

# WHAT A WASTE

How your computer causes health problems in Ghana

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# Colophon

What a waste - how your computer causes health problems in Ghana  
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#### **makeITfair**

makeITfair is a European wide project on the electronics industry, especially on consumer electronics.

We want to inform young consumers about the conditions and problems of consumer electronics over their full life cycle like human rights violations and non-compliance with social and environmental standards. And we want them to get active against this. At the same time we aim to take the multinational companies into account and ask them to take their responsibility and to change their behaviour.



#### **DANWATCH**

DanWatch is an in-depth journalistic watchdog, who creates new agendas by documenting the consequences of Danish and multinational companies' investments, spendings, trade and production abroad.

It is DanWatch's primary goal to bring attention to the exploitation of labour and natural resources abroad, among these the developing countries, the B.R.I.C. countries and other countries which house Danish workplaces, investments, productions and trade.

DanWatch is managed by a foundation and is independent of any political, governmental or private interests.

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# Introduction

The fastest growing type of waste stream is the electronics waste stream in the industrialized countries, growing almost three times faster than the overall municipal waste stream<sub>1</sub>. This is a result of the fast pace of technological innovation and, consequently, the shortened lifetimes of electronic products.

According to the UN, up to 50 million metric tonnes of e-waste are generated worldwide every year, waste that includes lead, cadmium, mercury and other hazardous substances, and up to 75 percent of the e-waste generated in Europe and around 80 percent in the United States goes unaccounted for<sub>1</sub>. A vast amount of this e-waste is exported to developing countries, which have no adequate infrastructure or mechanisms to accommodate or deal with the hazardous nature of e-waste.

One of these countries is Ghana, which has become an e-waste hotspot<sub>2</sub>, a dumping ground for electronic waste from the industrialized countries, and an export destination for second-hand electronics goods that will become e-waste eventually.

To give a detailed picture of what is causing this situation, this report also details the findings of research done in three regions of Ghana - Greater Accra Region, Western Region and Ashanti Region - to determine the influx, trends of distribution and dumping of electronic waste in Ghana from industrialized countries. Furthermore, research has been carried out with help from import figures, legislative frameworks and the economic and political interests of stakeholders on this matter. Greater Accra Region, Western Region and Ashanti Region.



## Key Findings

- An estimated 600 pieces of 40-foot containers are shipped to Tema Port each month as reusable second-hand items that are imported by Ghanaian e-shops and brokers.
- Great Britain, Belgium, Netherlands, Denmark, Italy and Spain are the top seven European countries that export used computers to Ghana. The authorities in Ghana do not know whether these computers are functional or obsolete.
- Computers from England, Denmark, Sweden and the USA formerly owned by the municipalities, institutions and companies have ended up in Agbogbloshie.
- Thousands of people are working in the informal waste industry in Ghana. Children constitute around 40 percent of the scrap workers at Agbogbloshie dumpsite.
- Health-damaging exposure to e-waste can result in long term, often irreversible effects, such as infertility, miscarriage, tumors, endocrine diseases and birth defects. The workers often suffer from cuts, coughs, headaches, upper respiratory problems, rashes and burns.
- The result of the health study
- Currently there is not any legislation in Ghana, and the country has only one recycling facility with three workers that cannot possibly manage all the incoming shipments of electronic waste as well as the domestically generated e-waste.



# Methodology

The research for this report has been conducted by researchers from DanWatch on a field trip to Greater Accra Region, Western Region and Ashanti Region in November 2009, where Mike Anane from the League of Environmental Journalists, based in Accra, Ghana, also contributed with research.

In July 2010 researchers from DanWatch visited Ghana to carry out the final research on the health consequences and to document new cases of European e-waste exported to Ghana. In addition, desk studies have been carried out by DanWatch.

The following data collection methods have been used:

To identify the distribution of electronic waste, interviews have been carried out with respondents from Ghana Ports and Harbours Authority, also known as GaPoHa, Ghana Shippers Councils, Ghana Customs, Ghana Standard Board, the Environmental Protection Agency in Ghana (EPA), the Accra Metropolitan Assembly, and a representative from Ghana's largest private waste management company, ZoomLion. The respondents also include scrap workers and scrap dealers at the dumpsites as well as owners of second-hand electronics shops in Accra, Takoradi, Kumasi and Tema.

With regard to the trends of distribution, fact-finding missions to the three Ghanaian regions mentioned above have been carried out in order to identify used electronics shops and dumpsites by means of observation.

Departmental heads at the Ministry of Environment and Science, the Environmental Protection Agency and the Accra Metropolitan Assembly have been interviewed to examine the governmental policies and regulations regarding the dumping of electronic waste in Ghana and for information on existing legislative framework on import of used electronic goods.

The Customs, Excise and Preventive Services of Ghana (CEPS) has been contacted for available data relating to the shipments of electronic goods from the industrialized countries.

The Ghanaian environmental organization GreenAd has been contacted for available research on the health and environmental impacts of e-waste.

Observations have been undertaken at the harbours of Tema and Takoradi, at second-hand markets and at dumpsites. At the markets and dumpsites asset tags and ownerships labels have provided helpful leads in establishing the countries of origin of e-waste shipments.

In collaboration with other members of makeITfair, authorities have been contacted in order to get the member states' policies on e-waste.

## E-waste policies

Legislation is necessary both in the importing and the exporting countries of used electronics if the problems of e-waste are to diminish. The lawmakers are aware of the issue, and initiatives have been taken and are continuously being taken, but the question remains whether enough is being done and whether it is the right initiatives that are being taken. As of May 5 1992, when the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal came into force, the export of electronic waste from OECD countries to non-OECD countries has been prohibited. The convention has, however, not been ratified by a sufficient number of countries, so the export prohibition has not yet entered into force on an international level, but it has been adopted by the EU<sub>3</sub>. By June 2010 174 countries had signed on to The Basel Convention.

In addition to the Basel Convention, in 2001 OECD drafted a decision on the Control of Transboundary Movement of Wastes Destined for Recovery Operations (OECD Council Decision). It is a controlling system for the import and export of waste destined for recycling, in order to allow trade within OECD member countries<sub>4</sub>.

The EU Regulation on Shipments of Waste (No. 1013/2006) implements the Basel Convention and the OECD Council Decision on a European level<sub>5</sub>.

In The EU the core legislation on e-waste is the the WEEE Directive (Waste Electrical and Electronic Equipment) and the RoHS Directive (Restriction of Hazardous Substances). The WEEE Directive (2002/96/EC) dates back to January 27 2003 and states that the producers and importers of electronic equipment have the responsibility for the collection and treatment of the waste that the disposal of their products creates. The directive also sets targets for collection and recycling. In the current form the collection target is set at 4 kg per person per year, and the target for recovery is set at 75 percent by an average weight per appliance, while substance reuse and recycling is set at 65 percent by an average weight per appliance. The numbers refer to the actual amount collected and not to the total recycling potential. The WEEE Directive is a minimum directive, which means that the EU member states can incorporate specific national provisions when they implement the directive as long as these provisions do not contradict the directive. The purpose of the WEEE Directive is to reduce the amount of waste from electrical and electronic equipment and to reduce resource consumption. The objective is to increase the reuse of raw materials and thereby reduce the amount of waste. Another objective is to secure that the handling of worn out equipment happens under controlled and environmentally friendly conditions and that e-waste is not illegally exported to developing countries that are not equipped to handle it in a safe and sound manner<sub>6</sub>.

The WEEE Directive is supplemented by the RoHS Directive. The RoHS Directive (2002/95/EC), which also dates back to January 27 2003, restricts the use of certain hazardous substances in electrical and electronic equipment as of July 1 2006. These substances are lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE). The purpose of the RoHS Directive is to protect the environment against these substances, which can be very harmful if released into the environment<sub>7</sub>.

The WEEE and RoHS directives were supposed to provide the producers of electronic equipment with an incentive to put more focus on ecodesign. This objective, however, has not been met to a satisfactory degree. One problem is that the WEEE Directive in its current form only encourages the producers to make lighter equipment, which is not necessarily equivalent to more eco-friendly equipment. Both the WEEE Directive and the RoHS Directive are currently under recast in order to determine how best to meet their objectives. The revised WEEE Directive provides hope for much more ambitious collection targets. The European Commission has proposed a target of 65 percent of the average weight of electrical and electronic equipment placed on the market over the past two years in each member state. This will result in very ambitious collection targets in countries with a high consumption of electrical and electronic equipment.

Furthermore an increased focus on ecodesign requirements to facilitate re-use, dismantling and recovery of WEEE is proposed in the ENVI Committee of the European Parliaments recommendation for second reading of the WEEE recast. Ensuring that the design phase also covers the recycling phase can lead to more and better recycling with among other things the reduction of harmful emissions and increased recovery of secondary raw materials as a result<sub>8</sub>.

### **National policy examples**

The WEEE and RoHS Directives and the EU Regulation on Shipments of Waste provide the framework for the e-waste policies in the EU Member States. But as mentioned above the directives are just a minimum set of regulations that the Member States are required to implement in their national legislation. Other legislation can be introduced at a national level as long as they do not contradict the directives.

In Hungary the main act on electronic waste is a Governmental Regulation (No. 264/2004), which states that the producers and distributors of electronic equipment are responsible for the recovery, disposal and recycling of the waste of their products. The Regulation is based on The WEEE Directive.

Every shop and supermarket that sells electronic equipment in Hungary is obligated to take back used equipment if a consumer buys a new one, and many distributors collect electronic waste (used equipment, batteries, cables) without any requirement of purchase. Furthermore there is the possibility of handing down your electronic waste for free to one of the more than 200 country-wide special waste yards. The producers and distributors of electronic equipment are helped by a number of coordination organizations to fulfill their recovery obligations. The minimum recovery rate for IT and telecommunications equipment was 37 percent in 2009, the same in 2010 and the planned rate for 2011 is 44 percent.

In Germany the WEEE Directive is implemented in the Elektro- und Elektronikgerätegesetz, ElektroG (electrical and electronic equipment law). Germany also has a waste shipment law (Abfallverbringungsgesetz AbfVerbrG), which is the German transposition of the EC Regulation on Shipments of Waste with certain national supplements<sub>9</sub>.



In the Netherlands, in connection with the implementation of the EU directives, a system for the collection and treatment of e-waste has been developed, in which two organizations, NVMP and ICT Milieu, represent the producers and help them organize the collection and treatment of their waste. NVMP is financed by the consumers through a visible fee on the products they buy, and ICT Milieu is financed by the producers on basis of their market share. The producers cover the collection costs by calculating them into the cost price of their products<sup>10</sup>.

In Sweden, in addition to the implementation of the EU regulations, a supplement to the existing environmental law (Miljöbalk, 1998:808) has recently been drafted. The supplement states that unauthorized shipment of waste can be punished with a fine or up to two years imprisonment. The new law came into force on May 1 2010, and it is therefore too early to tell if it will have any effect on the export of electronic waste<sup>11</sup>.

A similar law exists in Denmark. The Order on Waste Shipments of December 15 2010 (Bekendtgørelse nr. 1618) states that it is illegal to transfer waste for disposal to EU countries and EFTA countries that are part of The Basel Convention. Violation is punishable by fine, but if the violation has been done intentionally or through gross negligence and, in turn, caused damage to the environment or caused danger, the penalty may increase to imprisonment for up to two years<sup>12</sup>.

Every EU member state has established a national register of producers of electronic equipment. The producers, when identified, are asked to report to the register the amount of electronic equipment sold, which makes it possible to monitor the marketing of electronic equipment and the waste it creates. This is done to ensure that the producers live up to their responsibilities and to avoid the problem of free-riders. In Denmark this task is being performed by DPA-System (Dansk Produktansvars System). The handling of electronic waste from private households is done in collaboration with the municipalities, who collect the waste in the public recycling stations, and companies have been established that can handle the collection and treatment of the waste on behalf of the producers<sup>13</sup>.

In Denmark the WEEE Directive is implemented in the Danish environmental protection law no. 385 (Lov om miljøbeskyttelse af 25. maj 2005). The practical implications of the law are set in Order no. 362 of April 6 2010 (Elektronikaffaldsbekendtgørelsen).

## Export of e-waste



## Influx of used electronics to Ghana

One thing is politics and good intentions, another thing is reality. The Agbogbloshie dumpsite in Ghana clearly shows that despite the Basel Convention, old European computers end up as e-waste in non-OECD countries.

On Agbogbloshie, Ghana's biggest e-waste dumpsite, covering an area the size of 11 football fields, huge piles of frames from computer monitors make the area look like a post-apocalyptic universe. This is Ghana anno 2010 and the place where more than thousand people daily work trying to make a living.

There are various reasons of why Western second-hand electronics and e-waste end up here:

- Computers sent to Ghana in charity, among others by NGOs.
- Computers purchased by European brokers from different European companies. Research conducted in Denmark shows that a large proportion of Danish companies and some government departments prefer to sell their computers to a broker rather than pay for the dismantling.
- Relatives who send used electronics to their families in Ghana.
- Computers under the guise of being second-hand reusable electronics, but which are actually to be considered waste, derived from brokers and landfills in Europe, etc.

Each week the container loads of second-hand and obsolete TVs – CRT (Cathode Ray Tube) style -, CPUs, laptops, computer peripherals such as keyboards and printers, television peripherals such as DVDs and VCRs, and audio and stereo equipment are shipped from the United States, Canada, Italy, Holland, Germany, United Kingdom, Sweden, France and Denmark into Ghana.

YEAR	COUNTRY OF ORIGIN	PRODUCT	NO. OF OLD PRODUCTS	NO. OF NEW PRODUCTS
2009	Great Britain	Computers	43658	305
	Belgium	Computers	8654	321
	Netherlands	Computers	6706	0
	Denmark	Computers	5362	1636
	Italy	Computers	1664	1
	Spain	Computers	785	467
2008	Great Britain	Computers	40473	189
	Germany	Computers	8967	19
	Netherlands	Computers	8772	2
	Belgium	Computers	5277	0
	Italy	Computers	1422	0
	Denmark	Computers	817	0
2007	Great Britain	Computers	39225	124
	Netherlands	Computers	8770	68
	Germany	Computers	7014	138
	Belgium	Computers	4720	93
	Italy	Computers	2735	10
	Spain	Computers	1357	2
2006	Great Britain	Computers	40481	604
	Netherlands	Computers	7364	5
	Germany	Computers	5719	15
	Belgium	Computers	5133	184
	Italy	Computers	1790	5
	Denmark	Computers	1666	0
	France	Computers		2161

\*The figures only indicate the quantity of computers that have been declared in the export papers<sup>14</sup>

In addition to Tema Port, second-hand goods and e-waste are also being shipped into the country through Takoradi Port in Western Region. However, according to the research conducted for this report, it is a considerably smaller amount.

## Daily import of e-waste in Ghana

When a container loaded with e-waste is opened at Tema, the largest port in Ghana, the content is sorted out into two parts, “good” second-hand electronic goods and “bad” electronic goods. The items are examined physically at the harbour since the possibility of testing the goods is not present.

During a visit to Tema Harbour DanWatch could conclude that large amounts of used electronic goods and e-waste come in through this entry point every day. However, as the electronics are not tested at the site DanWatch had as much difficulty as the Ghanaian authorities in determining how many of the imported goods are obsolete.

In 2009, environmental enforcement authorities in the Netherlands (VROM-Inspectorate) and Ghana Environment Protection Agency, Ghana Customs Excise and Preventive Service, and Ghana Ports and Harbour Authority signed a bilateral collaboration agreement, called the Joint Working Programme. The goal was to:

improve the control of transboundary movements of waste, prevent the unwanted import of electric and electronic waste and second-hand equipment into Ghana, and research the possibilities for setting up a sustainable e-waste recycling management system and contribute to the decrease of negative environmental impacts of e-waste in Ghana<sup>15</sup>.

In connection with the cooperation between EPA, CEPS and GaPoHa in Ghana and the Dutch Ministry of Housing, Spatial Planning and the Environment<sup>1</sup>, a couple of seminars have been held at the Golden Jubilee Terminal at Tema concerning the prospects of monitoring import of used electronic goods, making sure they are not obsolete. But e-waste is still flowing to Ghana since no concrete actions have been taken yet.

“Unfortunately they are not labeled as such but just as personal effects or household goods. It is only when we strip them from containers that we see that it is electronic items that might be e-waste,” says Will Bafous Bedumenza, assistant terminal manager at Golden Jubilee and states that it is the customs’ job to give them clearance<sup>16</sup>.

As already mentioned it is impossible for the customs to turn on all the electronic items and check if they work. Instead they look at whether they have significant external damage or not. Due to lack of resources it is impossible to accurately determine the exact amount of the obsolete imported used electronics.



Tony Mensah, chief collector at the Laboratory of Ghana’s Customs, Excise and Preventive service (CEPS) at the Tema port estimates that almost every day no less than twenty containers full of e-waste are encountered at the Tema port. “They come into the country as store rejects, used personal effects, second-hand electronic items. Some even arrive in used vehicles from the EU and USA, but when you examine them, they simply do not work,” he says<sup>17</sup>.

If the customs do not give the clearance, the used electronics will not be delivered to the importers, such as brokers and e-shop owners. Instead the goods will be loaded on truck with other kinds of obsolete electronic goods, such as broken computer monitors, television sets and circuit boards, that go directly from Tema Harbour to the open air dumping grounds and unlined pits in cities and residential neighbourhoods.

## The European link

If previous agreements have been made between the exporters and shopkeepers, then the supposedly still functioning second-hand products are sent directly to second-hand electronics shops and warehouses belonging to Ghanaian businessmen who hope to refurbish and sell them. The rest of the possibly functioning goods will be transported to a huge area just outside the harbour where it will be sold to electronics dealers who have not made prior arrangements. The goods that seem to be beyond refurbishment will simply be carted to, for instance, the Agbogbloshie dumpsite in the centre of Accra.

It is a matter of chance for the e-shop owners whether the imported used electronic goods they buy from the importers are functioning or not, as they have no means of determining this on-site.

“I buy the used electronics untested, and I select and choose whatever I need – printers, computers and monitors. If I am lucky, all of them are functioning, but sometimes none of them are functioning,” says George<sup>18</sup>, who started in the business ten years ago, when his brother-in-law began to ship used computers to him from Finland. In his shop the customers can, among other things, buy a monitor whose label shows that the former owner was a library in Netherlands. Also, a monitor from a Dutch company is sold in the shop.

George, like many of the shop owners dealing in used electronic goods from Europe and the USA that DanWatch has interviewed, has close links to the exporting countries; an uncle, a brother or a friend in Europe. However, when trying to get the names of these middlemen facilitating the trade, the conversations almost always comes to a halt.

In one of the shops that DanWatch visited, the employees told that all the electronics was imported from Germany, where the German owner of the shop in Accra had a second business. The employees had been told to remove all labels showing the former owner, but in a box DanWatch found keyboards from two different police units in Germany.

In other shops computers from Danish institutions and a Danish ministry have been found<sup>19</sup>. When you walk around in e-shops, the sight of computers and monitors stacked from floor to ceiling seems overwhelming, especially because there were not any other customers while DanWatch visited the shops.

According to some of the Ghanaians that DanWatch has spoken to, many Ghanaians consider computers a status symbol, and many buy them without really knowing how it works, and the younger population mostly use them to watch movies on.

In the streets of Accra advertisements for computer courses indicate the need for Ghanaians to learn how to use the imported electronics. But even if some Ghanaians lack knowledge on how to use computers, the interviewed shop owners all note that some of the electronic appliances being shipped to them are obsolete. However, all of them emphasize that it is still a lucrative business for them.

Interviews with the “second-hand” electronic equipment businessmen in Accra, Kumasi and Tema indicate that shipping costs for a 40-foot container from the US are about 5,000 dollars and that each container can hold about 300 computers. You will only need about 25 functional Pentium 3 computers to pay the costs; the rest can be dumped. A functioning Pentium 3 can be sold for almost 200 Dollars in Ghana.

As Raspee, a businessman who has been dealing in second-hand electronic goods at the Nyamekye Abeka road for the past twelve years, puts it:

“When you receive a 20 footer container from Europe containing second-hand electronic items, you cannot test every single computer and television set, so we sell them to interested people untested, and we don't care about what happens thereafter. In case you take it home and it doesn't work too bad, we will not give you back your money. So we, the businessmen, make some money, and I think we are able to take care of our families<sup>20</sup>”

## The formal sector – a drop in the ocean

City Waste Recycling in Accra is the only formal e-waste recycling facility in Ghana. The company was established by Issah Nokabn, who has retired from the Ministry of Trade, and Jürgen Mainer, a German who has been living in Ghana for 20 years.

With support from the German Embassy, the City Waste Recycling was opened in February 2010. The warehouse in the outskirts of Accra is located in a two-room villa. The employees are dressed in medical gowns and have decent working conditions, but with only three employees the company does not have the means to process all the e-waste generated in Ghana. By next year they hope that they are in a better position.

“We are given a six acre land to build up a recycling facility, and we hope that the bank will help us,” says Issah Nikabn<sup>21</sup>. It is not only the size that limits their ability to compete with the informal sector. They also lack an economic basis. When

1. The Dutch authorities take part in this bilateral collaboration, as the Dutch ports of Amsterdam and Rotterdam are important exit points of European export, including second-hand goods and electronic waste shipped from Europe to West Africa and Asia.

the boys who work in the informal sector collect trashed computers in the e-shop, from businesses and from private households, they pay 3-10 Ghana Cedis for each item (equal to 2-8 US dollars), but City Waste Recycling has no economic surplus to pay for the computers they collect for recycling. Many of the companies that City Waste Recycling has contacted to ask if they could collect their computers have not returned with an answer.

“We are not able to compete at the moment on the prices, but we hope that our machinery and technology will make us able to show a better way to do it. We have to work very slow as we don’t want to fight the informal collectors,” emphasizes Issah Nikabn, who does not want to ruin the livelihood of those working in the informal sector. He tells that his employees need proper training on how to process the different parts.

City Waste Recycling exports the motherboards to Germany, and Nikabn Issah hopes to sell the plastic waste to Nigeria’s cement production. Hopefully the condensers will be exported as well. So far nobody has been interested in buying the aluminium.

Due to the lack of recycling facilities, children can be seen in the urban areas every day carting e-waste from the numerous second-hand electronic shops to the dump side in Agbogbloshie.

“I don’t have the means to dispose it, so I call on the boys that break and burn it. I am not happy about the situation,” says electronics technician Ben Benonis, who owns a TV repair shop, Summit Electronix<sup>22</sup>. He is one of the 10,000-15,000 people employed in the repair sector in Accra. In the whole country of Ghana between 14,000 and 24,000 people are involved in the sector.

Because people prefer buying a new second-hand product rather than paying for the repair of the old one, Ben ends up with a lot of waste in his shop. And even if he knew of City Waste Recycling, there are no collection points in the area.

“Africa has become a dumping ground for Europe and US. It is quite unfortunate that we allowed that. Naive or ignorant as we are, the Ghanaian people use money to get e-waste into our system, and I am worried that the government and authorities do not see this phenomenon,” he says and continues:

“Every politician wants the easy way out. If the government sees a truck with a pile of e-waste and they think that this makes the man’s life comfortable, they will not come and put pressure on him. The government is aware of the health issue, but they pretend that they do not see, because it is the easy option.”

Ben Benonis also points out that the used electronic equipment that Ghana imports often consumes a lot of energy.

“Why is Europe producing less energy consuming gadgets and then pushing the old gadgets on us? The energy consumption that we use on the used gadgets is serious, and we are always crying about our small energy resources,” he stresses.

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## **The E-waste workers’ motivation - a dream of a richer future**

It is difficult to determine the total number of people working in the informal waste industry in Ghana, since there are no Ghanaian statistics on this subject.

DanWatch met with Mohammed Lee, the Financial Secretary of the Greater Accra Scrap Dealers Association, which was formally registered in 1996 in his office at the Agbogbloshie dumpsite.

“At that time Agbogbloshie was bushy and only had a few members, but today the association has a membership of 3,000 – people who buy scrap metals, drivers, mechanics, electricians. Most of our members are located at Agbogbloshie,” he tells<sup>23</sup>.



According to a report by the Dutch Öko-institute e.V., between 6,300 and 9,600 people in the whole country of Ghana are collectors or recyclers<sup>24</sup>.

An estimated 90 percent of the people working in the informal waste management industry scavenging for and dismantling electronic waste are Muslim Hausa people originating from the northern regions of Ghana, which is the most deprived part of the country. The northern regions are characterized by a low average life expectancy, low educational standards, high infant mortality rates and a high incidence of emigration of the youth to other parts of the country in search of means to make more money and change their living conditions, a tendency that further entrenches a vicious cycle of poverty in the north. 40 percent of the people working with the electronic waste at the Agbogbloshie dumpsite are children<sup>25</sup>.

There seems to be a social hierarchy as to who does what during the segregation process. Typically the dismantling of electronics is handled by grown men who do not wear protective gear of any kind, while young boys over the age of 16 are in charge of the bonfires in which cables, among other things, are burned in order to extract valuable copper. The younger boys, in turn, scavenge for smaller pieces of metal that may have been lost or overlooked by the older workers, or they are the ones who drag and push around the carts with waste.

All day the piles of wiring and soldered circuit boards, condensers and capacitors are burned to extract metals, particularly copper. In the mounds of e-waste at Agbogbloshie, Mike Anane and DanWatch have found monitors from England, Denmark, Sweden and the US, formerly owned by municipalities, institutions and companies.

The metals segregated at Agbogbloshie are sold to middlemen at the dumpsite, mostly Nigerians, who in turn sell them to businesses in Tema that then export them to China, Dubai etc<sup>26</sup>.

The children scavenge to support their families' earnings; some usually go to school in the morning and return to the dumpsite in the afternoon.

They earn about a dollar and a half a day from selling the retrieved metals and with that they can afford to buy a meal for the day and give the remaining to their parents. About 30 percent do not attend school, as they cannot afford the uniform and shoes. Many work long hours, seven days a week, and a high proportion have already spent years engaged in this activity<sup>27</sup>.

Most of the children who work at the Agbogbloshie dumpsite also live in the Agbogbloshie slum, which is a squatter community of about 40,000 people. It is the largest informal settlement in Accra. Crammed into makeshift shacks, people live in an area characterized by narrow and twisted roads, poor sanitation and insufficient basic facilities such as drainage. The area has public baths and toilets, but the fringes of the Korle Lagoon and the Odaw river are used by both adults and children as a place of convenience where people openly defecate.

Dr. Caesar Apentiik from Department of Communication & Culture, Development studies program in Calgary, is trying to find the push factor for the workers to do this kind of work; what is the benefit and what can be done to make the working conditions better in terms of personal safety and health safety and environmental issues. According to him, a few of the boys succeed in improving their living standards. When they visit their village during the ritual ceremonies, the sight of their fine clothes and the stories of their lucrative business lure the young boys in the village to travel with the older boys to Accra, where they work for them.

“You can compare it to a mama in prostitution, where the dream of working up your way in the hierarchy seem attractive,” Dr. Caesar Apentiik tells and explains that the many e-shops are closely divided between the different groups of young boys. In that way they know exactly where they can come and buy obsolete computers and where not to go. On the dumpsite where the police never shows there are unwritten rules; for example, no one ever tries to steal used electronics from another group, as it would create too much trouble<sup>28</sup>.

Girls and women are never seen working directly with the e-waste; the few girls that are trying to make a living at Agbogbloshie do so by walking around selling water, food and cigarettes to the boys and men. Women do not seem to be engaged in the work at the dumpsite. However, just around the corner you will find one of the biggest food markets in Accra, an area that is indeed also being affected by the hazardous handling of e-waste at the dumpsite, since the black smoke from the bonfires reaches this area too. In addition to this, some of the vegetables sold at this market come from the small farms situated in close proximity to the Odaw river, which in turn means that these vegetables are being irrigated with contaminated water<sup>2</sup>.

## Workers at smaller scrap sites

At the smaller scrap sites of Kumasi and Takoradi the workers also manually dismantle the electronic waste, separating valuable substances from non-usable ones. Especially copper and aluminium is extracted and sold. The prices seem to vary but an estimated average profit<sup>29</sup> for a scrap worker for a pound of copper or aluminium is around 1.5 Ghanaian Cedis, equivalent to a little over 1 USD. The non-usable parts such as plastic cases for computers will be burned over bonfires.

In Kumasi a representative from the largest private waste management company in Ghana, ZoomLion, explains that the e-waste in this city either ends up at the numerous scrap sites or in the two major landfills of Kumasi where it is dumped along with household waste, as there are no specific procedures for the handling of e-waste. According to this representative, this has generated a veritable scrap work industry<sup>30</sup>. At one of these landfills in Kumasi visited during the research trip, the scrap work was somewhat systematized; each day approximately twenty scavengers are allowed onto the landfill by the administrators in order to search through the great amount of waste being transported here every day.

At the scrap sites visited in Kumasi and Takoradi, DanWatch did not encounter the same number of young children participating in the work with electronic waste. The work here is primarily done by grown men and boys over the age of 14 and seems to be differently organized than the work at Agbogbloshie. According to one of the scrap workers interviewed on the site, each month around 500 kilos of copper and 1,000 kilos of aluminium is segregated, bought by agents and sent from the landfill to Accra.

Even though the three regions visited are the worst affected in terms of e-waste dumping, the other regions of Ghana also have shops selling used electronic goods and thus a presence of scrap sites, albeit to a lesser degree.

### Fact box: E-shops

All three regions that were visited have e-waste dumps and a growing number of warehouses and shops that sell used European and American electronics to the public. In Accra, used electronics shops litter the city, particularly the areas of Darkuman, Nyamekye, Kaneshie, Odorkor and Newtown. The same goes for the Ashanti Region, particularly Kumasi, where Bantama highstreet, Stadium road, Ejisu Kumasi highway all have shops that sell used electronic goods shipped into the country from Europe and the USA. Takoradi in Western Region is not any different in terms of e-shops.

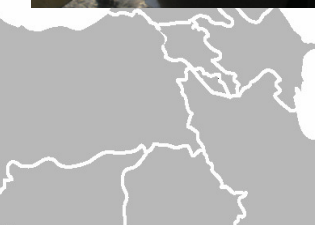
2. Research conducted by Greenpeace in the areas of Agbogbloshie and Koforidua, a city east of Accra, reveals that the soil and almost everything in the vicinity is highly contaminated with lead and other heavy metals as a result of the e-waste dumped at these places over the years.

# Findings of computer equipment from Europe in e-shops





# Findings of computer equipment from Europe at Agbogbloshie



## Health consequences have reached a crisis point

The mounting evidence reveals that the growing quantity of hazardous electronic waste shipped into Ghana every day is beginning to reach disastrous proportions, with a devastating impact on human health and the country's environment as a result.

At Ghana's Environmental Protection Agency John Pwamang, head of the Toxics Department, is quick to point out that the e-waste problem is serious because of the extent to which it has developed during the past few years. And the problem is compounded by the fact that the materials end up being burned by the operators. This makes e-waste a problem of alarming proportions.

According to him it was a publication that brought e-waste to light as a problem in 2007. The report focused on the young people involved in the informal industry and the burning of e-waste. Since then e-waste has been regarded as a very serious problem.

"But for quite some time before this report was written e-waste was already an issue caused by the fact that the informal operators started to break the e-waste down and recover materials, usually using fire. And we discovered that the things that were brought into the country for reuse actually in some cases was obsolete goods disguised as usable," says John Pwamang<sup>31</sup>.

Emmanuel Dogbevi, who, apart from Mike Anane, is one of the only journalists in Ghana who consistently focuses on e-waste, contributed with articles to *The National Daily Graphic* in 2007, where his aim was to educate people about the consequences of e-waste. According to him, there is generally a lack of focus on e-waste in the media and from the government.

"A couple of people know about the danger of e-waste, but there is a general lack of knowledge to the danger that people are exposed to and the environment as well. You will be surprised to know that there are even government officials working in the Environment Ministry that do not know what e-waste is about. We have reached crisis point because of the chemical s that are exposed to our environment and human health," says Emmanuel and continues:

"For a country like Ghana, where about 90 percent of our health budget is expended on Malaria, we have nothing left for any other disease, and then we have e-waste adding to our country. That means that we are exposed to much greater health danger, and we don't have the money or capacity to handle it<sup>32</sup>."

According to Hannah Quainoo, Principal Nursing Officer at the Ussher Polyclinic in Accra, health damaging exposure to e-waste and the attendant environmental risks can harm the fetus during pregnancy. The heavy metals, persistent organic pollutants and other chemical pollutants can also result in long-term, often irreversible effects, such as infertility, miscarriage, tumors, endocrine diseases and birth defects. She stressed that children who work at the e-waste dumpsite at Agbogboshie visit the clinic with cuts, coughs, headaches, upper respiratory problems, rashes and burns, which she attributed to their work with the waste. Particularly the toxic fumes from the burning process and the glass and metals from the dismantling cause problems for the children<sup>33</sup>.

At the private clinics visited in the Agbogboshie area during the research trip, the doctors were quick to point out that the men, women and children of Agbogboshie live under very hard conditions. The lack of access to basic sanitary facilities means that the clinics put a much greater emphasis on the work being done to relieve the effects of diseases such as tuberculosis, typhoid and malaria rather than focusing on the possible – and to them somehow intangible – effects of the handling of electronic waste. In the scarcely equipped clinics the imminent threats of the above-mentioned diseases cannot help but draw the attention away from the insidious effects of e-waste.

John Pwamang, head of the Toxics Department at Ghana's Environmental Protection Agency, agrees that the focus on solving the e-waste problem has not been adequate. It is not due to lack of awareness, but lack of resources. He is aware that the dismantling and burning of computer components and the intense and daily exposure to toxic e-waste is putting local communities, including children, at risk of intense contamination from heavy metals such as lead.

"As a government agency we have got limited resources, and the problems we have to tackle are many. We will accept that we are not doing enough, and if we had more resources, we would do much more. We have so many problems that we struggle with, and that is why there first came a focus on e-waste in 2007. Many times we need environmental organizations and civil society groups to confront the government to things they are not paying attention to. That is what Green Advocacy Ghana and environmental journalists and Greenpeace have been able to do. To make something a priority takes a lot of push from civil society," he emphasizes<sup>34</sup>.

After the population and industries in the area of Agbogboshie complained to the EPA because of the smoke, EPA visited the area to check what was going on.

“We found that it was a serious mess. All kinds of electronic equipment was being broken down, so we tried to organize them, and we tried so see how we could work with the city authorities that are responsible for the area to try to control the informal operators activities and the hazardous work they are doing,” John Pwamang from EPA tells.

But the EPA did not have much of an impact because it was too big a group to reorganize.

## Health study as part of E-waste Africa Project

When the Basel Convention Secretariat launched the E-waste Africa Project in 2009, sponsored by the European Commission, Norway, the United Kingdom and NVMP, the organization responsible for e-waste management in the Netherlands, EPA in Ghana quickly joined.

The Basel Convention Secretariat’s E-waste Africa Project covers four components:

1. A study of the flows of second-hand equipment and e-waste (EEE and WEEE) from Europe to Africa. The focus will be on two European ports (Belgium and the Netherlands) and five African countries;
2. A needs assessment for e-waste management in African countries;
3. A feasibility (and socio-economic) study for e-waste management in African countries (Nigeria and Ghana);
4. The improvement of enforcement and control of shipments of EEE and WEEE (IMPEL and African participants)<sup>35</sup>

According to John Pwamang, head of the Toxics Department at Ghana’s Environmental Protection Agency, this project makes it possible to make some very important studies on how to improve the legislation and the management of outdated computers. A part of the study was that EPA should get independent organizations to participate in data collection. The Ghanaian environmental organization GreenAd (Green Advocacy Ghana) was identified to assist in the study.

GreenAd was established in 2006. The organization has been concerned with waste management primarily in coast areas, and recently it has proposed a framework for managing electronic waste that is imported and generated in Ghana.

“We were concerned that there was no clearly cut policy or regulations in managing the import of second-hand electronic and electrical equipment and in managing the e-waste that is generated. People were just doing things their own way, burning everywhere. We were concerned about the level of pollution and the effect that it had on the people involved and on the general population,” says executive director Yaw Amoyaw-Osei<sup>36</sup>.

As part of the e-waste Africa project, GreenAd has launched a study to determine how much e-waste is imported to the country, how it is used and the the impact on humans and the environment.

Apart from taking soil and air samples to determine the impact on the environment, 87 persons, including e-waste handlers and people living in the neighbourhood, had their blood and urine tested in February 2010. As a frame of reference, 87 persons from the Makola market area, which is in another section of Accra that is free from e-waste dumping and recycling activities. were also tested.

“Everybody wanted to be involved. They all wanted to be a part of it, so they could get to know what was happening to them,” executive director Yaw Amoyaw-Osei recalls.

Due to ethical guidelines only people over 18 years could contribute to the study. The samples from humans for 12 heavy metals were sponsored by the Black Smith Institute in US, and the analysis was conducted at the Ghana Standard Board Laboratory. The Hunter College in New York helped in taking samples of the air and soil.

As part of the sampling, the team of medical officers involved did a full body examination of the people that gave samples. The persons that were shown to have problems were given the necessary prescriptions.

## Health and Environmental Impacts

Many of the substances found in electronic waste are toxic and are known to cause health problems. This includes brominated flame-retardants, PVC and various heavy metals. Many of the substances contained in the waste are known to cause cancer, respiratory illnesses and reproductive problems. They are especially dangerous because they are persistent and can bio-accumulate<sup>37</sup>. Below is a description of the 6 hazardous substances that are restricted by the RoHS3 directive; however, a multitude of other substances contained in electronic waste has a harmful effect on human health and the environment.

### Cadmium

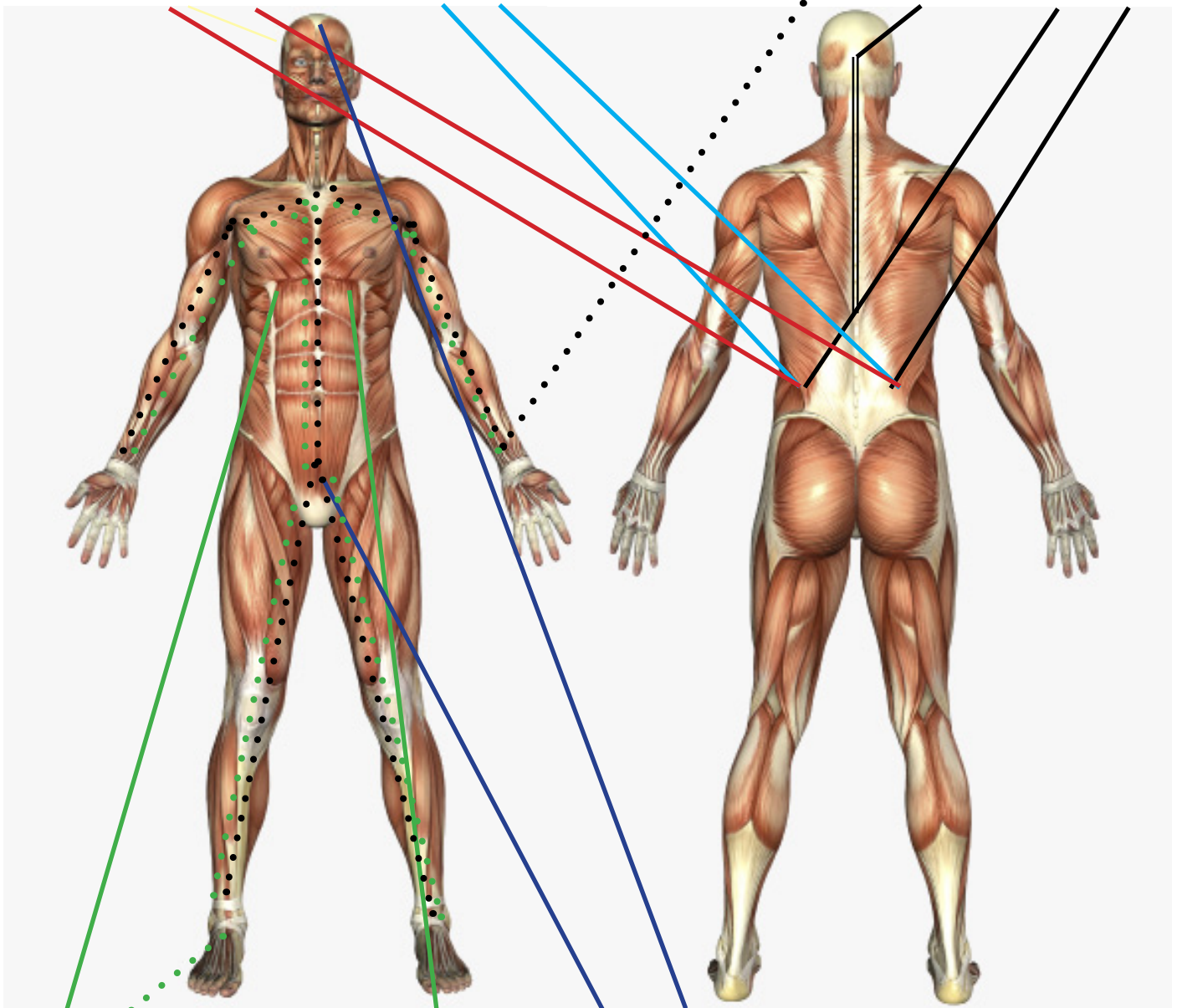
Certain components such as infra-red detectors and some chips contain cadmium which is also toxic. Cadmium accumulates in the human body, particularly in the kidneys that lose their function to remove acids from the blood in proximal renal tubular dysfunction. The kidney damage inflicted by cadmium poisoning is irreversible.

### Mercury

Mercury is used in thermostats, batteries and in switches on printed circuit boards. Mercury accumulates through the food chain, and it can cause damage to the brain and kidneys and the fetus.

### Lead

A CRT monitor can contain between three and eight pounds of lead alone. Lead from discarded cathode ray tubes as well as printed circuit boards in computer and television monitors accumulates in the environment and in the human body and it has high acute and chronic effects on plants and animals and humans. Lead is known to cause damage to the central and peripheral nervous systems, blood systems, kidneys and children's brain development<sup>38</sup>. A Greenpeace study has measured lead contents in soil and ash from Agbogbloshe and sediments. The result showed that ashes from the burning sites contained 4160 mg per kilo<sup>39</sup>.<sup>14</sup> In Denmark, soil containing more than 400 mg per kilo is to be totally prevented from contact with people<sup>40</sup>.



### Hexavalent chromium

Hexavalent chromium is for instance used as corrosion protection of untreated and galvanized steel plates. It passed quite easily through the cell membranes and where it causes various toxic effects. Inhalation of hexavalent chromium compounds increases risk of lung cancer. Furthermore, Hexavalent chromium can cause damages to the DNA.

### Brominated Flame Retardants (BFRs)

Brominated flame retardants are used in the plastic housings of electronic equipment. Two of the types of BFRs, namely PBB and PBDE, have been put under restriction under the EU RoHS directive due to their damaging effects on health and environment<sup>41</sup>. BFRs contain PBDEs (polybrominated diphenyl ethers), a group of chemicals that are highly persistent and bioaccumulative; they are suspected hormone disruptors and can cause cancer reproductive and developmental disorders. PBDEs are suspected of having particularly damaging effects on the thyroid (which controls brain development), and as a result, PBDEs may cause neurodevelopmental disorders such as learning disabilities and behaviour problems. PBDEs leach from products, and have been detected in house dust, human blood and breast milk.

3. RoHS stands for Restriction of Hazardous Substances.

## Demographic characteristics

The ages of the 87 e-waste exposed subjects from Agbogbloshie ranged from 15 to 73 years. The mean age was 32.4 years, median was 31 years and the modal age group was 26-30 years (Figure 3). The ages of the 87 non e-waste exposed subjects from Makola had a range of 15 to 37 years. The mean age was 25.5 years and the modal age group was aged 21 to 25 years. In terms of gender representation of participants 83 (95.4%) and all 87 (100%) of participants from Agbogbloshie and Makola respectively were males.

## Results of Assessment of body burden of heavy metals and trace elements

Tables 1 and 2 show the distribution of elevated body levels of heavy metals and trace elements among those exposed to e-waste handling and those who are non-exposed. Reference standards<sup>4,5</sup> could not be quoted for urine levels of Fe, Mn and Se because no international reference standards could be located.

The exposed group had a higher proportion of members with elevated urine levels of Ba, Cd and Zn. All participants in both exposed and non-exposed groups also had elevated urine levels of Cr, Cu and Hg.

Table 1: Distribution of elevated URINE levels of heavy/ trace metals by exposure or non-exposure to e-waste handling<sup>42</sup>

Urine heavy/ trace metals	Reference standard <sup>4</sup> (µg/ml)	Sample sizes		Mean urine levels (µg/ml)		Proportions with elevated level of heavy/ trace metals in urine (%)	
		N <sub>exposed</sub>	N <sub>non-exposed</sub>	Exposed	Non-exposed	Exposed	Non-exposed
Ba	< 0.6	26	25	0.72	0.75	24.4	20.8
Cd	< 0.001	33	33	0.01	0.02	100.0	75.0
Co	< 0.01	47	47	0.04	0.03	97.9	100.0
Cr	< 0.01	64	64	0.15	0.06	100.0	100.0
Cu	< 0.05	26	25	1.50	1.13	100.0	100.0
Fe	N/A	26	25	3.52	3.18	N/A	N/A
Hg	< 0.004	24	24	0.13	0.16	100.0	100.0
Mn	N/A	26	25	0.02	0.12	N/A	N/A
Pb	< 22.8	32	32	0.44	0.19	0.0	0.0
Se	N/A	36	35	0.39	0.20	N/A	N/A
Zn	< 1.4	25	25	3.66	2.72	91.8	79.2

However Table 1 shows that the mean urine levels of Co, Cr, Cu, Fe, Pb, Se and Zn was higher in the e-waste exposed group as compared to the non-exposed. On the other hand, mean urine levels of Ba, Cd, Hg and Mn were also higher in the non-exposed group.

Table 2 shows that the mean serum levels of Co, Fe, Hg, Pb, Se and Zn was higher in the e-waste exposed group as compared to the non-exposed. However mean serum levels of Ba, Cd, Cr, Cu and Mn were rather higher in the non-exposed group.

As with the findings in urine, the exposed group had a higher proportion of members with elevated serum levels of Co, Cu, Fe, Pb, Se and Zn. All participants in both exposed and non-exposed groups also had elevated serum levels of Ba, Cr, Hg and Mn (Table 2).

Assuming unequal variances among the exposed and unexposed sample populations, urine mean levels of Co, Cr, Cu, Fe and Pb were significantly higher in the exposed group while the mean urine level of Mn was also significantly higher in the non-exposed group, using 0.05 significance level (Table 3).

Table 2: Distribution of elevated SERUM levels of heavy/ trace metals among those exposed or non-exposed to e-waste handling<sup>43</sup>

Serum heavy / trace metals	Reference standard <sup>2</sup> (ppm)	Sample sizes		Mean serum levels (ppm)		Proportion with elevated level of heavy/ trace metals in serum (%)	
		N <sub>exposed</sub>	N <sub>nonexposed</sub>	Exposed	Non-exposed	Exposed	Non-exposed
Ba	< 0.001	86	86	0.72	0.75	100	100.0
Cd	0.0065 - 0.015	33	33	0.01	0.02	12.1	25.0
Co	0.001 - 0.02	47	47	0.04	0.03	91.5	86.7
Cr	< 0.00035	64	64	0.15	0.06	100	100.0
Cu	1.50 - 2.00	86	86	1.50	1.13	18.6	0.0
Fe	0.50 - 2.90	86	86	3.52	3.18	72.1	66.7
Hg	0.0005 - 0.015	24	24	0.13	0.16	100	100.0
Mn	0.004 - 0.012	86	86	0.08	0.12	100	100.0
Pb	0.45 - 0.60	32	32	0.44	0.19	18.8	0.0
Se	0.045 - 0.13	36	36	0.39	0.20	97.2	80.0
Zn	1.60 - 2.00	85	85	3.70	2.72	71.8	45.8

Using the same assumptions in table 3 for testing the significance of differences between the means of the heavy metals, the mean serum levels of Co, Cr, Cu, Fe, Pb and Se were significantly higher among the exposed group while the mean serum level of Mn was also significantly higher in the non-exposed group using 0.05 level of significance (Table 4).

Table 3: Comparison of mean values of heavy or trace metal concentration in URINE samples taken from the exposed and non-exposed populations using the two sample t-test<sup>44</sup>

Urine Heavy/ Trace metals	Sample sizes		Mean urine levels (PPM)		Mean Difference (PPM)	t	df	p-value
	N <sub>exposed</sub>	N <sub>nonexposed</sub>	Exposed	Non-exposed				
Ba	86	86	0.72	0.75	-0.026	-0.109	165.0	0.913
Cd	33	33	0.01	0.02	-0.008	-1.534	33.1	0.134
<b>Co</b>	<b>47</b>	<b>47</b>	<b>0.04</b>	<b>0.03</b>	<b>0.008</b>	<b>2.864</b>	<b>91.4</b>	<b>0.005</b>
<b>Cr</b>	<b>64</b>	<b>64</b>	<b>0.15</b>	<b>0.06</b>	<b>-0.978</b>	<b>-25.269</b>	<b>120.5</b>	<b>0.000</b>
<b>Cu</b>	<b>86</b>	<b>86</b>	<b>1.50</b>	<b>1.13</b>	<b>-0.370</b>	<b>4.928</b>	<b>129.3</b>	<b>0.000</b>
<b>Fe</b>	<b>86</b>	<b>86</b>	<b>3.52</b>	<b>3.18</b>	<b>3.360</b>	<b>23.792</b>	<b>98.3</b>	<b>0.000</b>
Hg	24	24	0.13	0.16	-0.038	-0.816	36.26	0.420
<b>Mn</b>	<b>86</b>	<b>86</b>	<b>0.08</b>	<b>0.12</b>	<b>0.019</b>	<b>1.068</b>	<b>24.3</b>	<b>0.009</b>
<b>Pb</b>	<b>32</b>	<b>32</b>	<b>0.44</b>	<b>0.19</b>	<b>0.247</b>	<b>-2.054</b>	<b>32.0</b>	<b>0.048</b>
Se	36	36	0.38	0.20	-	-	-	-
Zn	85	85	3.66	2.72	0.980	-1.194	49.1	0.077

**Table 4: Comparison of mean values of heavy or trace metal concentration in SERUM samples taken from the exposed and non-exposed populations using the two sample t-test<sub>45</sub>**

Serum Heavy/Trace metals	Sample sizes		Mean serum levels (PPM)		Mean Difference (PPM)	t	df	p-value
	N <sub>exposed</sub>	N <sub>nonexposed</sub>	Exposed	Non-exposed				
Ba	86	86	0.72	0.75	-0.03	-0.135	167.2	0.893
Cd	33	33	0.01	0.02	-0.01	-2.022	32.8	0.051
Co	47	47	0.04	0.03	0.01	2.673	91.8	0.009
Cr	64	64	0.15	0.06	0.09	-40.723	93.0	0.000
Cu	86	86	1.50	1.13	0.37	-16.91	166.0	0.000
Fe	86	86	3.52	3.18	0.34	23.865	97.5	0.000
Hg	24	24	0.13	0.16	-0.03	0.195	56.2	0.846
Mn	86	86	0.08	0.12	-0.04	-30.728	91.5	0.000
Pb	32	32	0.44	0.19	0.25	2.05	32.1	0.049
Se	36	36	0.385	0.20	0.18	6.563	60.8	0.000

The results of serum and urine assay for heavy and trace metals showed significantly elevated levels of Co, Cr, Cu, Fe and Pb in the exposed compared to the non-exposed in both serum and urine. Similarly, Se in serum is more elevated. This may be attributable to exposure to the products of e-waste. However, it is also noteworthy that several of the metals which are elevated among e-waste handlers are also elevated among non e-waste handlers eg Cr, Hg, Ba and Mn in serum and Cr, Cu, and Hg in urine. Furthermore, levels of Mn are significantly higher among non-e-waste than among the e-waste handlers both in serum and urine. This suggests that non-handlers may be exposed to or may have been previously exposed to heavy metals from other sources other than e-waste. Possibilities of such sources could be in their current working or living environment, or possibly from the physical environment in their geographical area of origin.

These observations however require careful interpretation considering the fact the estimations are bound to be very sensitive to reference standards used for the analysis. The results will only be comparable with those from determinations that employed similar reference standards and laboratory testing methods. Besides, the unavailability of clear cut limits for normal or acceptable physiologic concentrations for some of these heavy and trace metals in some body fluids, puts a limitation on the interpretation of extent of toxicity likely to be engendered by various levels of elevation.

In the related environmental study carried out the same month, air samples were taken to assess chemical contamination to worker's breathing zones and in ambient air in the environment. Soil samples collected around the perimeter of the area used by the scrap and e-waste dealers were also analyzed for heavy metals. Due to sampling limitations, worker breathing zone samples yielded insufficient data; however, ambient environmental air samples revealed that levels of aluminium, copper, iron, lead and zinc were above the US OSHA PEL standards.

The US EPA's standard for lead in bare soil in children's play areas is 400 ppm for 'play areas' and 1200 ppm for non-play areas<sup>6</sup>. Mean lead levels determined for 100 samples in 5 areas within the perimeter of e-waste handling grounds showed that 56% were above USEPA standards. Of that 56%, the highest lead in soil content sample taken was 18,125 ppm, which is 15 times higher than the non-play areas standard. Results of the soil samples thus show that there is contamination at the site probably due to dismantling and burning and related activities. However, since the soil was only tested for lead, the extent of contamination from other heavy metals is unknown. It however provides an indication of the source of lead that was demonstrably higher in e-waste handlers<sub>46</sub>.

Yaw Amoyaw-Osei emphasizes that the area around Agbogbloshie is very insanitary. Furthermore, due to the lack of access to running water, people are not able to wash their hands. As a result, pollution is also transmitted orally via people's dirty hands when they eat.

When driving around in Accra, one gets the impression that the public's knowledge about diseases is limited. On large billboards a huge text states that "AIDS is real", and other billboards show drawings which people can use to identify diseases such as gonorrhoea.

"In West Africa many people still believe that it is due to a curse if a person suddenly shows unexpected signs of disease or faints. Therefore, people need to be told that, for example, AIDS is not a curse but a reality and something you must protect yourself against<sup>47</sup>," says project manager Opoku Agyekum, who has worked with GreenAd's Health study. A part of the health study is therefore to educate the workers and tell them that the exposure to heavy metals puts their health at risk.

### **Education alone will not put an end to the toxic work**

Even though the health study states that the workers have elevated level of lead in their blood, the lack of alternatives makes the workers continue the hazardous work.

"The workers understand the health consequence, but it is a question of survival. The consequences are not shown fast, but they evolve gradually, and death can easily be associated with something else<sup>48</sup>," Dr. Caesar Apentiik says.

At Agbogbloshie DanWatch met with 26-year-old Abdulla, who has worked at the dumpsite for 10 years and is suffering from blood problems.

"I am aware of the health issues. I have problems when I burn the copper and the smoke enters my nose and I get sick. If I use blades instead of burning the copper I might cut myself. So I cannot stop burning the copper unless there was some way to retrieve it easier. We need help, we are suffering here<sup>49</sup>."

Abdulla is from the northern part of the country, and his plan is to return to his village when he has earned enough money. "I don't like it here. When I get money, I will go home. My father is dead now, so I have to earn enough money to support my mother, and when I have enough, I will go home and buy a house for me and my mother."

At the other end of the dumpsite, 16-year-old Peter Aduly from Nigeria is looking for scraps of copper in the mounds of ash. In Nigeria he was in the 9th place in his class, but unless he paid his teachers money, the teacher would degrade him to the 47th place. That is why he moved to Ghana with his mother and little brother - to study.

"I started working here two months ago to get close to the workers and to get the perfect job. Many have told me that it is dangerous to work here, but I need to earn money. So I try to prevent myself from the smoke, so I can save my health. There are also sharp objects on the ground that hurt you. My slippers melt when I get too close to the fires. But I have no money to buy shoes<sup>50</sup>," says Peter Aduly and tells that even though he is in danger of getting ill by the work he is doing, he would have to feel the pain before he would stop the hazardous work.

"Our situation is very pathetic. We don't know where we should address our problems, and it seems like the government sees our problems as minor, minor problems, but at the end of the day it affects all 22 million of the population, as the smoke does not only end in the scrapyards. If we can create awareness in the whole part of the country that will focus on the pollution on the environment and how it affects the whole country, it would make people start to make solutions<sup>51</sup>," Muhammad Lee, the Financial Secretary of Greater Accra Scrap Dealers Association, believes.

He emphasizes that the operations that the informal collectors are doing also help the government:

"Even though we are the informal sector, we help the government in so many ways, and we sell raw materials to the local industries in Tema that otherwise would have used more money to buy from abroad."

But until the government comes up with a solution on how to retrieve the copper in another way than burning the wires, the scrap dealers will continue their work.



## The Öko-Institut project

Another part of the E-waste Africa Project was a socio-economic and feasibility study in Ghana conducted by the VROM-Inspectorate, along with the Dutch Association for the Disposal of Metal and Electrical Products (NVMP), commissioned the Öko-Institut e.V. conducted. The aim was to:

- conduct an in-depth socio-economic assessment of the informal e-waste sector in Ghana.
- assess the feasibility of incorporating the informal e-waste sector in an international recycling cooperation for sustainable e-waste management in Ghana.

The results of the socio-economic assessment, which took place primarily at the Agbogbloshie metal scrap yard in the city of Accra and for the refurbishing sector distributed over the Greater Accra region, show that between 10,000 and 13,000 metric tons of e-waste are treated annually in Ghana by the informal sector. Particularly the informal collection activities, involving door-to-door collection as well as collection from warehouses and dumpsites, seem to be operating in a very effective manner<sup>52</sup>.

In the case of desktop computers, the comparison of the presently applied recycling technologies and the best applicable technologies reveals that there are significant untapped economic, environmental and social improvement potentials. According to the study, these potentials can be realised by manual pre-treatment in Ghana and export of the precious metals bearing fractions to one of the few pyrometallurgical refineries in Europe, Canada or Japan. In the Ghanaian context, the best applicable recycling technologies for desktop computers can be sketched as follows:

- house-to-house collection of e-waste;
- manual pre-treatment, including deep dismantling up to the level of parts of subcomponents;
- mechanical shredding or granulation of cables;
- further manual pre-treatment of low-grade copper fraction to reduce plastic content;
- refinery of steel and aluminium fraction in domestic plants;
- refinery of high grade precious metals fraction in pyrometallurgical refineries abroad;
- refinery of copper and low-grade copper fraction in copper or steel-copper refineries abroad
- controlled incineration / energy recovery or land filling of remaining plastic fraction<sup>53</sup>.

The study states that:

“From environment’s point of view, the above-mentioned e-waste management system would not only lead to an export flow of high concentrations of heavy metals and organic pollutants from Ghana to state-of-the-art facilities abroad, but at the same time, it will lead to higher recovery rates – 87% above – of precious metals, such as gold, silver and palladium.

Consequently, with these optimised recovery rates of silver, gold and palladium, a total of 5.23 kg CO<sub>2</sub>eq could be saved per desktop computer if compared to primary mining of the same amount of metals.

In economic terms, higher recovery rates of precious metals from the recycling of one desktop computer, as achieved in the proposed state-of-the-art technologies, would lead to an increase in the revenue from US\$ 7.22 to US\$ 13.19. Under usual conditions these values can compensate the costs for manual pre-treatment, logistics, transport and refinery.

From the type of operations needed in Ghana, it is obvious that this business is largely independent from investments into machinery parks or infrastructure, and that manual preprocessing operations can be run by medium and low-skilled workers. Therefore, the business is suitable to be implemented by the current informal e-waste recycling sector in Ghana<sup>54</sup>”

## National steps towards an e-waste free future

As the import of second-hand and obsolete electrical and electronics equipment to Ghana and other African countries has increased, the e-waste management of these countries calls for adequate action to be taken in both the e-waste exporting countries and the e-waste receiving countries.

The Ministry of Environment, Science and Technology of Ghana is keen on getting a solution on how to collect and dispose the e-waste.

“We are looking in the best way to collect and recycle. There is also proposal of creating a center for collection where people will submit their unwanted waste<sup>55</sup>,” says Eric Amaning Okoree assistant director - biosafety / biodiversity desk of the Ministry of Environment, Science and Technology.

But according to other stakeholders, there are many steps to take before creating a center for collection.

One of the first measures that GreenAd wants to take in the implementation phase of the new legislation is to eliminate burning of wires, since exposure to hazardous heavy metals is the major part of the environmental problem caused by e-waste. What is needed is a substitute to remove the copper.

Dr. Caesar Apentiik Department of Communication & Culture, Development studies program in Calgary, emphasizes that an alternative way to remove the copper has to be introduced before a ban of burning.

”In the third world it is not like we don’t have laws. You talk about women’s and children’s rights, but there is a difference between law and enforcement. If you ban burning at Agbogbloshie the workers will relocate somewhere else and continue burning in even more informal places,” he states and points out that the workers in the informal e-waste industry should be a part of the future management system. Otherwise they will continue their hazardous work.

“You should find a business model to turn this around. It should be a model that allows the thousands of people that operate in this sector to continue their job. If there was a machine that could retrieve the copper from the wires they have collected, they would be willing to pay the price<sup>57</sup>,” says Dr. Caesar Apentiik.

John Pwamang agrees that the informal operators are much needed in the intervention to improve the e-waste management. “We are looking at how they can use their cheap labour to break down the e-waste to smaller components that can be shipped abroad. In that way they can get more money for the scrap. Right now they lose a lot of valuable materials when they burn it in addition to the impact on the environment<sup>58</sup>.”

He further states that the EPA would like to have collection points all across the country, especially in the urban area. The intention is that it should be the former informal e-waste operators that should manage these collection points. But most important is the demonstration point, where the workers can be shown how to manage the waste.

John Pwamang also points out that there should be a license system for e-waste recycling.

Apart from the focus on the technical management of e-waste, GreenAd is looking for sanitation facilities where workers can wash their hands, and an organization point where workers can receive medical attention if necessary.

The stakeholders believe that once preconditions are met (e.g. an alternative to burning), legislation on proper disposal, such as setting up collection and demonstration points and introducing a ban on burning, will eliminate scrap yards such as Agbogbloshie. This should be the way to make the whole system more formal, without sacrificing employment of current informal workers. But what is needed is financial support to set up such systems. Depending on how successful it turns out, the plan is to duplicated it in other parts of the country.

It ought to be mentioned that it is DanWatch’s impression that Ghana has a slow and low level of enforcement of other bans. The ban on import of refrigerators containing CFCs should have been implemented in June 2010 but has been re-scheduled. And despite the ban on mattresses, as these often come from hospitals and nursing homes and therefore are contaminated with bacteria, they are still sold in public places. This indicates that civil society, scrap dealers, politicians and NGOs all must contribute to the enforcement of a new e-waste legislation.

## **A call to the e-waste exporting countries**

Even if Ghana gets a collection and management system that can tackle e-waste, the flow of e-waste into the country must be eliminated. In addition to national action the Ghanaian stakeholders call for action in the e-waste exporting countries.

“We propose that the exporting countries conduct the necessary tests and certify that all used electronic equipment that is exported is functional. At the same time we should have the resources to test the equipment at the entry of the harbor<sup>59</sup>,” says Yaw Amoyaw-Osei and explains that if the test shows that it is waste, then GreenAd recommends that it is reexported at the expense of the importer.

“We are calling on the companies and governments in the developed countries in the light of the Basel Convention to stop dumping of electronic gadgets<sup>60</sup>,” says John Pwamang head of the Toxics Department at Ghana’s Environmental Protection Agency.

In his opinion the extended producer responsibility<sup>4</sup> should be expanded to Ghana’s part of the world. He points out that Philips, Nokia and other companies should have an arrangement regarding end-of-life computers in Ghana, so these companies should pay for the proper management of the computers they have produced.

Former Environmental Manager at Tema Port Harry Barnes-Dabban thinks that the authorities of the developed countries should be persuaded to enforce stricter regulations on what leaves their ports in terms of electronics. He also thinks that

4. Extended Producer Responsibility (EPR) hold producers liable for the costs of managing their products at end of life

Ghanaian brokers living in Europe and the USA, who according to him seem to be involved in the majority of the exports, should be informed about the consequences that their businesses inflict on the health, environmental and economic situation in Ghana<sub>61</sub>.

But it is not only the Ghanaian residents in Europe who send used electronics to Ghana that should be made aware of the consequence of their exports. According to Dr. Caesar Apentiik, a large amount of used electronics is given in the name of aid. Institutions donate electronic equipment to schools in Ghana that have no electricity. After a year or two the equipment is unusable. Therefore these institutions, too, should be informed about the consequences of such donations.

“People are not aware of the harm that the transportation is doing to other people’s lives. Some might think that they help. It is a matter of balance. Small institutions like hospitals and organizations should look at their policies and make sure that when they donate computers they don’t send computers that are outdated<sub>62</sub>.”

John Pwamang predicts that the e-waste problem will reach further heights before it will flatline as a result of the above-mentioned steps and the phasing out of hazardous components.

“I see that the problems will increase, but after some time we will be able to manage the hazardous equipment, and in time hazardous components will be phased out and they will be easier to manage at their end of life<sub>63</sub>,” he says and emphasizes that since Ghana is not the only e-waste receiving country, Ghana would get to link with other developing countries to see how they manage it.

### **makeITfair’s priorities**

makeITfair supports the steps that the Ghanaian stakeholders want to take. In 2010-2012 makeITfair will focus its efforts to push electronics producers to take the following responsibilities concerning resource-use and recycling of electronic products:

- Proactively phase out hazardous substances and develop electronics that are more ecologically and socially sustainable, maximizing the use of recycled materials, and minimizing the use of scarce materials in electronics.
- Take financial responsibility for the collection and recycling of the waste stemming from their own products in cooperation with operators. Adopt financial incitements to make take-back systems work.

To adequately tackle the e-waste problem and create enabling conditions for producers to take their responsibility, makeITfair believes that governmental action in developed countries is needed. At this point in time, figures on collection, recycling and trade flows of e-waste and used electronics are surrounded by unclarity, which complicates the identification of an effective intervention strategy. makeITfair has identified the following governmental relevant actions.

- Setting minimum requirements for used electronic products intended for export, monitoring destinations of used electronics, and legislating that exporters of used electronics must obtain export permission from the authorities and be in possession of relevant paper work.
- Establishing a national e-waste authority that monitors e-waste collection, recycling and export flows. This authority should proactively identify the loopholes in the national e-waste system, by examining whether producer responsibility compliance and local control at recycling stations are sufficient. At the same time the communication between the main e-waste receiving countries and European countries should be increased to create a greater oversight of the magnitude of the e-waste trade. This allows a quick identification of new e-waste hotspots and information sharing about illegal exporters.

## Conclusion

As this report shows, there is an uncontrollable flow of second-hand electronic goods and e-waste into Ghana. Great Britain, Belgium, the Netherlands, Denmark, Italy and Spain are the top seven exporters of used computers to Ghana. Whether the computers are functioning or obsolete is uncertain. But due to the lack of recycling facilities, they will, no matter what, end up at dumpsites in Ghana and create pollution and health problems.

For a small part of the population the import of used electronics is a lucrative business, but for a major of the people involved in the industry it is a matter of survival.

Although the authorities have been aware of the problem for many years and even regard it as a problem of alarming proportions, not much has yet been done to solve it. The only visible initiative that has been taken is the establishment of the City Waste Recycling, which, because of its small size and lack of money, does not have the means to compete with the informal scrap dealers.

The e-waste situation in Ghana calls for immediate action from the Ghanaian government. In order to eliminate the hazardous work, an alternative to the burning of wires must be introduced, and formal recycling facilities must be established. Both things must be done in collaboration with the workers in the informal sector, whose livelihood depends on the work in the waste-industry.

Ghanaian stakeholders emphasize the need for the Authorities in the EU member states to close the current legislative loophole that enables shipments of hazardous electronic waste to be passed off as “bridging the digital divide”. Closer scrutiny of the prevailing systems is highly recommendable. In order to stop the negative trend in Ghana, import agents, Ghanaian exporters living in Europe and the United States, and European and American brokers exporting used electronics also need to take responsibility and stop the disposal of waste into non-OECD countries.

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