extent, an unsolved dilemma.

EC LEGISLATORS TRYING TO CLOSE THE LOOP

Waste from electrical and electronic equipment (WEEE) includes a wide spectre of products ranging from fridges and washing machines to computers and TVs. It often contains ingredients that risk damaging human health and polluting the environment. Consequently, exports of WEEE to developing countries are banned according to EC legislation (the Waste Shipment Regulation).

New EC legislation also requires that the cost of properly disposing of electronic products must be picked up by the producers of the waste (the WEEE Directive). The producers must also phase out some of the most hazardous substances (the RoHS Directive)¹. Consequently, creative minds at several electronics companies have been set in motion in order to produce more eco-friendly products that are easier to recycle and handle when they reach their end-of-life. This positive trend in the EU will have global effects, since the electronics market and its production process are global.

DEVELOPING COUNTRIES FACING INCREASED HAZARDOUS BURDEN

However, when it comes to the burden of e-waste, several developing countries in Asia and Africa that lack proper systems for recycling and disposal are experiencing increasing problems; firstly because consumption of electronics is increasing most within these countries at present, and secondly because e-waste is exported from the rich world to developing nations that lack the capacity and regulations to handle this waste in a responsible manner. During rudimentary recovery by informal recyclers in countries such as China, India, Ghana and Nigeria workers are exposed to hazardous chemicals and material when products are broken apart in order to extract valuable components and metals. A study published in 2007 showed that children in the Chinese recycling town Guiyu had much higher blood lead levels than children living in a settlement where recycling of electronics did not take place. Other health problems that have been reported include diseases and problems related to skin, stomach, respiratory tract and other organs. Despite the high health risks and the pollution of soil, air and water, mostly unskilled migrant workers try to make a living by recovering valuable components. In Ghana young

¹ The RoHS Directive restricts the use of six hazardous materials in the manufacture of various types of electronic and electrical equipment: lead, mercury, cadmium, hexavalent chromium and some brominated flame retardants (PBB and PBDE). Brominated flame retardants are often found in printed circuit boards, plastic casings and cables. They may transform to very dangerous dioxines and furans when burning. Long-term exposure to some BFRs may risk harming reproduction. Some of them may also cause long-term damage to the environment. PentaPBDE, for example, is toxic to aquatic life.

workers earn less than a euro per day and low wages are symptomatic for these tasks. Other actors in the informal e-waste supply chain can make quite a good profit though.

E-waste contains a variety of hazardous metals and organic compounds. The content of electronics collected in the EU will become less problematic over the next few years when the effects of the Restriction of Hazardous Substances Directive (RoHS) will be fully developed. However, the restrictions of RoHS only apply to products put on the market after 1 July 2006. At present old products, which were put on the market before this date, are still being discarded. Moreover, the RoHS Directive only requires the phase out of some of the problematic content of electronics and it also includes exemptions. Cathode ray tubes may still include lead, for example, and LCD screens and displays used in computers, mobile phones and other products are still allowed to include mercury.

Moreover, risks related to some of the other content are still poorly documented. More than 200 chemicals compounds are included in a single mobile phone, for example, and all possible effects of the content on humans and the environment have not been fully studied. Gallium is one example, a metal that is used in mobile phones with camera flashes. More than 80 percent of all handsets are expected to include camera functions by 2011 however the environmental toxicity of gallium is poorly documented.

Over the last few years, several electronics companies have increased their efforts to phase out hazardous materials, spurred by legislative and consumer demands. On the market as a whole there is still room for improvement though. In 2008 Greenpeace International detected hazardous chemicals and materials such as PVC, phthalates, beryllium and brominated flame retardants in the most popular game consoles; Playstation 3, Nintendo Wii and Xbox 360. The tests showed that each manufacturer had eliminated or reduced certain individual substances in certain materials of the console, but not the same ones. The fact that different companies exclude different ingredients in their products proves that technical know-how to achieve further improvements does exist.

PROBLEMS WITH THE COLLECTION OF DISCARDED PRODUCTS

The purpose of collection and recycling of electronics is to make sure that materials can be reused and that potentially hazardous materials do not leak into the environment. From an environmental perspective, recycling of electronics limits new mining activities with large environmental footprints and reduces the emissions of greenhouse gases. Despite these benefits many discarded phones and other products are left in drawers or attics around the world, instead of being given up for reuse or recycling. Market research conducted by Swedish service provider Telia suggests that most Swedes have two mobile phones that they do not use. 12% of the respondents stated that they have five mobile phones or more that they do not use. 38% said that there is no real reason for keeping them.

Regarding e-waste collection in general, the average annual collection rate within the EU is about five kilos per person, while it is expected that each inhabitant generates 15 kg of e-waste annually. Sweden currently holds the leading position by collecting 17.5 kg per inhabitant in

2007. A recent study shows, however, that toys, watches, hair dryers, computer keyboards, hard discs, circuit boards, radios and CD players can be found in Swedish household garbage. Larger products, such as fridges and TVs, are more or less always handed in to the recycling system, but 1.3 kilos of e-waste per Swedish citizen (mostly smaller electronic products) is estimated to end up in the household garbage or in the wrong garbage skips.

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. The rest, the remaining 60% to 75%, represents what Greenpeace International calls “the hidden flow”. It might be stored or disposed of otherwise within the EU however reports from developing countries show that parts of this “hidden flow” are being exported for reuse, recycling or disposal in, for example, Asia and Africa.

THE TRADE FLOWS OF EUROPEAN E-WASTE

No one currently knows the scale of the EU’s e-waste exports to developing countries, but there is evidence that it does occur. Some experts fear that these exports will increase as an unanticipated result of EU’s environmentally sound directives. When new legislation set higher targets for collection and recycling, the economic incentives to export the waste to countries offering low costs may increase. The economic logic of the exports from the rich world is clear. It costs about EUR 10 to recycle a computer in Sweden. In India on the other hand it can be recycled for EUR 1.50 within the informal sector.

Some exporters of e-waste attempt to cover up their illegal shipments by mislabelling them as ‘products for reuse’ or ‘donations’ to poor countries. According to Customs officials and the police, it appears that Hong Kong, China, Singapore and Malaysia are the main recipients in Asia at present and that Nigeria and Ghana are the main destinations in Africa. Shipments also leave for the Middle East, where countries may function as recipients or countries for transit. Trade routes tend to change, though, to escape strengthened control and the media spotlight.

Hifi systems, fridges, cable waste, metal scrap and lithium batteries were among the products found during inspections within the EU between 2003 and 2006. During a joint Asian inspection in 2007, Hong Kong Customs seized 98 consignments of hazardous wastes during an eight month period, mostly containing computer batteries, used computers and TV monitors and used vehicles. In total 1,000 tonnes of computer monitors and 2,000 tonnes of batteries were seized during this period. Most of the shipments came from the US, Canada, Japan and EU countries.

According to the Environment Agency for England and Wales, some of the waste is collected 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 or to informal recyclers who extract valuable metals from the products in a hazardous manner. Moreover, Customs and police report about “waste tourists”, who are non-EU citizens coming from developing countries to collect waste that they can make money on in their home countries.

Different aspects make it difficult to prosecute offenders. It is, for example, quite difficult to

interpret existing law. Current EC legislation forbids the export of e-waste, but exports of second-hand goods are allowed and it is difficult to draw the line between these two categories. NGOs and authorities in developing countries report that a large part of the exports, up to 50% to 75% for some countries, does not function when it reaches its final destination. Some countries have tried to introduce age-limits for some products, but these efforts are not supported by controls and testing in EU harbours.

EXPORT OF SECOND-HAND GOODS

There is a desperate need for computers and other information technologies in Africa. These products may help bridge the so-called “digital divide”. However, the trade in second-hand electronics generates both positive and negative effects. On the one hand, it may increase poor people’s access to IT and increase the lifespan of electronic items, which is good from an environmental point of view. On the other hand, the final disposal and treatment of the products will take place in countries where proper disposal and treatment systems are lacking and brands and retailers are not required to take back products nor pay the actual costs.

National statistics in different EU countries, showing shipments of electronics that have been declared as actual products and not waste, indicate that parts of the exported electronic goods might be waste or second-hand products with unknown additional lifetime. In this context, countries in Africa and the Middle East seem to be important recipients.

In late 2006, an analysis conducted on behalf of the Danish Environmental Protection Agency indicated that Danish shipments to a large extent consisted of used products or illegal e-waste. In total 2,500 tonnes of electronic and electrical products were exported directly by ship from Denmark to developing countries in 2005, mainly to West Africa and the Middle East. Based on the Danish figures, the European Topic Center on Resource and Waste Management (ETC/RWM) suggests that as much as 200,000 tonnes of used TVs, computers, monitors, screens, refrigerators and deep freezers might be exported each year out of the EU. Due to the low number of port inspections in the EU as a whole, Customs are not aware of the age and the quality of these exported products.

ETC/RWM has also analysed European trade statistics for colour television sets and noticed that 52,000 units were exported to African countries in 2005 at relatively low prices. Most of them were exported to Ghana, Nigeria and Egypt at an average price of EUR 28, a strong indicator that a large number of them might be used products or waste.

SwedWatch’s analysis of Swedish export statistics gives rise to questions similar to those of the Danish survey. Total exports of mobile phones and computers have increased since 1995. According to official statistics, no exports of mobile phones or stationary computers took place between 1995 and 2005. In 2007 exports totalled 2,095 tonnes of mobile phones and 1,063 tonnes of stationary computers. Some of the shipments are probably due to the fact that Sweden currently offers low prices on electronics in general in comparison to many other countries. However, SwedWatch’s review of the official statistics raises several issues that should be further examined by Swedish authorities and Customs. Average weights and prices often do not seem

to fit the products that the exports are declared as. Moreover, for some destinations the declared average prices indicate that the shipments may contain used products of unknown age and additional life time or waste. This goes for example for stationary computer shipments in 2007 to Ethiopia (8 tonnes at average SEK 267 or EUR 28 per piece) and Gambia (5 tonnes at average SEK 228 or EUR 24 per piece). The same year 11 tonnes of laptops were shipped to Ghana at an average price of SEK 86/EUR 9.

Custom officials in many EU member states point out that they lack resources necessary to learn about the contents of shipments leaving their countries. In general narcotics, alcohol, tobacco and financial crimes are issues of priority, not illegal shipments of waste.

WHAT SHOULD BE DONE?

Green IT is currently one of the major topics of discussion within the electronics industry. Several brand name companies have made considerable efforts to make their products greener, but within the industry as a whole much more can be done regarding, for example, hazardous content, take back and possibilities of upgrading software instead of having to buy new products. The total lifecycle of electronics is still far from sustainable, especially if the effects in developing nations are taken into account; effects caused by the mining of metals, manufacturing in Asia and the final waste treatment. Sustainability is often defined as a goal where environmental, social and economic goals are realised simultaneously. The triple bottom line, also called 'people, planet, profit', means that all three aspects must be fulfilled if anything is to be called 'sustainable'.

Governments, brand name companies, manufacturers and their suppliers as well as consumers all need to contribute if these goals are to be achieved. The hazardous ingredients included in the products constitute the root cause of the problem. Reducing the hazardous content is therefore vital, together with the setting up of well-functioning and sustainable collection and recycling systems. The EU's Waste Shipment Regulation, the RoHS and the WEEE Directives provide good tools with which to accomplish this. However, legislation forbidding dumping of e-waste in developing countries falls short if it is poorly enforced and controlled, which is currently the case in most EU member states.

Apart from reducing the hazardous content and designing products that are easy to recycle, electronics companies should offer take back and sustainable recycling even in countries where the law does not require this. In several developing countries companies, as well as formal recyclers, have problems obtaining feed. Consumers do not hand in their products without being paid or receiving other economic incentives, such as prepaid cards etc. Companies should therefore consider such incentives.

Finally, consumers must be made aware of the need for recycling of old electronics. There are three billion mobile phone owners in the world today. If each of them handed in one unused phone each, 240,000 tonnes of raw materials could be saved. The emission of greenhouse gases would be reduced to the same effect as taking four million cars off the road. However, research presented by Nokia shows that globally only 3% recycle their phones.

Companies selling second-hand electronics also present an alternative to individual consumers, companies and institutions who are not interested in the latest models but want to reduce the ecological footprint of the products they buy. Companies exporting second-hand goods to countries outside the EU should, however, avoid selling to brokers and carefully control the effects of their exports on developing countries.

1. INTRODUCTION

The consumption of consumer electronics has increased at an astonishing rate over the last few years. Mobile phones with new multi-functions, ever lighter notebooks and flatter TV screens are quickly replacing outdated products. As the consumption of electronics has boomed, so have the waste amounts generated by discarded products. The UN estimates that some 20 to 50 million tonnes of e-waste are generated in the world each year, comprising more than 5 % of all municipal solid waste, and these amounts are expected to increase.² At the same time, it is estimated that less than 10 % of global e-waste is recycled.³

The heaps of e-waste that are generated every year very much reflect our habits, preferences and everyday lives. The urgent shift from older televisions with cathode ray tubes to flat screen TVs is one example, a shift that is noticed by garbage collectors all over Europe at the time of major TV events such as football world cups. Recessions and upswings are also reflected on refuse dumps.

New EC legislation requires that the cost of properly disposing of electronic products must be picked up by the producers of the waste (manufacturers, retailers, branders and importers). The producers must also phase out some of the most hazardous substances. Consequently, creative minds at several electronics companies have been set in motion aimed at producing more eco-friendly products that are easier to recycle and handle when they reach their end-of-life. This positive trend in the EU will have global effects, since the electronics market and production process is global.

However, when it comes to the burden of e-waste, several developing countries in Asia and Africa that lack proper systems for recycling and disposal are experiencing increasing problems; firstly because consumption of electronics is increasing most within these countries at present, and secondly because e-waste is exported from the rich world to developing nations. During rudimentary recovery by informal recyclers in countries such as China, India, Ghana and Nigeria, workers are exposed to hazardous chemicals and material when products are broken apart to extract valuable content. Water, air and soil are also polluted.

Waste from electrical and electronic equipments (WEEE) often contains ingredients that risk damaging human health and polluting the environment. Consequently, export of WEEE to developing countries is banned according to EC legislation (the Waste Shipment Regulation). Still, inspections made in harbours of the EU member states and in recipient countries show that this trade takes place anyway. Some of the shipments leaving the EU contain waste but are disguised as 'products for reuse' or 'charity donations', which are not banned in the regulation.

Some of the exports that take place are truly second-hand products that will be used by customers in poor countries where many consumers cannot afford to buy new products. This second-hand trade increases the lifetime of electronic products, which is positive from an environmental perspective since the production of electronics is very energy and material

² Greenpeace International, 2008, *Toxic Tech: Not in Our backyard*, p 16.

³ LaDou J et al, Export of Electronics Equipment Waste, published in *International Journal of Occupational and Environmental Health* 2007;14, p 1-10.



Global levels of e-waste have increased rapidly over the last few years, however only a small part of this waste is recycled.

intensive. On the other hand, the final disposal and treatment of the products will take place in countries where proper disposal and treatment systems are lacking and where brands and retailers are not required to take back products nor pay the actual costs.

This report aims at describing the trade routes of e-waste generated in the EU member states (Chapter 5). It examines possible explanations as to why some electronics originating from the EU end up in backyard recycling and dump sites in developing countries. The second part of this report presents an overview of the situation in developing and transition countries where the e-waste is piling up, as well as opportunities and obstacles for closing the loop so that electronics are managed in a sustainable manner (Chapter 6).

Special focus has been on Sweden (chapters 5.2.2, 5.2.2.1 and 5.2.2.2), a country that has taken the lead in collection and recycling within the EU while the e-waste issue has been little discussed in the public domain. The authorities currently do little to check Swedish borders to prevent illegal or otherwise problematic exports of e-waste to developing countries.

2. METHODOLOGY

Research for this report was conducted using desk research methods. The research included a literature review and further online research in 2008 and 2009, as well as complementary interviews with different experts at universities and public bodies, EU Customs and police officials, as well as local and international NGOs working with the e-waste issue. Swedish companies that are selling second hand electronics have also been contacted.

More research is needed to gain insight into the complex trade flows of e-waste between the EU and the rest of the world. This report presents a summary of the information that currently exists, but it is important to stress that no one has a full overview at the moment, neither of the scope nor of the effects of the EU's trade flows of e-waste and second-hand electronics. Figures presented should be interpreted with care, given the limited and sometimes poor quality of data available. SwedWatch has attempted to mitigate these problems by comparing a wide range of sources and complementing statistics with interviews with different actors specialising in the e-waste issue.

E-waste includes a wide spectrum of electronic and electrical products ranging from fridges and washing machines to computers and toys. The different products give rise to different environmental and health problems if not disposed of properly. The main focus of this report lies on IT equipment and consumer electronics. However, when the general term WEEE (Waste from Electrical and Electronic Equipment)⁴ or e-waste is used, the wider range of products is considered, excluding the waste that manufacturing of these products generates. The latter also adds considerably to the problem in developing countries where much of the electronics that European consumers buy is currently being manufactured.

4 Huisman J. et al, 2007, *2008 Review of Directive 2002/96 on Waste Electrical and Electronic Equipment WEEE*, p iv. In 2005, a breakdown of WEEE within the EU showed that 56% was household appliances, 21.6% was CRT TVs and monitors, 8% was IT and telecom products (excl. CRTs) and 7.8% was consumer electronics (excl. CRTs).

3. WHAT IS IN OUR ELECTRONIC GARBAGE?

Electronic waste that is classified as hazardous waste must be processed properly if the environment and human health is not to be put at risk. The waste may contain a variety of hazardous metals and organic compounds, but the content of electronics collected in the EU will become less problematic in the future when the effects of the Restriction of Hazardous Substances Directive (RoHS) will be fully realised. This EU Directive restricts the use of six hazardous materials in the manufacture of various types of electronic and electrical equipment: lead, mercury, cadmium, hexavalent chromium and some brominated flame retardants (PBB and PBDE).⁵ These restrictions apply to products put on the market after 1 July 2006. However, at present old products that were on the market before this date are still being discarded.

The RoHS Directive only requires the phase out of some of the problematic content of electronics and it also includes exemptions.⁶ In December 2008, the European Commission brought some more substances to the attention of the public, one brominated flame retardant and three different phthalates; however they are not yet included in the RoHS Directive's phase out list.

According to Oladele A. Ogunseitan, Professor of Public Health and Social Ecology at the Department of Population Health & Disease Prevention at the University of California, more than 200 chemical compounds are included in a single mobile phone. He explains that it would be a lifetime of work for a toxicologist to try to separate them and study the possible health effects that might be associated with burning or immersing them in water. Oladele Ogunseitan's research team studied 34 mobile phones in 2007 and concluded that copper, lead, nickel, antimony, zinc and different organic compounds may leach out if the waste is not disposed of properly.⁷

Given the risks tied to the content Oladele A. Ogunseitan feels that the current regulations must be strengthened:

“The US has not shown sufficient leadership in e-waste regulations as there are variations across states and no current national policy that is enforceable. The European RoHS also needs to be broadened in scope. There are too many exemptions.”

In some cases new problems arise due to the fact that old products are replaced by new ones. CRT screens in computers and televisions may create environmental problems because they

5 The directive is available at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:2002L0095:20080524:EN:PDF>

6 LaDou J et al, Export of Electronics Equipment Waste, published in *International Journal of Occupational and Environmental Health* 14:2007, p 1-10 and Lincoln et al, Design and Evaluation of Bioepoxy-Flax Composites for Printed Circuit Boards, published in *IEEE Transactions on Electronics Packaging Manufacturing*, Vol 31, No 3, July 2008.

7 Lincoln J et al, Leaching Assessments of Hazardous Materials in Cellular Telephones, in *Environmental Science & Technology*, 41:2007, p 2572-2578.

RISKS CONNECTED TO BFRs AND PHTHALATES

Brominated flame retardants (BFRs) may be found in printed circuit boards, plastic casings and cables. They are applied to prevent electronics from catching fire, but the effects on humans and the environment is vividly debated. BFRs may transform to very dangerous dioxines and furans when burning. Long-term exposure to some BFRs may risk harming reproduction. Some of them may also cause long-term damage to the environment. HBCDD and pentaBDE, for example, are toxic to aquatic life.

Phthalates are used to soften PVC. They are degradable but yet they are found in humans and the environment. Studies of some phthalates have shown that they risk harming fertility. The risks of negative environmental effects have not been proved but cannot be eliminated.

Source: Swedish Chemicals Agency

contain lead. Recently they have been replaced by LCD screens containing mercury.^{8 9} LCD displays are also used in smaller products, such as mobile phones and MP3 players. As mobile phones and other electronics goods are becoming increasingly smaller, stronger materials are required such as beryllium/copper alloys that are able to cope with higher temperatures. Beryllium is a metal that risks damaging the health of workers in the manufacturing process since it is carcinogenic and sensitising. It is also highly toxic to aquatic life. Gallium is another metal that is used in 'newer' products such as mobile phones with camera flashes. More than 80 percent of all handsets are expected to include camera functions by 2011; however the environmental toxicity of gallium is poorly documented.¹⁰

Several electronics companies have increased their efforts to phase out hazardous materials over the last few years, spurred by legislative and consumer demands. Nokia has, for example, marketed PVC-free models since late 2005 and the company is trying to make sure that all new models are free from brominated flame retardants and antimony trioxide by the end of 2009. All Sony Ericsson phones are currently free from PVC and the models launched since January 2008 are free from beryllium, antimony and phthalates.¹¹ In 2008 Apple announced that its new line of iPods would be free of brominated flame retardants, PVC and mercury.¹² On the market as a whole there is still room for improvement though. In 2008 Greenpeace International detected hazardous chemicals and materials such as PVC, phthalates, beryllium and brominated

8 Interview with Elin Eriksson, Deputy Department Manager at Swedish Environmental Research Institute (IVL), 09. 02.2009. Elin Eriksson is the author of the following report: IVL, Samhällsekonomiska effekter av WEEE-direktivet – En fallstudie av dataskärmar, Oct 2007.

9 Lead in the glass of cathode ray tubes is exempted from the requirements of the RoHS Directive (Item 5 in the directive's Annex). Some of the directive's exemptions concerning the use of mercury in lamps are relevant for LCDs (see further Items 1 to 4 in the Annex).

10 Danish Miljøstyrelsen, The Elements in the Second Rank.

11 Greenpeace, Guide to Greener Electronics, Nov 2008.

12 Greenpeace International, Nokia tops latest Greener Electronics Guide, 16 Sept 2008.

RANKING BRAND NAME COMPANIES' ENVIRONMENTAL PRACTICES

Greenpeace International ranks the main PC, mobile phone, TV and game console brands in its 'Guide to Greener Electronics'. The companies are compared on issues regarding toxic chemicals, recycling and climate change. At the end of 2008 Nokia and Sony Ericsson received the highest scores while Nintendo and Microsoft ended up at the bottom of the list. Read more at www.greenpeace.org/international/campaigns/toxics/electronics/how-the-companies-line-up

flame retardants in the most popular game consoles - Playstation 3, Nintendo Wii and Xbox 360. However, the test also showed that each manufacturer had eliminated or reduced certain individual substances in certain materials of the console, but not the same ones.¹³ The fact that different companies excluded different ingredients in their products proves that the technical know-how for further improvements is available.

13 Greenpeace International, Game Consoles: No Consolation, 8 Jan 2008.

4. RECYCLING OF ELECTRONICS IN EUROPE

The purpose of collection and recycling of electronics is to make sure that materials can be reused and potentially hazardous materials do not leak into the environment. By recycling electronics new mining activities with large environmental footprints, as well as green house gas emissions, can be limited. Moreover, big money can be made, since the products contain several precious and valuable metals such as gold, platinum and palladium. Mobile phones are the most valuable form of e-waste. If all the phones that were sold in 2007 were recycled, approximately EUR 800 million worth of precious metals would be recovered.¹⁴ With modern technology professional recycling companies in Europe are able to recycle 65% to 90% of a computer, a TV or a mobile phone.¹⁵

Despite these benefits many discarded phones are left in drawers or attics around the world, instead of being given in for reuse or recycling. Market research conducted by Swedish service provider Telia suggests that most Swedes have two mobile phones that they do not use. 12% of the respondents stated that they have five mobile phones or more that they do not use. 38% said that there is no real reason for keeping them.¹⁶

Collection rates of electronics in general vary a lot between the EU member states. The WEEE Directive requires each member state to annually collect four kilos per inhabitant.¹⁷ The average annual collection rate within the EU was 5.3 kilos per person, while it is expected that each inhabitant annually generates 15 kg of WEEE.¹⁸ This shows that there is substantial room for improvement. Sweden currently holds the leading position by collecting 17.5 kg per inhabitant in 2007. A recent study shows, however, that toys, watches, hair dryers, computer keyboards, hard discs, circuit boards, radios and CD players still can be found in household garbage. While larger products, such as fridges and TVs, are more or less always handed in to the recycling system, 1.3 kilos of e-waste per citizen (mostly smaller electronic products) is estimated to end up in the household bin or in the wrong garbage skip.¹⁹

The aim of EC legislation is to handle the waste in environmentally sound ways and stop it from being dumped in developing countries. Still, e-waste of unknown scale keeps ending up in Africa and Asia. Moreover, some experts expect this export to increase as an undesirable side-effect of the environmentally friendly laws in the EU. When EU member states need to meet higher collection targets and the recycling costs are lower in other countries, exports may become more attractive, especially when the fate of collected products are not monitored by the authorities.

14 SwedWatch's calculations based on information in the New York Times, *The Afterlife of Cellphones*, 13 Jan 2008. Forex's currency rates for January 2008 have been used to calculate the amount into Euro.

15 According to recycling company Stena Metall only a few percent of a PC or a TV cannot be recycled (interview with Phår Oscár, Managing Director and Business Area Director WEEE at Stena Technoworld, 9 March 2009). Nokia writes that 65% to 80% of a Nokia device is recyclable (Nokia, press release, 8 July 2008).

16 mobil.se, *Mobilkomposten håller insamlingskampanj för gamla mobiler*, 3 April 2008.

17 Link to full text of the directive is available in the list of references at the end of this report.

18 Huisman J. et al, 2007, 2008 Review of Directive 2002/96 on Waste Electrical and Electronic Equipment, p 247 and Elkretsen, Sverige i världstopp i insamling av elavfall, 29 Feb 2008.

19 Avfall Sverige, 2008, *Vart tar smått el-avfall från hushåll vägen? Studie av plockanalyser samt hushållens attityder och agerande*, Rapport 2008:3, p 15-17. Pilot projects are currently taking places in some cities to improve the collection of smaller products.



Credit: Stena Metall

In order to produce a computer with a monitor 240 kilos of fossil fuel, 1,500 kilos of water and 22 kilos of chemicals are required. Increasing the lifespan of electronics and recycling are two important strategies to help decrease the large-scale ecological footprint of electronics consumption. The photo shows a modern recycling facility in Norway a country which, together with Sweden, leads the global recycling league.

5. THE ELECTRONIC WASTE OF THE EUROPEANS

Shipments are stopped by the Spanish Customs on the Canary Islands. Inspections reveal computers and TV sets from Sweden destined for Africa. In Nigeria and Ghana hundreds of shipments stuffed with computers from the US and Europe are arriving each month, but most of the goods that arrive do not function. In 2007, a Danish team found electronics labelled with the names of European and American firms and institutions such as Stockholm Schools, the World Bank and the United Nations on waste dumps in Ghana.²⁰ The e-waste that is exported from Western countries to Africa is described as a ticking toxic bomb by local specialists and organisations²¹, a bomb that developing countries lack the capacity and resources to handle and exporting countries have failed to prevent.

Reports from developing countries send a clear message to governments, authorities, electronic companies and consumers in the developed world: some of the rich world's e-waste problem is currently being exported to countries that lack the capacity and resources to handle hazardous waste. By not ratifying the Basel Convention and not requiring producers to take back products that are discarded, the US is often targeted as the main culprit. However, there is also evidence that EU member states take part in this toxic game. Despite regulations and the requirement to enforce them, many member states refrain from working to properly combat illegal e-waste shipments. No one knows the scale of EU exports of e-waste or used goods at present, but information from several developing countries and the knowledge built up by Customs and police within the EU show that this export is taking place and needs to be addressed at EU borders. The following chapters take a closer look at the data currently available.

5.1 'THE HIDDEN FLOW'

The United Nations University (UNU) estimates that each person in Western Europe generates 14 to 24 kg of e-waste per year. In total, UNU suggests that some 8.3 to 9.1 million tons of e-waste occurred across the European Union's 27 member states in 2005. Currently, it is estimated that 25% of the medium sized appliances and 40% of the larger appliances are collected and treated.²² The rest, the remaining 60% to 75%, represents what Greenpeace International calls "the hidden flow".²³ It might be stored or disposed of otherwise within the EU, but given the reports from developing countries parts of this "hidden flow" is being exported for reuse, recycling or disposal in, for example, Asia and Africa. Moreover, also some of the collected material might be exported to developing countries.

5.2 AN ANALYSIS OF THE EUROPEAN TRADE STATISTICS

Shipments of different types of waste are increasingly crossing the borders within the EU and between the union and other states of the world. A recent study from the European Topic Center

20 Cases described by Swedish authorities (Margareta Appelberg, interview in March 2008), DanWatch (*European electronic waste in Ghana and Nigeria*, 25 Feb 2008) and the Basel Action Network (*The Digital Dump*, Oct 2005).

21 For example Prof. Oladele Osibanjo, Director of the Basel Convention Regional Coordination Centre for Africa for Training and Technology, in BAN, *The Digital Dump*, Oct 2005.

22 Huisman J. et al, 2007, Executive summary and p 60.

23 Greenpeace International writes about "the hidden flow" in *Toxic Tech: Not in Our Backyard*, 2008.

ILLEGAL TO EXPORT E-WASTE, BUT SECOND-HAND GOODS ARE ALLOWED

On the international level, the Basel Convention of 1989 established worldwide notification requirements for the movement of hazardous waste and obliged the parties to minimize the generation of such waste and to ensure its environmentally sound management. The European Community transposed the Convention by Council Regulation (EEC) No 259/93 (the Waste Shipment Regulation). As from 1998 the EU also prohibits the export of hazardous wastes to non-OECD countries altogether. Consequently, exports of hazardous e-waste from the EU to developing countries are illegal, but properly functioning, used electronic goods are allowed. The Basel Convention was amended to include a ban in 1995, but the amendment has not yet entered into force due to insufficient number of ratifications.

For more information about the Basel Convention and the EC legislation, please refer to <http://ec.europa.eu/environment/waste/shipments/background.htm>, www.basel.int and www.ban.org.

on Resource and Waste Management (ETC/RWM) also suggests that illegal shipments of waste in general to non-OECD countries increased between 2001 and 2005, although it is not known whether this is due to an increase in exported amounts of illegal waste or the result of more inspections conducted by the Customs and the police.²⁴

The figures presented by ETC/RWM should be interpreted with care, given the limited and sometimes poor quality of available data. With regard to waste from electrical and electronic equipment (WEEE), ETC/RWM stresses that only a small percentage of the WEEE shipments can be extracted from trade statistics, covering mainly batteries. The figures that do exist show a strong increase; from 1997 to 2005 the quantities of exported WEEE tripled. ETC/RWM suggests that most registered exports take place between member states, while exports to countries outside the union are less than 10% and relatively stable. According to the statistics, main recipient countries are countries in Asia and South Eastern Europe (Albania, Bulgaria, Bosnia-Herzegovina, Croatia, the Republic of Macedonia, Romania, Turkey, Serbia and Montenegro).²⁵ However, ETC/RWM has not studied if the e-waste is treated in these countries or if it is re-exported to other parts of the world.

When analysing national statistics for shipments of electronics that have been declared as actual products and not waste, an additional picture emerges. These figures indicate that parts of the exported electronic goods might be waste or second-hand products with unknown additional lifetime. In this context, countries in Africa and the Middle East seem to be important recipients.

5.2.1 DENMARK

In late 2006, the Danish consultancy firm PlanMiljø analysed the exports of used electrical and electronic equipment on behalf of the Danish Environmental Protection Agency. A special

²⁴ European Topic Center on Resource and Waste Management, 2008, Transboundary shipments of waste in the EU – Developments 1995-2005 and possible drivers, p 67-68.

²⁵ Ibid, p 10, 52-53 and 64.

focus was placed on exports to Africa, Asia and the Middle East. The low price of the exported products indicates that the shipments, to a large extent, consisted of used products or illegal e-waste. In total 2,500 tonnes of electronic and electrical products were exported directly by ship from Denmark to non-OECD countries in 2005, mainly to West Africa and the Middle East.²⁶

Based on the Danish figures, the European Topic Center on Resource and Waste Management (ETC/RWM) suggests that as much as 200,000 tonnes of used TVs, computers, monitors, screens, refrigerators and deep freezers might be exported each year out of the EU. Other products, such as mobile phones and copy machines, have not been included in these estimations.²⁷ Due to the low number of ports inspections in the EU as a whole, the Customs are often not aware of the age and the quality of these exported products.

ETC/RWM has also analysed European trade statistics for colour television sets and noticed that 52,000 units were exported to African countries in 2005 at relatively low prices. Most of them were exported to Ghana, Nigeria and Egypt at an average price of EUR 28, which is a strong indicator that a large part of them might be used products or waste.²⁸ Local sources estimate that the majority of the products that arrive as second-hand electronics to Nigerian ports are junk and not repairable or resalable.²⁹

5.2.2 SWEDEN

SwedWatch's analysis of the Swedish export statistics gives rise to questions similar to the Danish survey. Total exports of mobile phones and computers have increased since 1995. According to official statistics, no exports of mobile phones or stationary computers took place between 1995 and 2005. In 2007 exports totalled 2,095 tonnes of mobile phones and 1,063 tonnes of stationary computers.³⁰

A small part of these exports may be explained by retailers sending new products to affiliates in other countries. Other shipments are probably due to the fact that Sweden currently offers low prices on electronics in general in comparison to many other countries.³¹ However, SwedWatch's review of the official statistics raises several issues that should be further examined by Swedish authorities and Customs. Average weights and prices often do not seem to fit the products that exports are declared as.³² Moreover, for some destinations the declared average prices indicate that the shipments may contain used products of unknown age and additional life time or waste. This goes for example for stationary computer shipments in 2007 to Ethiopia (8 tonnes at average SEK 267 or EUR 28 per piece) and Gambia (5 tonnes at average SEK 228 or EUR 24 per piece). The same year 11 tonnes of laptops were shipped to Ghana at an average price of SEK

26 Ibid p 54-55.

27 Ibid, p 56.

28 Ibid, p 56-58.

29 John Burns, Environment Manager at the Environment Agency in the UK, interviewed on 6 March 2008.

30 Export statistics from Statistics Sweden's Statistikdatabasen.

31 Possible explanations given to SwedWatch by companies selling electronics in May 2008.

32 For example 117 tonnes of mobile phones were exported to Indonesia in 2007 at very high average weight and prices, which raises question marks about the accuracy of the custom declarations and the actual content of these shipments. The same goes for exports of goods declared as mobile phones to Malaysia (89 tonnes) and India (77 tonnes) and shipments of other electronic products.



Thousands of discarded computers, TV sets and household electronic apparatus arrive in the ports of West Africa every day. Some of the shipments come from Europe and are treated by informal recyclers even though health risks are extreme. Electronic products often contain hazardous materials and two of the most deadly persistent organic pollutants, dioxins and furans, may be released when plastic casings and cables are burned, which is the case in this photo.

86 /EUR 9. The average weight of these items indicates that the products shipped were entire products and not components.³³ In 2008 stationary computers were shipped to several countries in Asia and Africa at low prices (SEK 120 to SEK 1200 or EUR 12 to EUR 120 per piece).³⁴ It is, however, difficult to say if the shipments contain whole products or components. SwedWatch asked the Customs for additional information regarding shipments to developing countries (names of exporters or information about if these are known companies or smaller ones etcetera), however the request was denied.

“In order to know exactly what is in these shipments, you would have to physically inspect them. In the early days we looked at everything, we opened every box to see if the content agreed with the declaration, but this is not feasible anymore. The trade flows are so much bigger and processing has to be done quickly”, says Martin Johansson, specialist in environmental crimes at the Swedish Customs.

33 SwedWatch's calculations based on export statistics from Statistics Sweden's Statistikdatabasen. For the calculation of values in euro, Forex's exchange rates of 1 July 2007 have been used.

34 SwedWatch's calculations based on export statistics from Statistics Sweden's Statistikdatabasen. For the calculation of values in euro, Forex's exchange rates of 1 July 2008 have been used.

Currently, narcotics, alcohol, tobacco and financial crime are areas of high priority for the Swedish Customs, while waste and e-waste is not. Due to limited resources, inspections made are very few and the penalties are relatively low, which may increase the risk of illegal activities.

The Swedish police point out the lack of resources necessary to become more expert on the contents of shipments leaving Sweden.

“Information indicates that computers and TV sets are disappearing from recycling centres in Sweden, and of course these products will end up somewhere, but we do not know the scale of the problem since we have not mapped it. There is, however, no reason to believe that some of the products that end up in dumps in Africa or Asia do not come from Sweden, but in order to get this under control we first need to examine it properly”, says Linda Arroyo at the National Criminal Investigation Department at the Swedish police.

From a legal perspective, some electronics that are crossing Swedish borders may not be classified as waste in the end, Linda Arroyo says. Still the shipments may be problematic from an environmental perspective if they have limited lifetime left and if proper disposal and recycling processes are lacking in the recipient country in question. Swedish municipalities and county administrative boards bear responsibility for ensuring that goods collected are handled as they should, however according to Swedish Environmental Protection Agency they lack the resources to implement sufficient control.³⁵

5.2.2.1. What happens to Swedes' mobile phones?

About three million mobile phones are sold in Sweden each year. El-Kretsen³⁶, a company in charge of a recycling system for discarded electrical and electronic products in Sweden, estimates that less than a million of these phones are sent to recycling by El-Kretsen or by repair shops. What is happening to the rest of these phones?

As mentioned earlier many mobile phones are kept in homes and El-Kretsen estimates that 15 million mobile phones may not be used, but still not sent to recycling. These do not pose a threat to the environment in terms of leakage, but finite resources such as metals would be saved if they were to be recycled. According to El-Kretsen, discarded mobile phones also leave Sweden. Collections are organised by actors outside the system for producer responsibility. No one is, however, willing to give further information about this.

“The whole sector knows that discarded mobile phones are leaving Sweden. We do not know how many actors that are behind this, but we do know that it is taking place”, says Ulrika Eliason at El-Kretsen.

³⁵ Interview with Margareta Appelberg at Swedish Environmental Protection Agency, 23 March 2009.

³⁶ El-Kretsen is a nationwide recycling system for discarded electrical and electronic products with approximately 950 collection facilities. By becoming a member of El-Kretsen, the producer avoids having to build its own system. Apart from this, some producers and retailers in Sweden have set up a system of their own.

El-Kretsen's system focuses on recycling and phones that go into this system are not refurbished to be sold as second-hand goods.³⁷ Other actors do carry out refurbishment and reuse though. The collection campaign Mobilkomposten is one example. It was initiated by the aid organisation Plan Sweden in cooperation with Nokia in 2008 and collection bins were placed at retail stores such as The Phone House, Media Markt, Teknikmagasinet and Expert, as well as in the shops of two Swedish service providers; Telia and Tre. Phones collected are sent to the British recycling company Greencyc, which sorts out phones that can be sold as second-hand goods (about 25% of the total) and components that can be reused. According to Greencyc refurbished and tested mobile phones that are less than two years old are mainly remarketed in Spain and the UK, while phones that are older are remarketed in countries such as Greece and Italy. Morocco is also considered for future sales.³⁸

Information on Mobilkomposten's website says that phones collected are only resold in countries with sufficient legislation and recycling processes in place.³⁹ However, the health and environmental problems caused by informal recycling of electronic products in Morocco have recently been highlighted by computer vendor HP and the Swiss Federal Institute of Technology (Empa), which concluded in 2008 that Morocco's legal framework was insufficient and that no organised e-waste management system was in place for mobile phones and computers.⁴⁰ HP operates a policy of not reselling electronics used in developed countries on markets in the developing world until sound recycling systems are in place.⁴¹

When SwedWatch asked Greencyc if the risks in Morocco had been considered, the company replied that no phones had yet been sold to Morocco, but the company is in the process of pre-qualifying two customers.

"Until we are satisfied with these customers' ability and Morocco's ability as detailed above, no sales will be made", writes Peter Johnston at Greencyc.

Greencyc currently pays Plan Sweden at least SEK 30 per phone, funds that go to Plan's aid projects focusing on children in countries affected by climate change.⁴²

5.2.2.2. The Swedish second-hand market for computers

Reuse instead of recycle: for the sake of the environment. That is the motto of several Swedish companies involved in the refurbishing and re-selling of used computers at the moment. After having eradicated all data in the PCs that they receive they sell them on, mostly to companies, authorities, schools and municipalities that want to cut costs and do not need the latest models

37 Interview with Fredrik Benson at Elkretsen, 6 Feb 2008.

38 E-mail from Peter Johnston at Greencyc, 30 March 2009 and 1 April 2009.

39 mobilkomposten.se, Mobilens kretslopp.

40 More information about the current e-waste situation in Morocco is available in Laissaoui SE; Rochat D, 2008, Morocco, E-Waste Country Assessment.

41 In collaboration with the Swiss Federal Institute of Technology (EMPA) and the Global Digital Solidarity Fund, HP is currently engaged in a project to improve the recycling methods in several African countries, including Morocco, and may reconsider its policy in the future if the project will be successful. Arab Environment Watch, HP to Tackle E-waste Recycling in Morocco and Tunisia, 7 Oct 2007.

42 Interview with Cajsa Norell at Plan Sweden, 23 March 2009.



Credit: Empa, Switzerland

There is a high level of demand for second hand electronics in developing countries. Products that European consumers find outdated are for example used in homes, Internet cafés and offices around Asia.

in order to conduct more basic tasks. These companies help to increase the lifetime of each computer, which largely benefits the environment since the manufacturing of computers is very resource and energy intensive. To produce a PC with a monitor requires 240 kilos of fossil fuels, 1,500 kilos of water and 22 kilos of chemicals, which constitutes a large-scale ecological footprint.⁴³ The energy used to manufacture a stationary computer is about four times greater than the electricity consumed by using the computer.⁴⁴

“Some of our customers have started thinking about the environmental effects of computer production and therefore they choose to buy second-hand products in order to contribute to more sustainable IT development”, says Björn Rasmussen at Inrego.

His company, together with Once Again and Smålandsbörsen, own most of the second-hand market for computers in Sweden. Together they sell around 100 000 to 120 000 units to customers in Sweden and they have a common annual turnover of about MEUR 26 or MSEK 250.⁴⁵ The quality and the age of the computer decide what market it will be destined for. There is for example quite some demand for used computers in Eastern Europe at present, even though

43 Kuehr R; Williams E, 2003, Computers and the Environment – Understanding and managing their impacts, p 7.

44 Williams et al, Sustainability Review of the International Reverse Chain for Reuse and Recycling of Computers, in Proceedings of the 2008 IEEE International Symposium on Electronics and the Environment.

45 Tord Henryson, Sales Manager at Once Again, 5 May 2008.

Swedish customers find them outdated and see no reason for keeping them.

Another actor within the second-hand segment is IGUS Data, which focuses less on the Swedish market and sells mostly to clients in Germany, the Netherlands, Poland, Hungary and Norway where the demand for used computers is bigger. IGUS Data's customers are mostly brokers that act as retailers or middlemen for further trade. According to the company some of the products that were sold to brokers in 2008 probably ended up in Russia and countries in Africa.⁴⁶

“From some of our bigger clients we get guarantees about where the products go, at least in a few more tiers, but we do not know where the products we sell to smaller clients end up. Asking them for this kind of information would be like taking away their livelihood; they might get the impression that we are trying to deal with their customers directly instead of going through them”, says Kent-Olof Nordh at IGUS Data.

He is informed about the environmental and health risks that may arise from improper recycling and disposal in developing countries, but points at the opportunity of increasing poor people's access to IT by offering them second-hand goods.

“How are they ever going to compete with us if they cannot buy second-hand goods? These people cannot afford to buy new products. From our side, we try to have a tracking system in place so that we can see where it went wrong if one of our products turns up in a dump site”, he says.

One out of ten computers that Once Again sells goes to countries other than Sweden, both to big companies and to smaller traders in, for example, the Baltic States. Other destinations are India, Egypt and Morocco.

All the companies interviewed by SwedWatch stress that the products that they export to developing countries are well functioning and tested before shipment, and well packaged to last the journey.

“Swedish customers use the products for such a short time. In countries such as India or in Africa they can last for many more years. By increasing the lifetime of these products we are doing a good thing for the environment. Production of a PC and a monitor is very resource intensive. Therefore reuse makes sense”, says Tord Henryson, Sales Manager at Once Again.

The risks of the developing countries becoming the end station for IT equipment must be weighed against the benefits of access to technology, says Conny Halvardson at Smålandsbörsen:

“There is also a responsibility for us, within the EU, not to ship outdated equipment. Rule of thumb – if the equipment holds a value and it is tested and approved technically, then it should be useful and hence OK to export. Reuse is always a better option when possible”.

⁴⁶ In 2009, IGUS Data informed SwedWatch that they cannot know this for sure since the company does not trade directly with customers in these countries. E-mail from Kent-Olof Nordh, 27 March 2009.

COMPANY	EXPORT DESTINATIONS OF COMPUTERS FOR REUSE *
Inrego	Mostly Sweden and Europe. Only small amounts to the US and Russia plus one client in Malaysia.
Smålandsbörsen	75% of the products go to Sweden and Europe and 25% to the rest of the world (Africa, Asia and the US).
Once Again	90% go to Sweden, 10% to Eastern Europe, North Africa and India.
IGUS Data	95-98% goes to clients outside Sweden (mostly the Netherlands, Germany, Poland, Hungary and Norway). **
Nadex	Sells to all countries of the world.

* Company information given to SwedWatch in May 2008.

** In 2009 IGUS Data informed SwedWatch that the updated figure is 85% to 90% and that the company is increasingly reaching out to larger customers in Sweden. E-mail from Kent-Olof Nordh, 27 March 2009.

5.3 INSPECTIONS IN HARBOURS AROUND EUROPE

The export of e-waste is not an area that has so far been paid much attention within the European Union as a whole. Even though laws exist that should be enforced to exert real effects, the area has not been given high priority. Reasons mentioned by several officials are the lack of resources and political will by member state governments, as well as difficulties in enforcing the quite complicated law. The main dilemma is to interpret what actual waste is and what should be regarded as second-hand products suitable for reuse.

5.3.1. TRADE ROUTES FROM EUROPE TO OTHER PARTS OF THE WORLD

IMPEL-TFS is an informal network of the environmental authorities of the EU member states, acceding and candidate countries and Norway. Nancy Isarin, a consultant working for IMPEL-TFS, stresses the lack of sufficient data to be able to draw more definite conclusions about European e-waste, where it is going and what its effects are. IMPEL is currently investigating the shipment of European e-waste. Harbour inspections conducted so far give illustrative examples with regard to the current trade flows.

“What we do know is that illegal exports of electronics occur. The exporters are trying to cover up the exports by mislabelling the shipments. At the moment, it seems like Hong Kong, China, Singapore and Malaysia are the main recipients in Asia and that Nigeria and Ghana are the main ones in Africa”.

HiFi systems, fridges, cable waste, metal scrap, lithium batteries, municipal waste and scrap cars were among the products found during inspections in the EU between 2003 and 2006.⁴⁷ During inspections by the Dutch Inspectorate of Housing, Spatial Planning and the Environment (VROM) the destinations below were found for e-waste that left the country illegally. It should be noted that the majority of the waste shipments that leave Europe from Rotterdam do not originate from the Netherlands but from other countries, since Rotterdam is one of the EU’s main exit ports to the rest of the world.

47 ETC/RWM, 2008, Transboundary shipments of waste in the EU – Developments 1995-2005 and possible drivers, p 71.

COUNTRY OF DESTINATION	PERCENT
China/Hong Kong	43
Other Asian countries (Malaysia, Pakistan, etc)	7
West Africa (Ghana, Nigeria, etc)	28
Eastern Europe (Romania, Poland)	7
The Middle East and North Africa (Egypt, Jordan, Iran and Turkey)	10

Source: VROM

VROM stresses that the stream of e-waste or used electronic equipment passing through Dutch ports is not by far as big as the waste streams of plastic, scrap metal or paper, but the Inspectorate describes it as a prominent problem. The results of the first inspections in 2004 were “shocking”. Every fifth discarded TV had been illegally collected and exported to non-OECD countries as second-hand goods for reuse. However, VROM found that 50% to 90% of them were broken and should have been considered as waste. The enforcement projects that followed resulted in a large number of inspections, an analysis of the Dutch waste-chain and cooperation with the various actors in the field of e-waste, including electronics producers, e-waste collectors and e-waste recyclers in the Netherlands. As a result the number of offences has decreased, states VROM.⁴⁸

E-waste revealed by Dutch inspectors is often found as by-loads in second-hand cars and trucks, or together with domestic second-hand goods such as furniture, mattresses etc. In general, the small-scale exports go to West Africa while the larger and sometimes more structurally organised transports go to South East Asia where used products are often destined for Hong Kong, but then probably forwarded from there to mainland China and other countries in the region.⁴⁹

During a joint Asian inspection in 2007, Hong Kong Customs seized 98 consignments of hazardous waste during an eight-month period. The hazardous waste consignments were mostly electronic and electrical waste (used vehicle and computer batteries as well as used computer and TV monitors). In total 1,000 tonnes of computer monitors and 2,000 tonnes of batteries were seized during this period. Most of the shipments came from the US, Canada, Japan, countries of the EU (computer monitors from Belgium, Germany and Italy), but also from Central America and Africa. It was often difficult to say if the waste originated from these countries or if they constituted departure points for waste coming from elsewhere.⁵⁰

Investigations have also been conducted in Germany. In 2007 the German organisation Deutsche Umwelthilfe observed computers and old TV sets that were tumbling from shipping containers in the port of Hamburg. The organisation reported hundreds of cars and minivans stuffed with electronics and other waste on their way to Africa. The authorities claimed that they could not stop them, arguing that the shipments contained functioning goods, while Umweltshilfe argued

48 Letter to SwedWatch from Piet ten Brink at VROM, 14 April 2008 and Recycling International, *Mission Impossible? Illegal E-Scrap and the Issue of Enforcement*, March 2007.

49 Letter from Piet ten Brink at VROM, 14 April 2008.

50 World Customs Organisation Regional Intelligence Liaison Office for Asia and the Pacific, *Evaluation Report on Project Sky-Hole-Patching*, Oct 2007, p 12-16.

that many items clearly did not function. The investigation also discerned new trade routes for waste disguised as goods, from Germany to Vietnam and Uzbekistan.⁵¹

At first glance it might seem as if the Netherlands, Belgium, the UK and Germany were behind most exports of e-waste. However according to John Burns, National Enforcement Campaign Manager at the Environment Agency for England and Wales and project manager within the IMPEL-TFS Cluster, the higher numbers of violations in these countries might have other explanations. Firstly, these countries are the ones that have been most proactive in carrying out most inspections over recent years. Secondly, they host major ports that function as exit or hub ports for ships that come from all over Europe on their way to Africa and Asia. However, as controls have become stricter in these hubs, it is plausible that trade routes may be changing, says Nancy Isarin:

“We suspect that some waste goes through countries such as Greece, Italy and Spain, which are not members of IMPEL [and do not conduct many inspections]. This needs to be verified, but it is imaginable that these countries are attractive for exports to countries in North Africa for example.”

Dutch police officials also talk about port hopping, which means that offenders choose to make several transit stops within Europe as a tactic to cover their tracks and make identification and tracking of illegal shipments difficult.⁵²

5.3.2. OFFENDERS AND PROSECUTION OPPORTUNITIES

More research is needed in order to find out more about who is behind the illegal export that is taking place. According to John Burns, some of the waste is collected by producers as it should according to the WEEE Directive, but then sold on to brokers in Europe that turn to China, Indonesia and other countries where the products are either sold as second-hand products or to informal recyclers that extract valuable metals from the products in a harmful manner. Moreover, Customs and police talk about “waste tourists” coming from developing countries to collect waste that they then make money on in their home countries:

“People who are not EU citizens come to Europe for a few weeks where they collect waste, arrange for a shipment and send the waste to their home countries, for example Nigeria. This makes it difficult to prosecute and enforce the law in the end, since the dealers might have left when the shipment is detected”, says Nancy Isarin.

The difficulties in prosecuting exporters of illegal waste such as e-waste are mentioned by several police officials that SwedWatch has spoken to. As mentioned earlier it is, for example, often difficult to tell if the goods in a container are functioning (and thereby legal) or not (and thereby illegal).

51 Deutsche Umwelthilfe, *Germany Export World Champion – Thanks to Waste Electrical and Electronic Equipment too*, press release, 20 June 2007.

52 Telephone interview with Mario van Leeuwen at the Dutch National Intelligence Service Agency, 11 March 2008.

“At the same time you can often clearly see if someone wants the products to work when it reaches the final destination or not. In some containers you find products that have been carefully packed in. In others, like in one that was found in Rotterdam in late 2007 destined for Pakistan, they had just thrown in the computers at the back of the container and they were clearly not working”, says John Burns.

Another difficulty stressed by some officials has to do with products destined for repair. It is illegal to export goods for recycling to non-OECD countries, but the law is more difficult to interpret when it comes to goods destined to be repaired.

“You never know if it is possible to repair a product or not until you try, which means that you cannot know if it is waste from the start or not. Nevertheless, repair activities often generate hazardous waste anyway. Therefore the Swedish authorities look at repair operations as a borderline case”, says Margareta Appelberg at the Swedish Environmental Protection Agency.

The aim of the EC legislation is to protect the environment, but Nancy Isarin fears undesirable side effects due, for example, to the WEEE directive that entered into force in 2005.

“Because of the WEEE Directive, EU member states need to meet higher collection targets. If a country does not have enough capacity to handle this, or the costs are lower in other countries, exports become more attractive”, says Nancy Isarin.

Meanwhile, shipments of e-waste continue to arrive in African and Asian ports. According to Michikazu Kojima, specializing on recycling and waste management in Asia at the Japanese Institute of Developing Economies (IDE-JETRO), the number of shipments of used TV sets and TV waste arriving to Asian harbours seems to be increasing, but for computers and mobile phones no figures exist.⁵³ IMPEL is currently trying to intensify cooperation with national authorities in Hong Kong and China, but this is in the early stages and it is an understatement to say that these countries lack the necessary resources to stop the illegal waste flow.

“Only 50% of the electronics arriving to China for reuse actually work. In Nigeria you hear about similar figures; half or less actually works when it arrives. Therefore, key to preventing this problem is for exporters to check items within shipments so that they are in working order before they leave the exporting country within the EU”, says John Burns.

53 Email correspondence with Michikazu Kojima, 2 May 2008.

EFFORTS TO CURB THE EXPORTS OF E-WASTE AND SECOND-HAND GOODS IN ASIA

In an effort to control the problem, some recipient countries have introduced their own regulations on imports of hazardous wastes and used electronic goods. In 2000 and 2002, China introduced legislation that prohibited the import of e-waste. India has done the same, however this legislation includes many loopholes. Also Indonesia and Vietnam have decided to prohibit import of e-waste.

As regards second-hand goods, different countries take different positions. Indonesia has banned the import of used TVs, radios and other second-hand equipment. Since 2003 Thailand requires that a range of electronic products may not be more than three years old. The Philippines requires prior notification and consent before used electronics may enter the country. India's policy is relatively liberal; second-hand computers up to ten years old may be brought into the country as donations.

Kojima (2005, 2006) and Toxics Link (2007)

6. THE RICH WORLD'S ELECTRONIC BACKYARD

Paa Kwesi is a seventeen year old boy living at the Kokomba market in Ghana's capital Accra. It is a settlement not far from the electronics waste dump at Agbogbloshie where he has earned his living the last three years by breaking open non-functional computers and television sets that have been shipped from the US and Europe.⁵⁴ He complains of headaches and chest pains. Without protective equipment he breaks cathode ray tubes that probably contain lead and removes the yoke which contains copper. He then removes the wires and other parts of the computers with his hands and burns them over open fires to expose the copper, which he sells to local scrap dealers. The remaining parts of the computer are then dumped along the banks of the river Odaw, which runs through the dump site.⁵⁵

This type of informal recycling is typical of many developing countries. Despite the high health risks and the pollution, mostly unskilled migrant workers try to make a living by recovering the valuable parts. Paa Kwesi earns less than a euro per day and low wages are also symptomatic of these tasks. However other actors in the e-waste supply chain can make quite good profits.

Field investigations conducted by the Danish research organisation DanWatch show that thousands of discarded computers, TV sets and household electronics arrive in the ports of West Africa every day.⁵⁶ According to local specialists only about a quarter of them actually work.⁵⁷ The remainder often end up on dumpsites such as Agbogbloshie.

There is a great need for computers and other information technologies in Africa. These products may help bridge the so called "digital divide" and mobile phones makes it possible for people to communicate despite poor roads and long distances. 75% of all phones in the least developed African nations are mobile phones and for the user it is a product of very high value, even though European consumers would find the models obsolete. However there is a considerable difference between bridging the digital divide and dumping waste on poor nations. The influx of non-functional computers has made local experts urge the US and the EU to put mechanisms in place to ensure that only functional, tested and certified computers come in.

Ghana is but one country that cannot handle the effects of e-waste at present. Other examples are China, India, Pakistan, Indonesia and the Philippines. A major part of the e-waste burden in these countries is a result of the rapidly increasing domestic consumption of electronics. However, illegal exportation from the rich world to poor nations adds to the problem. The clandestine nature of this trade makes it impossible to estimate the scope of it locally. Moreover, local NGOs and researchers trying to investigate where the waste and used goods originate from find this to be an increasingly difficult task.

54 Products found on this dump site originated from the US, Germany, the UK, the Netherlands, Italy, Denmark, Sweden and other European countries.

55 Portrait and information received from Mike Anane, Director of the League of Environmental Journalists in Ghana in early 2009.

56 DanWatch, *European electronic waste in Ghana and Nigeria*, 25 Feb 2008.

57 Estimates given by Professor Oladele Osibanjo, Director at the Basel Convention Regional Coordinating Centre for Africa, to DanWatch in 2007.



Credit: Empa Switzerland

Informal recyclers are exposed to severe health risks on a daily basis. Many of them are unaware of the fact that electronic products often contain hazardous ingredients and that protective equipment is vital.

“Nowadays most labels are gone and plugs [that otherwise could indicate if products originate from the US or Europe] have been removed. Instead we try to get information from different actors in the e-waste chain and documentation from Customs. Their information confirms that e-waste is being imported from Europe via Dubai to Indian ports. Most of it comes under the names of ‘mixed metal scrap’ or ‘donations’”, says Priti Mahesh, Senior Programme Officer at the Indian NGO Toxics Link.

The economic logic of the exports from the rich world is clear. It costs about EUR10 to recycle a computer in Sweden. In India on the other hand it can be recycled for EUR 1.50 in the informal sector.⁵⁸

“When our research team visited these sites we could barely stand it for a minute, but these people live and work in these places, every day, year after year”, says Priti Mahesh at Toxics Link in India.

⁵⁸ Figures from recycling company in Sweden and Toxics Link, E-waste Factsheet, Nov 2007. Forex's currency rates for 2007 have been used to calculate the amounts into Euro.

The dumping of e-waste in poor nations was first highlighted in 2002 when pictures from the town of Guiyu in the eastern Guangdong Province in China reached the world. As in Ghana, poor men and women were burning wires to recover copper, a process that exposed them to two of the most deadly persistent organic pollutants; dioxins and furans. Computer plastics were melted in badly ventilated rooms and children were seen playing in a landscape full of ashes and toxic residues. Much of the electronics they handled originated from the rich world, mostly North America but also Japan, South Korea and Europe.⁵⁹

Several scientific studies of health and environmental effects in Guiyu have been published since then, showing high levels of heavy metals and organic contaminants in samples of dust, soil, river sediment, surface water and ground water. A study published in 2007 showed that children in Guiyu had much higher blood lead levels than children living in a settlement where WEEE-recycling did not take place. Health problems within the WEEE-recycling industry as a whole have been reported in the last few years, including diseases and problems related to skin, stomach, respiratory tract and other organs. Protective equipment is rare, even though a quite basic safeguard such as inhalation protection against dust, could assist workers or mitigate some of the reported problems.⁶⁰ Moreover, information available indicates that most workers are not covered by health insurance or unemployment and pension schemes, and migrant workers from the countryside often see the e-waste industry as a job opportunity in the industrial regions of Guangdong. As soon as they are offered better jobs in other sectors they quit.⁶¹

Several researchers stress the economic importance of the WEEE-recycling industry in Guangdong and also in the neighbouring Zhejiang Province. By creating jobs and new businesses, as well as providing other sectors with raw materials, it has contributed to economic development, although at very high human and environmental costs.⁶² Even if toxic materials are entirely designed out from electronic products, the environmental impacts generated in informal recycling processed would still be unacceptably high. This has led to discussions on how to partly or fully formalise the informal sectors in developing countries, which currently consist of a wide range of actors and tasks (collection, testing, refurbishing, disassembling, recycling, resale of recycled materials and products for reuse). Many people depend on these activities for their living today.⁶³

The trade flows between North and South, as well as within the different continents and countries, are constantly changing. According to Jack Qiu, Assistant Professor in Communication at the Chinese University of Hong Kong, e-waste was a more serious problem

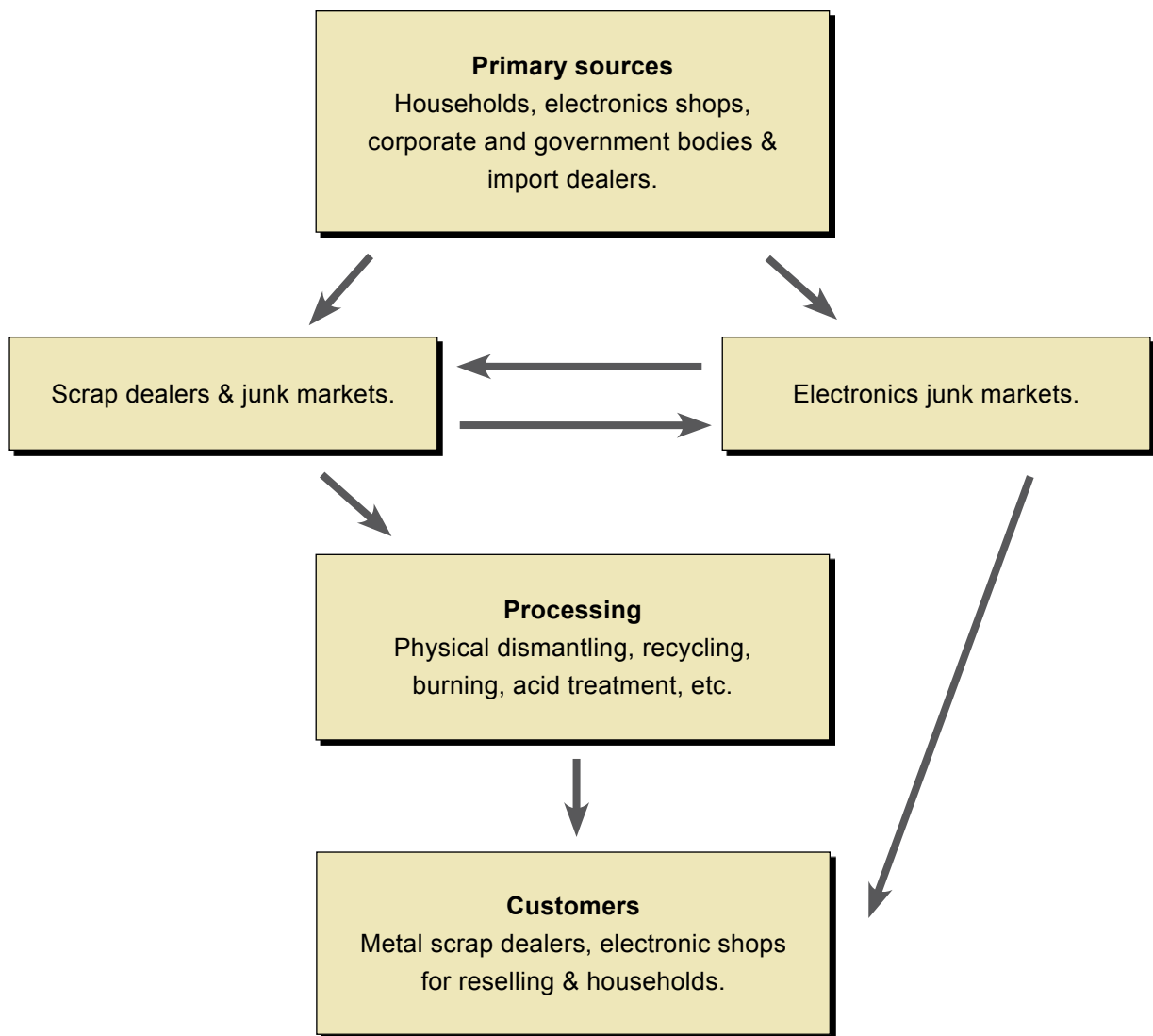
59 BAN, 2002, *Exporting Harm*, p 15-22.

60 Manhart A, *Key Social Impacts of Electronics Production and WEEE-Recycling*, June 2007, Chapter 4. For more specific information about the study on increased blood lead levels, please refer to Huo X, Elevated Blood Lead Levels of Children in Guiyu, an Electronic Waste Recycling Town in China, published in *Environmental Health Perspectives* Volume 115, Number 7, July 2007. See also academic studies about severe pollution caused by informal recycling activities in Guiyu in Wong MH et al, Export of Toxic Chemicals – a review of the case of uncontrolled electronic waste recycling in *Environmental Pollution*, vol 149, 2007, p 131-140.

61 Manhart A, *Key Social Impacts of Electronics Production and WEEE-Recycling*, June 2007, Chapter 4.

62 Tong X and Wang J, Transnational Flows of E-waste and Spatial Patterns of Recycling in China, published in *Eurasian Geography and Economics*, Volume 45 No 8, Dec 2004.

63 Read more about how the sector could be formalised in practice in Williams E, 2005, Mandated prices as an instrument to mitigate environmental impacts in informal reuse/recycling.



Based on ASK India (2006)

in Southern China three to five years ago than it is today.⁶⁴ Computers, printers, TV sets etc. used to come from the US and Japan through Hong Kong to cities in Guangdong, but the WEEE-industry in the province is currently subsiding.

“Due to stricter environmental policies, enforced by local governments in Southern China, most e-waste is not being recycled there anymore. We fear that the e-waste is going to the northern parts of China instead, to the inland, and to Vietnam and other countries of Southern Asia such as Cambodia. Polluting factories of textile, electronics, garments etc. have already taken that route – from Southern China to Vietnam and Cambodia - and the e-waste flow is following”, says Jack Qiu.

64 Interview with Jack Qiu, 18 May 2008.

Hong Kong's role as a big port hub for e-waste and used electronics also seems to be changing, which also affects the trade routes for used goods. Jack Qiu's investigation shows that used mobile phones have been imported by Hong Kong traders over the last few years, mainly by Indians and Pakistanis who sell them to African buyers who come primarily from Nigeria and Tanzania.

“Up until the end of 2007, it was easy for African traders to get an entry visa at the Hong Kong airport. However, since Hong Kong tightened its immigration policy, the African traders have been leaving Hong Kong for Chinese cities like Guangzhou on the mainland, where they can purchase cheaper, more heavily used phones from the larger refurbishing companies there. Many Nigerians have learned Mandarin in order to do business in Guangzhou and the city now even has an African-style coffee shop”, says Jack Qiu.

Some phones that arrived from EU countries were brand new but outdated models that the Europeans did not want, says Qiu. They travelled across the globe to finally end up in Africa.

Jack Qiu is currently involved in a five-year research project focusing on how the people within the working class use IT. He stresses that terms such as “waste”, “functioning” or “not functioning” are defined differently by poor people in Asia than by consumers and regulators in Europe.

“The computers you find in Internet cafés in Southern China are repaired computers that perhaps did not function when they arrived here. I have also met buyers in some parts of China who regarded computers merely as decorations. They only wanted the IBM logo in their offices, but never turned it on.”

The second-hand trade increases the IT knowledge of people who otherwise would have been excluded from the new economy, he says. However, systems must be set up and public education is needed concerning how to deal with the e-waste that arises from the repair and reuse of electronic goods.

“There are positive aspects and negative aspects of this trade, but there is also a huge grey zone. More research is needed in which researchers go out and talk to consumers of used electronics in, let us say, Sri Lanka, Cambodia, Tanzania and Kenya to see how they benefit from these used goods and also what the final environmental effects are”, says Jack Qiu.

Priti Mahesh at Toxics Link in New Delhi is more sceptical towards the exports of second-hand electronics to Asia.

“In India it is legal to import up to ten-year-old products. This is in fact dumping. We want the import of second-hand electronics to be banned. India already has great difficulties handling the waste that is generated domestically at the moment, through domestic consumption and manufacturing of electronics”.

EPR TO SPUR ENVIRONMENTALLY FRIENDLY DESIGN

Extended producer responsibility (EPR) is an environmental policy principle where the producer's responsibility for a product is extended to also cover the stage after the consumer has stopped using it.¹ Instead of letting local governments and tax payers take on all the responsibility, the EPR principle argues that the producers should be more involved. The EU WEEE Directive is based on this idea and producers and distributors of electronics are responsible for financing the collection and treatment of e-waste, which provides incentives to design products that are less toxic and easier to recycle. Different systems have been designed in different EU countries where the directive has been implemented. However, the EPR principle has not been included in India's legislation. In China an e-waste fund has been discussed, which would provide funding for formal recycling activities, but its implementation is very uncertain.²

At the same time some companies have set up voluntary take back systems of their own or in cooperation with different service providers. One example is Sony Ericsson that launched an "environmental warranty" in 2008. By this warranty Sony Ericsson promises to recycle its products in an environmentally sound way when they are taken to any designated collection point globally, regardless of where the product was originally purchased. The information to customers has, however, so far been limited. In Greenpeace's latest ranking of 2008 Nokia received the highest score on take-back by offering to take back old products in 124 countries around the world, including Africa. HP, Sharp, Philips, Microsoft and Nintendo received the lowest scores on this issue.³

1 For more information about the EPR principle, see Manomaivibool et al, 2008, EPR in a non-OECD Context: An introduction to research projects on the management of WEEE.

2 Priti Mahesh, Toxics Link India, 3 November 2008 and Dr Martin Streicher-Porte at Swiss Federal Laboratories for Materials Testing and Research (Empa), on 25 Feb 2009.

3 Greenpeace International's Guide to Greener Electronics, Nov 2008.

6.1 EFFORTS TO CLOSE THE LOOP

The formalisation of recycling processes in Asia and Africa, and setting up collection systems that work, is an urgent task that has proven to be very difficult. Formal recycling facilities in developing countries, with stricter environmental practices in place, have great difficulties competing with the informal sector today. Owners of old equipment or waste expect to be paid for handing over the products to a recycler or a collector. Moreover, Chinese pilot projects for formal recycling have mainly proven to be profitable for PC recycling so far.⁶⁵ When take-back systems are not required by law, as in the EU's WEEE Directive, only products that are profitable tend to be collected.

Twelve formal recyclers existed in India at the end of 2008 and so far some pilot projects have been set up in China.⁶⁶ In addition to this some brand name companies have voluntarily tried to organise take-back systems, but they all have difficulties in getting feed.⁶⁷

Nokia writes that up to 80% of the materials in an old phone can be reused in manufacturing of a new product and thus limiting the need for new mining activities with large ecological footprints. There are three billion mobile phone owners in the world today. If each of them handed in one unused phone, 240,000 tonnes of raw materials could be saved. The emission of greenhouse gases would be reduced to the same effect as taking four million cars off the road. However, research presented by the company shows that globally only 3% recycle their phones. 74% of the respondents said that they do not think about recycling their phones, mostly because they were not aware of the fact that it is possible or where they could hand in their phones.⁶⁸ These figures reveal the urgent need for awareness raising among consumers.

Another strategy aimed at increasing collection rates, especially in developing countries, may be financial incentives to make consumers hand in their products, such as prepaid cards and discount vouchers. A deposit refund system may constitute another alternative, especially for products with shorter life spans.

“In general companies are sceptical towards deposits though, since they add to the price of the product. Competition within the sector is fierce at present and margins of profit are small. Every single price increase is therefore heavily debated. Even if deposits are paid back to consumers, the psychological barriers are great”, says Andrius Plepys, Assistant Professor at the International Institute for Industrial Environmental Economics at Lund University in Sweden.

Deposits for products with longer life spans, of for example seven or ten years, may also be less attractive since the value of the deposit will have decreased at the time it will be repaid. Some experts also fear that deposit systems may lead to the effect that consumers hand in products just because they want to cash in the refund, not because the product cannot be used anymore, which

65 E-mail correspondence with Dr Martin Streicher-Porte at Swiss Federal Laboratories for Materials Testing and Research (Empa), on 25 Feb 2009.

66 Priti Mahesh, Toxics Link India, 3 November 2008 and Dr Martin Streicher-Porte at Swiss Federal Laboratories for Materials Testing and Research (Empa), on 25 Feb 2009.

67 More information about different company efforts or lack thereof regarding take-back is presented in Greenpeace's ranking *Guide to Greener Electronics*, Nov 2008.

68 Nokia press release 8 July 2008.

would not be good from an environmental point of view.

Yet another strategy, discussed among researchers and policy advisers around the world is that, in the future, consumers would not buy the product but instead purchase the service for a specific number of years. The product would then be returned to the manufacturer where the consumer fetches a new one and the loop would be closed. According to Dr Ruediger Kuehr⁶⁹, Executive Secretary of an initiative of various UN organisations called Solving the E-Waste Problem (StEP)⁷⁰, the idea has been tested but not taken further.

“There is an assumption in the industry that consumers do not want this, but it is not clear what consumers want. Today companies base their strategies very much on consumer demand, but if consumers are not aware of this possibility, that this would benefit the environment, why should they demand this? It becomes a ‘chicken or egg’ discussion. Considering closing the loop requires much more. Further action would be appropriate”, says Ruediger Kuehr to SwedWatch.

69 Ruediger Kuehr is the first editor of the book *Computers and the Environment – Understanding and managing their impacts*, 2003.

70 For more information about StEP, please refer to www.step-initiative.org

CONCLUSIONS

The global volume of e-waste might be as high as some 40 to 50 million tonnes per year, which is enough to fill a line of dump trucks stretching half way around the entire globe.⁷¹ A Western European household is expected to generate around 900 kilos of e-waste over a 20-year period.⁷² Electronic products improve and intensify our lives in many different ways, but their afterlives remain, to a large extent, an unsolved dilemma.

The hazardous ingredients included in the products constitute the root cause of the problem. Reducing the hazardous content is therefore vital, together with the setting up of well-functioning and sustainable collection and recycling systems. The EU's Waste Shipment Regulation, the RoHS and the WEEE Directives provide good tools to accomplish this. However, legislation forbidding dumping of e-waste in poor countries falls short if it is not enforced and controlled, which is currently the case in most EU member states. Few EU members give priority to this issue at present. Authorities are not given enough resources to inspect electronics shipments at their borders, even though the dumping of e-waste in developing countries has been highlighted for quite some time now.

Custom officials and NGOs, in the EU as well as in Asia and Africa, report on mislabelled EU shipments covering up illegal export of e-waste. Even though no one knows the scale of the exports, evidence exists that they do occur. The waste ends up in the informal recycling sector where it harms the health of men, women and children who lack opportunities to make a living in any other way. Toxic substances leak out into the environment and pollute land and waters as a result of their rudimentary methods. Some experts fear that these exports will increase as an unwanted result of the environmentally sound directives of the EU. When new legislation sets higher targets for collection and recycling, the financial incentives to export the waste to countries offering low costs may increase. Decreasing metal prices, on the other hand, may reduce Asian and African demand for these imports.

As regards the export of second-hand electronics, researchers and activists present different views. These trade flows may create both positive and negative effects. On the one hand increasing the life-span of the products should be a given goal. It is good for the environment, since production of new items create large-scale ecological foot-prints. Second-hand goods may also increase poor people's access to IT. However, the final treatment of the waste generated by these goods will, in the end, be dealt with in countries lacking sustainable recycling systems, which is something that EU legislators have tried to avoid. Some developing countries have tried to curb the flow of second-hand goods by requiring age-limits for different products. These efforts should be supported by testing and controls in EU harbours. As it is now, authorities in countries such as Ghana may do little but establish the fact that most of the computers arriving to the country's ports are not functioning.

Green IT is currently one of the major topics of discussion within the electronics industry.

71 United Nations University and STEP, UN, Industry, Other Partners to Create World Standards for E-Scrap Recycling, Harvest of Valuable Components, 6 March 2007.

72 Huisman J. et al, 2007, p 61.

Several brand name companies have put considerable efforts into making their products greener, but within the industry as a whole much more can be done regarding, for example, hazardous content, take-back and opportunities to upgrade software instead of having to buy new products. The total lifecycle of electronics is still far from sustainable though, especially not if the effects on developing nations are taken into account. Effects caused by the mining of metals, the manufacturing in Asia and the final waste treatment. Sustainability is often defined as a goal where environmental, social and economic goals are realised simultaneously. The so called triple bottom line, also called 'people, planet, profit', means that all three aspects must be realised if something is to be called 'sustainable'.

Governments, brand name companies, manufacturers and their suppliers, as well as consumers all need to contribute if these goals are to be achieved. Governments need to regulate and make sure that the law is followed. Apart from reducing the hazardous content and designing products so that they are easy to recycle, electronics companies should offer take-back and sustainable recycling even in countries where the law does not require this. They should consider incentives for consumers who are reluctant to hand in products that are no longer in use. Finally, the consumers must be made aware of the need for recycling of old electronics. Companies selling second-hand electronics also present an alternative for those who are not interested in the latest models and want to reduce the ecological footprint for the products they buy. Companies exporting second-hand goods to countries outside the EU should, however, avoid selling to brokers and carefully control the effects of their exports on developing countries.

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