Producer Responsibility When WEEE Has a Value

Table of contents

Producer Responsibility When WEEE Has a Value

Daniel Seager[1], Klaus Hieronymi[2], Kirstie McIntrye[3], Herve Guilcher[4], Ruben Janse van Rensburg[5,6]

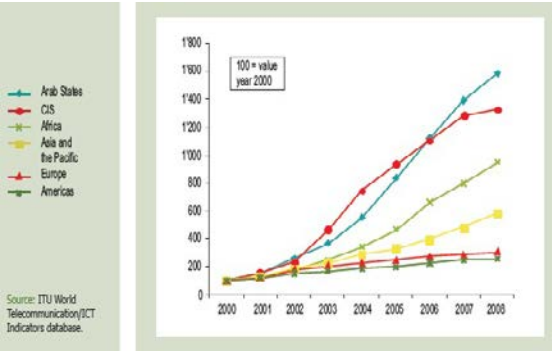
Abstract

E-Waste in Africa and other emerging markets is posing a challenge as well as a significant opportunity. E-waste is a valuable resource for the re-use, and secondary raw material markets. The countries in the region, however, lack the infrastructure and resources for the environmentally sound management of electrical and electronic waste or e-waste arising when such products reach their end-of-life. Processing and disposing of e- waste incorrectly can be a human health and environmental hazard. In the last decade we have seen increasing attention by international governments, producers and non-governmental bodies to the issue of e-waste. We are seeing the emergence of several policy mechanisms being adopted by governments to manage e-waste, varying significantly from country to country. First we will analyze the trends with e-waste and its subsequent management and the emergence of e-waste related policy. This will be followed by an analysis of some of the basic principles of e-waste management, drawn from several years of experience in setting up and managing e- waste systems. The paper will highlight some of the work HP and other OEM's have undertaken in e-waste management in Africa before drawing conclusions to the question of where should producer responsibility lie when WEEE has a value and what safeguards are necessary to ensure that all e-waste is managed appropriately.

Introduction

Information and communication technologies (ICTs) are crucial in improving access to health and education services and creating new sources of income and employment for the poor. Being able to access and use ICTs is a major factor in driving competitiveness, economic growth and social development [1]. The uptake of ICT equipment and other electronic equipment in general, in Africa is rapidly increasing. By 2008, Africa had nearly eight times as many Internet users as it did in 2000. The uptake of internet in Africa, accompanied hand in hand by an uptake in ICT equipment was the third highest region in the world behind the CIS and the Arab States (see chart) [2]. Following this rapid increase in consumption is an increase in the volumes of end of life (EoL) electronic and electrical equipment (EEE). It is estimated that every year between 40 and 50 million tons of e- waste are generated [3] and the waste stream is the fastest growing in the EU, growing 3 times faster than normal municipal waste [4]. According to Jim Willis, Executive Secretary of the Basel Convention: "e-waste is now the fastest growing waste stream worldwide" [5].

Figure 1. Internet user growth by region



[1] Hewlett-Packard Co., Amstelveen, Netherlands
[2] Hewlett-Packard Co., Hamburg, Germany
[3] Hewlett-Packard Co., London, United Kingdom
[4] Hewlett-Packard Co., Grenoble, France
[5] Hewlett Packard Co., Johannesburg, South Africa
[6] Corresponding Author, Seager, Daniel

We are also seeing a north to south shift in the generated volumes of e-waste [7]. It is estimated that volumes of obsolete PC's in developing regions will exceed that of developed regions by 2016- 2018 [6].

Accompanying this trend has been an increase in interest amongst policy makers in developing countries to tackle what is considered by many as a growing problem.

E-waste as a resource

Apart from the fact that volumes of e-waste are rising rapidly, e-waste also contains several materials which are considered toxic such as cadmium, lead and mercury which can become hazardous if not treated correctly. E-waste also contains several materials of high value, some of which are also considered scarce. Primary production of such materials, especially of precious metals is energy intensive and has significant impacts on climate change. The recovery and recycling of such materials can alleviate the mining of virgin materials. For example, a metric ton of waste computers contains more gold than that recovered from 17 tons of gold ore [7].

In the last decade we have seen a rise in the value of materials such as gold, copper and steel as a consequence of increased demands and diminishing resources. Several types of waste, especially e- waste now increasingly represents a value. The term "*urban mining*" has gained significant importance in the context of waste management and resource recovery. Electronic waste now contains precious metal deposits 40 to 50 times richer than found in ores mined from the ground [8].

Table 1. Material content and value of an average desktop PC at 2003 and 2007 resource prices [9]

Material	Amount contained in desktop PC, [g/unit]	Material value 2007, [US$/unit]
Steel	6,737.50	1.7
Plastics	1,579.50	0.49
Aluminium	550.20	1.49
Copper	413.20	2.99
Zinc	25.90	0.09
Antimony	18.50	0.11
Nickel	12.70	0.47
Lead	6.50	0.02
Silver	1.70	0.94
Gold	0.30	5.82
Palladium	0.10	1.38
Total	**9,346**	**15.5**

Rather than to look at electronic waste as a burden it is now becoming more apparent that it should be seen as an opportunity, as a resource (see table 1), albeit it is necessary to have functioning systems and safeguards which ensure that the waste is correctly treated, in its entirety, including the non- valuable fractions, avoiding the potential hazardous posed from improper treatment.

In Europe, the Waste and Electrical and Electronic Equipment Directive (WEEE Directive) [10] based on the Extended Producer Responsibility (EPR) principle has been in force since 2002. The aim of the Directive has been to reduce the volume of WEEE entering landfills and to maximize the recovery of materials. The Directive has been implemented with mixed results across Europe, with some countries collecting as much as 14.8 kg per inhabitant (Sweden) to 0.8kg per inhabitant (Romania) [11].

[7] Terms "e-waste" and "WEEE" are used inter-changeably throughout this paper.

The Directive has since been recast and entered into torce on the 12th August 2012. The new Directive has laid down new and more ambitious targets. By 2019 Member States must achieve a collection rate of 65% (based on EEE put on the market in the preceding three years) or 85% of total WEEE arising in the Member State.

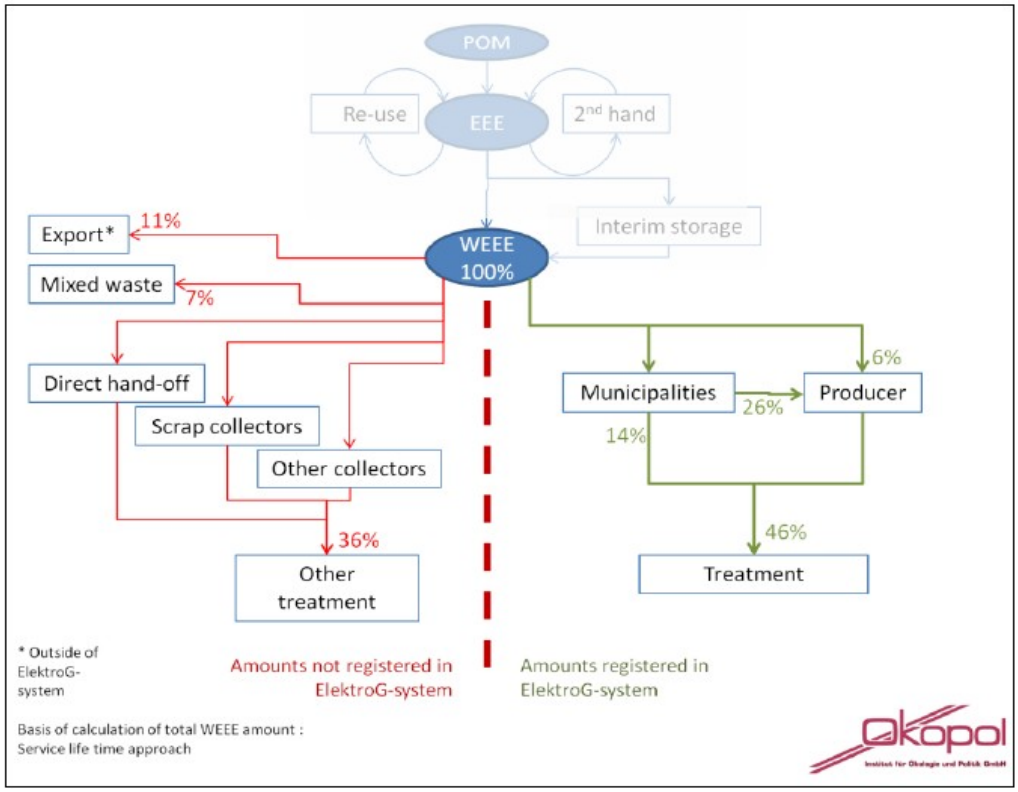
Recent studies in some European countries have estimated the total volumes of WEEE collected and treated. These studies have revealed the extent market forces are playing upon the commercial collection and recycling of WEEE. It was found that, despite the existence of extensive systems available for both private users as well as business users to dispose of their end of life equipment, on average, only 35% of WEEE arising is being handed over to producer managed systems[8]. A similar or even larger volume of WEEE is however also being collected and recycled by commercial actors who operate outside of producer systems (see table 2 & figure 2). These so called "complementary WEEE flows" (since the flows are complementary to Producer managed flows), are being collected by an array of actors, operating from small-scale door-to-door collectors to large scale scrap dealers and recyclers whose incentive is to generate economic return from the recovery of valuable materials contained within the WEEE. A majority of e-waste is now a sought after commodity and is recycled without producer intervention in Europe.

Table 2. Showing ICT EEE/WEEE flows in NL. Source UNU, 2012 [14]

Flow	IT Sector EEE/WEEE Kg/Inh	% of POM
EEE Put on the Market	3.79	
WEEE Recycled Through Producer Schemes	1.22	32.19%
WEEE Recycled Outside of Producer Schemes	1.26	33.25%
Total Confirmed Recycled	2.48	65.44%

In Germany a study by Okopol [14] found that 50% of WEEE arising is treated by non-producers compared to 32% by producers. A total of 82% WEEE arising is already being collected. Very often the only WEEE delivered to producers is WEEE which has a negative material value and bears no commercial interest (see figure 2).

Figure 2. WEEE flows in Germany split between producer flows and other flows



[8] Average figure for UK, Germany and Netherlands based on references [12,13,14]

This phenomenon is not necessarily a problem *per se*, however the question arises as to the quality of recycling and what should be the producer's responsibility for WEEE which has a value and is recycled outside of producer systems?

This question gains even more significance in Africa where the practice of recovering valuable material from e-waste is much documented in the media and in recent studies. The report by the Basel Convention "*Where are WEEE in Africa?*" [15] revealed that e-waste is also seen by many as a resource and subsequently collected and its valuable fractions harvested. The study found that the collection rate of e-waste in Africa can be as high as 95% (in Ghana). However this high collection rate does not signify a high material recovery and neither necessarily good environmental practice, since much of the non-valuable fractions are disposed of in dumpsites and landfills.

E-waste management and emerging policy mechanisms

The boom in electronic consumption first experienced in the developed countries and now shifting to the developing countries has brought with it a boom in the volumes of obsolete equipment being disposed. The need to properly manage e-waste has triggered the rapid emergence of policy development, many of which are based on the principle of EPR.

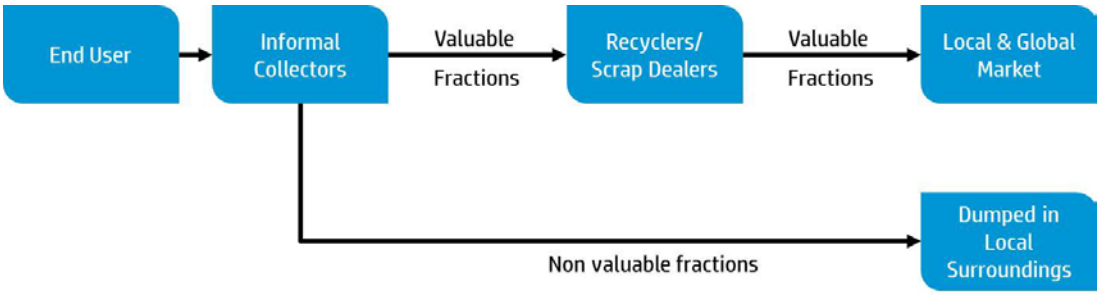
A primary function of EPR is the transfer of the financial and/or physical responsibility of waste management from local government authorities and the general tax payer to the producer [16]. Properly designed EPR policy can be a driving force for waste avoidance and high environmental standards. However when waste of producer products are considered by many to have a material recovery value and several actors are already active in the collection of e-waste to make their livelihood, the traditional EPR systems, based on collection points and producer take-back systems may become unsuitable. The responsibility of producers may become clouded. A new model is needed. EPR has traditionally been based in the concept that waste is waste (an externality) and not a resource. It becomes increasingly important to consider the various socioeconomic factors in force in each country regarding e-waste so as to develop effective and optimal policy.

It also becomes necessary to make a distinction between valuable and non-valuable fractions and consider the manner in which material recovery is performed, promoting clean and safe recovery practices and stimulating development of appropriate capacity to deal with e-waste in an environmentally sound manner.

Unlike in Europe, where commercially collected (complementary) WEEE undergoes similar, high standard recovery operations as that WEEE collected by official producer managed systems (documented in the Netherlands by the UNU report [13], in Africa much of the recovery is performed in rudimentary and often harmful ways. Burning of cables is performed outdoors with little or no protection of those performing the work. CRT screens are shattered to remove the valuable copper and printed circuit boards are stripped of valuable materials often by hand. This process is both harmful to those engaged in the activity as well as to the surrounding environment where many of the toxic substances contained in e-waste are released into the surrounding environment. Material recovery rates are also far lower than those achieved in more controlled environments where proper infrastructure and tools exist. The problem in Africa is therefore threefold:

1. Whilst there is already a high level of collection in many countries, the recovery of WEEE happens in a manner which is not environmentally friendly neither good for health.
2. The second issue is that recovery rates are not optimal due to manual techniques. This is also aggravated by a general lack of capacity and industrial know how of the techniques for optimal material recovery from WEEE. There are no smelters on the continent of the likes of Boliden or Umicore which can achieve high recovery rates of valuable metals.
3. The third concerns the non-valuable fractions whose fate is currently landfill or dumpsites (see figure 3).

Figure 3. Material flow of WEEE without EPR



E-waste policy in Africa needs to be approached from a substantially different angle to the approach adopted in more developed countries. Arguably policy in developed countries also requires significant restructuring to accommodate changing economies, but this is beyond the scope of this paper to discuss. Mandating the setup of free collection points from which producers must finance the recycling of WEEE (as is the case in Europe) would not solve the problem. WEEE would not likely make its way into these collection points. Providing for mandatory hand back of EoL EEE to producers may be counterproductive to the livelihoods of thousands involved in material recovery from WEEE. Setting binding targets upon producers may result in the profiteering by holders of e-waste and distort the recycling market.

Development and implementation of policy in several African countries (Ghana, Nigeria, Kenya, South Africa etc…) is underway.

- South Africa has adopted a flexible approach mandating industry to develop, submit and execute Industry Waste Management Plans (IWMP). Several OEM's including Dell, HP, Nokia and IBM set up a Producer Environment Group under the ICT industry association to develop an IWMP for the ICT sector. The plan has currently undergone industry consultation and is ready to be lodged with the South African Environment Authorities[9].
- In Nigeria, NESREA[10] have enacted an e- waste regulation which calls for producer responsibility over all e-waste, HP along with other OEM's are currently working with NESREA and other stakeholders to develop an optimum EPR approach there.
- Kenya is developing a similar regulation to that of Nigeria which will be based on extended producer responsibility with shared obligations for all other stakeholders. HP is active in Kenya where it helped set up Africa's first e-waste treatment facility to operate to international health and safety standards (EACR) [17].
- Ghana has issued a draft regulation whose mechanism is a centrally managed State fund raised through the taxation on imported EEE. The fund would be used to create collection points and recycling facilities. Arguably such a mechanism (which can be considered reflective of several European models) is not optimal for Africa [18, 19] as it does not address some of the issues aforementioned, neither does it provide producers with sufficiently incentives in order for them to invest in and improve the system.

Principles of e-waste management

An effective and practical solution for e-waste management in Africa should seek to address the three challenges outlined earlier. It should harness the economic value of e-waste recycling through job creation and the production of valuable secondary raw materials. It should promote the collection and environmentally sound recovery of all e-waste (including non-valuable fractions) and stimulate the development of appropriate facilities to deal with e-waste. However it is important to note that as it is not possible for each country to have an e-waste recycling facility immediately due to lack of volumes of e-waste in any one country.

Recyclers would require guaranteed large volumes of throughput to make the business viable in any one country. As such, it is suggested that a few countries could act as recycling hubs for surrounding countries as is being suggested by an informal African E-waste Alliance (comprised of Dell, HP, Nokia, Phillips and Reclaimed Appliances Ltd) for Kenya. In order for this to be possible (albeit as a temporary measure until the surrounding countries generate sufficient e-waste to stimulate facility development in each country), there must be measures put in place (guarantees) by each country to allow the transfer of e-waste across borders to be treated. Several African countries have, for clear reasons, implemented total bans on the import of e-waste, however under certain conditions, and compliant to the notification procedures of the Basel Convention,e-waste should be allowed to cross borders to facilitate the development of a regional recycling hub in African regions.

Permitting flows in the opposite direction will also be necessary if material recovery is to be maximized. E-waste fractions requiring specialized processing techniques (such as printed circuit boards) should be allowed to be exported to countries which have these facilities. Banning or laying down too many administrative burdens upon these processes will ultimately increase the cost of such operations, thus hampering its progress. This concept is one which is currently being advocated by a study performed under the StEP (Solve the E- waste Problem) umbrella called "The Best of Two Worlds Approach" where domestically generated e-waste in developing countries undergoes efficient local pre-processing followed by maximum recovery of material and proper treatment of residual waste in countries with the best technologies for the job.

Waste beneficiation projects can also add significant value to the local economy and generate sustainable green jobs by remarketing waste fractions for which readily available markets are less developed (such as for ABS plastic casings of CRT monitors) for the manufacturing of new products. Developing national, closed loop waste beneficiation solutions is something which should be stimulated by academia with R&D into processes, materials and markets which will create additional local jobs. Examples include brick making for local construction or jewelry making for national consumption or export. The key requirement for any waste beneficiation projects is that its business model makes economic sense compared to other developed technologies driven by fair and competitive markets globally.

[9] IWMP available at www.ita.org.za
[10] National Environmental Standards and Regulations Enforcement Agency

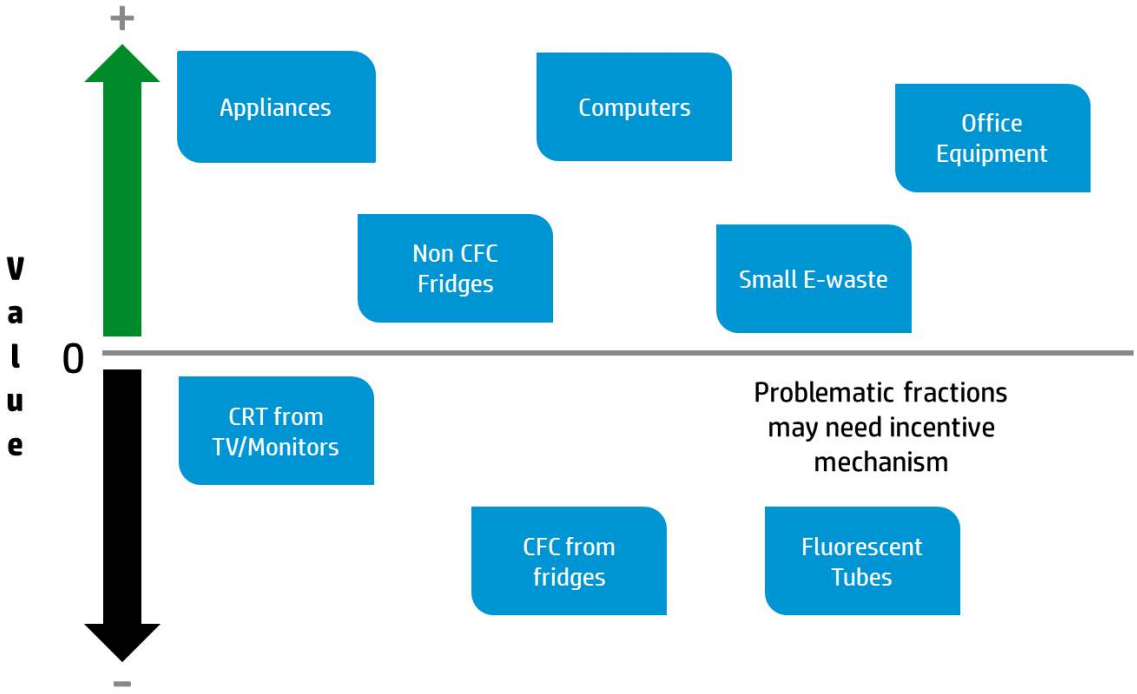
The authors of this paper have been extensively involved in developing EPR systems in Africa and elsewhere. HP is an active member of the United Nations StEP community and is part of an informal African E-waste Alliance, a group of companies actively working to develop and set up sustainable and scalable e-waste solutions on the continent. HP has financed, together with CAMARA the East Africa Compliant Recycling company and is committed to developing effective EPR systems in Africa. Based on this experience it has become increasingly apparent that the success of any policy designed to tackle the issue of e-waste must recognize a set of principles:

E-waste is a resource and its collection makes business sense. Developing solutions should resolve around the development of sustainable business solutions which creates jobs and supports the local economy.

The hazardous nature of e-waste resides in its improper treatment. Current methods of recovery must be avoided for which several stakeholders have an important role to play (especially in education and enforcement).

Some fractions of e-waste are problematic and may require a financial incentive mechanism, financed by producers in a fairly allocated manner to ensure that all e-waste is treated (see figure 4).

Figure 4. Positive and negative value e-waste



Involving the informal sector is key to the success of the solution. The informal sector already operates an efficient collection system. An EPR system should provide for an incentive to the collectors of WEEE to hand over WEEE in its entire form so as to avoid hazardous (open air) recovery techniques.

Policy must include proper recycling standards. Enforcement of these standards is paramount. Only through the adoption and enforcement of proper recycling standards will the hazardous nature of improper treatment be prevented.

Finally, producers do not have full control of the enforcement mechanisms needed to ensure that all e-waste is collected and handled appropriately. It is vital to understand that although the main responsibilities lie with authorities and producers, all stakeholders including the consumers depicted in figure 5 below have responsibilities which must not be ignored. Clear obligations and collaboration from all stakeholders is necessary.

Figure 5. Stakeholders who should be involved in e-waste policy

Conclusion

Producers should carry out their extended producer responsibility by providing for the financing of end-of-life management of their products, either collectively or individually. Producers should also be made responsible overall for the collection and treatment of the e-waste under the extended producer responsibility principle. In order to allow optimization and to maximize efficiency of the process implied by this obligation, producers should have the flexibility to design the collection system, choose the most appropriate recycling partners and select the most suitable financing mechanism for their own waste streams rather than let this be managed by a State led system. Such involvement creates an incentive for the producer to invest in the system, continually improving and innovating.

With the increasing value of resources and subsequently e-waste, a growing amount of waste equipment will represent a value and a business opportunity. It is not in the interest of producers to hamper this development by attempting to recover these products from collectors before they get to it. Rather, it should be the responsibility of producers, under EPR policy to act as a financial safety net to ensure that negative fractions of WEEE are also collected and treated. The optimal solution for achieving maximum material recovery as well as minimizing, health and environmental hazards is to set up a system based on incentives, good standards and education. Given effective enforcement and collaboration from all stakeholders the concept of e-waste as a valuable resource may become fully realized.

Literature

[1] OECD, 2009, Policy Coherence in the Application of Information and Communication Technologies for Development. [Online] Available: http://www.oecd.org/ict/4d/44029390.pdf

[2] ITU 2009, Information Society Statistical profiles Africa. [Online] Available: http://www.itu.int/ITU-D/ict/material/ISSP09-AFR_final-en.pdf

[3] Schwarzer, S., A. D. Bono, et al. (2005). E- waste, the hidden side of IT equipment's manufacturing and use. UNEP Early Warning on Emerging Environmental Threats No. 5.

[4] Darby, L. and L. Obara (2005). "Household recycling behaviour and attitudes towards the disposal of small electrical and electronic equipment." Resources Conservation and Recycling 44(1): 17-35.

[5] UN News centre press release “UN-backed report warns of dangers of increasing electronic waste in West Africa” [Online] Available: http://www.un.org/apps/news/story.asp?NewsI D=41201&Cr=environment&Cr1=

[6] Jinglei Yu, Eric Williams, Meiting Ju, YanmYang, Forecasting Global Generation of Obsolete Personal Computers, 2010, [Online] Available:http://rit.academia.edu/EricWilliams/Papers/780411/Forecasting_global_generation_of_obsolete_personal_computers

[7] Bleiwas, D. and T. Kelly, Obsolete Computers, “Gold Mine,” or High-Tech Trash Resource Recovery from Recycling. 2001, US Geological Survey.

[8] UNU, 2012, E-waste: Annual Gold, Silver “Deposits” in New High-Tech Goods Worth $21 Billion+; Less Than 15% Recovered, News report, 2012-07-09, [Online] Available: http://unu.edu/news/releases/step-news- release-6-july-2012-e-waste-precious-metals- recovery.html

[9] Oko-Institute e.V, E-waste Africa Project, Methodology and Background of Component 3, Socioeconomic study and feasibility study, 2009. [Online] Available: http://www.resourcefever.org/publications/pres entations/kick-off_component3_Oeko_Inst.pdf

[10] 2002/96/EC, [Online] Available http://ec.europa.eu/environment/waste/weee/in dex_en.htm

[11] EUROSTAT, WEEE Collection Rates, 2008, http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data/wastestreams/weee

[12] WRAP, Market flows of WEEE materials,February 2011

[13] Huisman, J., van der Maesen, M., Eijsbouts, R.J.J., Wang., F., Baldé, C.P., Wielenga, C.A., (2012), The DutchWEEE Flows. United Nations University, ISP – SCYCLE, Bonn,Germany, March 15, 2012

[14] Okopol, WEEE Flows in Germany, December 2011

[15] Basel Convention, Where are WEEE in Africa, 2011

[16] OECD 2001, Extended Producer Responsibility, A Guidance for Governments, France.

[17] Hewlett Packard, 2011, IT E-waste Recycling Facility Supported by HP Now

[18] StEP, Comments to Ghana E-waste Bill, February 2012

[19] Industry Position paper on Hazardous and Electronic Waste Control and Management Bill, Ghana, 2011 prepared by Boliden, Datec Technologies, Dell, Ericsson, HP, Sony Ericsson, Nokia and Raw Materials Group.January 2012.

Learn more at
http://www.hp.com/livingprogress

Sign up for updates
hp.com/go/getupdated

June 2014