All Wired for E-Waste

IT Association of South Africa Producer Environmental Group (ITA PEG)
e-Waste Association of South Africa (e-WASA)

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ABSTRACT

The paper aims to communicate the issues associated with the sustainable management of electrical and electronic waste (e-waste) in South Africa and the solution that the IT Association of South Africa Producer Environmental Group (ITA PEG) and the e-Waste Association of South Africa (e-WASA) have proposed. Following the introduction to e-waste, the paper will cover what needs to be done to tackle the ever increasing amount of e-waste generated and explores the three core conference focal areas of Value, Grow and Sustain in relation to the plan of ITA PEG and e-WASA including the dependencies and requirements thereof. Value is addressed in a material and socio-economic sense, growth is addressed in a labour market and material supply chain sense while the need to sustain an effective e-waste system is addressed in terms of the financial, governance and environmental sustainability requirements necessary for an effective and sustainable e-waste solution.

1. INTRODUCTION TO E-WASTE

E-waste is defined by Solving the E-waste Problem (StEP) as being “all types of electrical and electronic equipment (EEE) and its parts that have been discarded by the owner as waste without the intention of re-use” (StEP, 2014). Due to increased consumption rates of electrical and electronic equipment of all kinds, E-waste is one of the fastest growing waste streams globally: The UNU ADDRESS project documents that volumes of EEE placed on the market since 1990 has grown from 19.5 million tonnes to 57.4 million tonnes in 2010 and is set to over triple to approximately 75 million tonnes by 2015 (Huisman, 2012).

While over the last decades, E-waste and Africa have been linked by the infamous and illegal trade of the redundant equipment from other parts of the world into the African continent for disposal, the opportunities for development that lies in Information and Communications Technology (ICT) electronic equipment nowadays result in continuous growth of the consumption and use of such within the African societies leading to increased e-waste generation. According to the StEP E-waste WorldMap in 2012 just under 10kg per inhabitant of Electrical and Electronic Equipment (EEE) was placed on the market in South Africa while they estimate that 6.63 kg of e-waste per inhabitant has been generated during the same year (StEP, 2014). It is unclear at present how much of the e-waste generated in South Africa is actually being collected and channelled into sound recycling channels and being treated appropriately.

South Africa has seen solutions evolving for the collection and treatment of e-waste. Reason being the increase of e-waste generated also create a business opportunity. E-waste contains substances that are hazardous to human health and the environment if treated inappropriately, but at same time it also contains complex valuable materials including precious metals which can be effectively and environmentally sound recovered as resources.

1.1 What To Do About It?

The issue of e-waste and ‘what to do about it’ has been discussed in South Africa for a number of years. e-WASA and ITA PEG have prepared individual proposals for Industry Waste Management Plans and submitted them to the government of South Africa in 2012 (ITA-PEG, 2012, e-WASA, 2012). During the last two years ITA PEG and EWASA have engaged to align their respective proposals into one systemic framework solution for South Africa and are ready to share with the government a holistic framework proposal that both parties believe is required to promote sound practices and enable the recycling industry to grow in a sustainable manner while creating ‘green jobs’ and preserving the environment in South Africa.

The systemic framework provides a governance structure that enables sound recycling businesses to evolve while leaving the government to enforce standards and control fair financing. Producers will finance the e-waste management of the non-valuable product fractions that recycling companies would not be interested to treat.

This paper explores the three core conference focal areas of Value, Grow and Sustain in relation to the plan of ITA PEG and e-WASA including the dependencies and requirements thereof.

2. VALUE

2.1 Material Value

Value is important to the success of all solutions as we strive for financial sustainability. E-waste can possess positive or negative monetary value subject to its material composition, the global material trading markets and the treatment requirements of the material fractions.

Factors that determine the overall value of e-waste include costs associated with collection, transportation, storage and sound treatment of all components versus the value that can be recovered from the material fractions. The resulting positive or negative value of a specific e-waste fraction will, therefore, be the difference between the value recovered minus the costs incurred.

The specific costs and values will depend on factors such as accessibility to the most eco-efficient solutions for treatment, competition between solution providers and operational efficiencies in both the local and global markets. For example, labour intense manual dismantling operations which are feasible in countries with low labour costs can result in a higher level of material sorting for further processing and thus increase efficiency; while the fractions' end-processing in high-tech smelters outside local markets can achieve better metal recovery rates and thus higher value returns compared to any solution that is locally accessible. As prices for different raw materials recovered form e-waste are dynamic and determined by world commodities markets, value recovered will not be constant over time. Materials that have positive value are usually ferrous and non-ferrous metals, complex materials containing precious metals e.g. printed circuit boards and plastics.

The content of valuable versus non valuable material in e-waste can change over time, e.g. related to changing raw material market prices and access to the most cost efficient markets for recycling, but also related to changes in technology and materials in equipment. For example, Nokia dematerialization efforts for continuous leadership in sustainability claim to have reduced the environmental impact of comparable devices by up to 65 % over a decade while introducing new features so that mobile devices can positively impact society (Comparison Nokia 3310 of 2012 to Nokia X2 in 2010, source: Nokia 2010).

2.2 Socio-Economic Value

The recycling activities currently observed across Africa are centred around all e-waste containing valuable material being collected and treated by both formal and informal operators. Unfortunately, only e-waste of value is collected eg mobile phones, smart devices, etc. due to the high content of gold in their material fractions. Other e-waste that does not have overall positive value is either not collected or has valuable parts removed and the remainder dumped, in the case of the informal recycling sector, or, in the case of the formal recycling sector, stored pending consolidation for shipment to appropriate treatment facilities. E-waste that holds less value or may incur cost to treat poses a problem as eventually someone will need to pay for it to be appropriately treated.

Initially introduced in the early nineties in Germany and Sweden, Extended Producer Responsibility (EPR) was primarily intended to provide incentives to the producers to design products more easy to reuse and recycle with fewer and less hazardous materials to discard at end of life. (Lifset, 1993; Lindqvist and Lifset, 2003). It was also expected to support and improve the operational elements of the collection, recycling and treatment of waste. (Kunz et al, 2014) The principles of EPR allow producers and importers of electrical and electronic products to take responsibility for ensuring environmentally appropriate treatment at end of life.

Where EPR is applied a financial safety net is created by producers and importers financing the collection and treatment of e-waste including the negative value material fractions ensuring that they no longer need to be dumped or stockpiled awaiting treatment. This approach creates a market/demand for these otherwise undesirable and potentially valueless materials.

Where the principles of EPR are established they deliver value to stakeholders. The consumer knows that all e-waste will be collected and treated provided they take it to their nearest collection point or give it to their local collector and may even see some monetary value for doing so. The government benefits as funding the cost of collecting and treating the e-waste is done by the producers and importers of the EEE products. However, government has an important role to play in ensuring an enabling legislative framework is created, implemented and complied with and in supporting the education of the general public in the correct disposal process and responsibilities for sound recycling of their old products.

Setting up the right EPR system for South Africa is a challenge that needs to consider the specific socio-economic and governance factors.

3. GROW

Harnessing the value in e-waste can contribute to the economy in South Africa. It can deliver not just revenue but growth in 'green jobs' while integrating the informal sector into the formal e-waste industry. The growth of local solutions can trigger growth in new material supply chains in South Africa and trade with the outside world for new revenue and access to markets.

3.1 Labour Market Growth

The enabling power of ICT products has a tremendous impact on labour market even before the products are actually discarded as waste. Furthermore, an extensive reuse culture in South Africa has created jobs in both the formal and informal sector e.g. repair and refurbishment. It is recognised that additional efforts should be put into achieving better environmental performance in many industries including e-waste recycling.

In line with the government New Growth/ Development Plan framework, the repair, refurbishment and end of life management of ICT and other electrical and electronic equipment is an opportunity to deliver "green jobs" to South Africans as the reuse and recycling industry grows. Repair and refurbishment markets are well established in South Africa (Finlay 2008 eWASA) and in other parts of Africa providing many thousands of jobs as no country can afford to ignore the inherent value of products that can be repaired or spare parts recovered.

Increased growth will occur as more recyclers access the market and the existing formal recycling sector expands their capacity to collect and treat more e-waste. E-waste handling and treatment requires various levels of skilled workers, where jobs relate to collection, logistics but also include manual dismantling, sorting materials etc.

In the Best-of-2-Worlds (Bo2W) philosophy (Wang et al, 2012) the eco efficiency scores of recycling scenarios show that complete manual dismantling provides most economic and environmental gain over other types of dismantling including all forms of mechanical dismantling (shredding, depollution etc.)

Jobs creation through waste beneficiation can also be achieved through processing e-waste material fractions for the manufacture of new products in South Africa. With beneficiation the emphasis is on diverting waste from landfill and creating sustainable green jobs. There are numerous tested and proven technologies available globally that can utilize more than 70% of the waste going to landfill as input materials for new manufacturing opportunities. (eThekwini Municipality – USE-IT July 2009)

An initial calculation by ITA PEG on the potential for job creation indicates that, in the case of a fully manual treatment process, one job could be created for each tonne of e-waste collected and treated.

Following the Bo2W philosophy helps to achieve the most sustainable solution for developing countries and, in the case of South Africa, a country with a developing recycling infrastructure. It ensures maximum value from the use of existing and developing pre-processing of domestically generated e-waste by manual dismantling and the delivery of critical, often hazardous or materially complex, fractions to state-of-the-art end processing facilities in the global market.

As the South African recycling industry and its infrastructure matures more specialised methods of treatment may be introduced which should enhance local capability and put it at an advantage as neighbouring countries could send e-waste derived material to South Africa for final processing or treatment.

3.2 Material Supply Chain Growth

Currently there is limited treatment capacity for e-waste material available in South Africa. Over time, and as the market demand increases for recycled material locally, it is expected that treatment facilities will expand and more will be established for both valuable and non-valuable materials.

As an example, there are specific gaps are in the treatment of potentially hazardous materials such as CRT monitors, fluorescent tubes and batteries requiring these items to be shipped to established specialist facilities in Europe or the United States for recovery. However, we understand that a fridge treatment plant study is currently being conducted by SECO.

A concept discussed at the Public Private Sector policy dialogue in addressing e-waste management in Africa meeting hosted by the Africa Institute 13/11/2013 was that of regional solutions. Regional solutions can allow neighbouring countries to draw on the technical expertise and strength of existing recycling solutions as their own are in the incubation process.

Concern was expressed initially regarding abuse to the effect of dumping e-waste outside the generating country, but it was eventually agreed that enforcement of cross-border controls and appropriate material shipment only to registered and licensed facilities, in accordance with Department of Environmental Affairs requirements, can leverage a commercial transaction and drive both economic and material supply chain growth.

4. SUSTAIN

All solutions need to be sustainable in the long term ie socially, environmentally and economically. The ITA-PEG and e-WASA systemic framework model therefore hosts an e-waste registry and council to ensure a sustainable solution by correct allocation of responsibilities and employing the optimum financing methodology.

For the solution to be fully sustainable there needs to be an appropriate legislative structure in place that enforces standards for sound treatment while enabling recyclers to expand their operations and producers enforced to take responsibility for end-of-lie management of the products they put on market. The legislative structure needs to have the primary aim of protecting the environment and be enforced to ensure a level playing field for all stakeholders including e-waste collectors, recyclers and producers.

4.1 Finance

EPR incentivises producers to design products that are easier to reuse and recycle, have fewer and less hazardous materials which will support and improve the operational elements of the collection, recycling and treatment of waste. This effectively shifts the waste treatment and management costs to producer (Lifset et al, 2013) and away from municipalities (OECD, 2001).

Producers therefore are required to participate in the creation of an efficient financial structure for the solution applying their market knowledge and e-waste compliance expertise.

During expert discussion between the authors of this document and a number of African governments over several years, concern has been raised about the financing of e-waste treatment. Government representatives have been clear that they do not want to see any solution imposing taxes or fees on the consumer or business user. Generally, fees placed on producers are translated to the consumer of the product at the time of purchase. Taxes furthermore can increase uncontrolled trade, counterfeit goods and grey imports of product into countries. Governments should not manage funds to treat e-waste (Africa Institute, 2013)

The e-WASA/ITA PEG framework aims to ensure that EPR financing solutions are effective and cost efficient preventing the passing of what can be seen as excessive costs or fees to the consumer. Their EPR model ensures that producers and importers cover the costs of end of life treatment of what is non-valuable e-waste, while treatment of valuable e-waste can continue as ongoing business under a governance structure ensuring appropriate permitting, licensing and standards. This is underlined by the findings of INSEAD (Kunz et al, 2014) where a producer responsibility organisation appears to be effective only for collecting waste that is costly to treat.

An EPR model establishes a financial structure which ensures all stakeholders providing collection and treatment of the waste can be fairly recompensed.

4.2 Governance Structure

An effective governance structure is crucial to ensure a level playing field for all stakeholders. The establishment of a control tower with representation of the relevant stakeholders e.g. producers, recyclers, collectors, government, etc is vital in ensuring the EPR solution operates effectively and sustainably in the long term. One of the key roles it has is to ensure environmental and legal standards are appropriately implemented and maintained with the support of the relevant stakeholders such as government providing enforcement. Without such governance there is potential for stakeholders to cut corners with recycling or collection standards which could put workers health or the environment at risk and deviates from one of the principal aims of environmental legislation ie to protect the environment. It is proposed that e-WASA assumes the control tower role in the form of a council with a multi-stakeholder group of directors.

4.3 Environmental Sustainability

Potential environmental issues associated with e-waste management are manifold. E-waste contains valuable materials such as precious and rare metals that could be used as raw material resource for new products. Recycled material creates a lower environmental impact compared to raw materials as it reduces the need for mining/manufacturing virgin raw material effectively closes the loop on material resources. The hazardous fractions of e-waste should be separated and treated correctly to ensure environmental sustainability.

Thus the overall objective is to maximise the amount of recycled material being returned into the material markets to be used in new products and closing the loop on material resources. The technology for re-using materials, particularly plastics, has developed significantly in recent years allowing more technically demanding products to be manufactured. In 2009 WRAP (Waste Resources Action Plan) conducted a study with two leading high-end audio manufacturers to determine how suitable recycled plastics were for use in consumer products and found that the use of recycled HIPS performed as well as or better than the use of virgin HIPS vs PCABS passing the moulding technical requirements but failing to meet the manufacturers strict aesthetic standards.(WRAP, 2010) In 2014 Dell announced the launch of new product being made from closed loop plastics sourced from its own recycling programmes. (Dell, 2014). and HP announced that more than 75 percent of its ink cartridges and 24 percent of HP LaserJet toner cartridges are now manufactured with “closed loop” recycled plastic as well as other product (HP, 2014)

Environmental sustainability should be the principal aim of all producer responsibility legislation and, therefore, is dependant on the design of components and EEE as well as on the materials and substances that are in such EEE. Global brands design and produce for the global market and therefore products sold in South Africa are compliant with existing legislation in other jurisdictions eg EU Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment.

Conversely, the management of e-waste collection requires a local solution in the markets where e-waste is generated. While the sound dismantling of e-waste, pre-treatment of fractions and end processing of easily recyclable fractions eg ferrous metals can be performed locally, the effective recovery of precious metals from complex e-waste depends on access to global market specialists. The eWASA/ITA PEG framework has specifically been designed to ensure the following:

- Collection of all material whether of value or not is governed by the solution;
- Local dismantling of material can create jobs;
- Local profit for metals that are not associated as being hazardous to recycle;
- Access to the global market is maintained for appropriate recycling and treatment of e-waste material where specialist treatment is necessary and does not exist in South Africa; and
- Material can be channelled into appropriate beneficiation, effectively closing the materials loop.

5. DEPENDANCIES

Other than the engagement of all stakeholders in the process, the most critical dependency is that government must ensure an effective legal structure is in place to enable EPR to be implemented effectively. There is optimism that the proposed changes with the recent gazetting of the Waste Amendment Act and soon to be published Waste Pricing Strategy will be positive for sustainably implementing EPR solutions in South Africa.

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