e-Waste: Job Creation Potential in the Automotive Sector

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ABSTRACT

Electrical and electronic waste (e-waste) is currently the fastest growing waste stream (in tonnes) world-wide, estimated to be in the region of 4-6% per annum. E-waste is often hazardous, complex and costly to treat in an environmentally sound manner. Furthermore, there exists a lack of legislation or enforcement regarding the recycling of e-waste. The combination of the complexity of the material and lack of enforcement of safe disposal, results in a current imbalance between the number of tonnes of e-waste generated and the significantly lower number recycled annually.

Waste in general, and e-waste specifically, are recognized as a potential source for job creation in the green economy. In South Africa, the IDC estimated 34 workers for every 1 100 tonnes of e-waste collected (2011). The paper corroborates these numbers, since on average e-waste management companies surveyed collect 2 451 tonnes of e-waste per annum and employ 48 workers, of which 20 (41%) work with the e-waste every day, the remaining workers work on the admin side of these businesses or work with other recyclables every day.

Besides the environmental challenges to South Africa in the short and long term, e-waste is of particular concern in terms of decent work deficits, particularly in the informal economy. On a daily basis, thousands of waste pickers are handling e-waste as we speak, mostly concealed and away from the public eye in precarious working conditions.

The paper explores the potential for job creation by analysing systemically the set-up of e-waste in South Africa with a focus on enterprise development (and upgrading of existing informal jobs). The potential to establish a pilot e-waste collection system set-up in KZN could be used to test the practicality of job creation in e-waste, specifically working with the automotive and large white goods sectors.

1. INTRODUCTION

With much research been done, e-waste is no longer the new kid on the block in the recycling industry. It represents one of the fastest growing waste streams in the world and with our collective hunger for newer and ever evolving electronics and gadgets, there is no end in sight with an industry that is always adapting to new designs and materials used to make our daily lives easier.

Numerous studies have been conducted on the harmful effects of e-waste on the natural environment and people. Approaching e-waste from a job creation perspective has been investigated less. In South Africa it is estimated that currently only around 13% of the available e-waste is collected, indicating an industry with much opportunity for employment growth and much work to be done to continue raise awareness and collection figures in the country.

According to StEP's e-waste world map 9.94kg/person Electric & Electronic Equipment is put on market, while 6.63kg/person e-waste is generated. This translates to 339.31 kilotonnes of e-waste generated (Huisman, 2012).

Table 1: StEP e-waste map for SA[1]

Subject	Unit	Year	Amount	Source
EEE Put on Market*	(kg per inhabitant)	2012	9.94	UNU (Jaco Huisman)*
	(total in metric kilotonnes)	2012	508.74	UNU (Jaco Huisman)*
E-waste Generated*	(kg per inhabitant)	2012	6.63	UNU (Jaco Huisman)*
	(total in metric kilotonnes)	2012	339.31	UNU (Jaco Huisman)*

[1] http://step-initiative.org/index.php/Overview_South_Africa.html

While there are many definitions for e-waste the accepted understanding in South Africa is any discarded electronic or electrical equipment. Since 'waste' is defined in the Waste Act (2008) as something that the user no longer wants, in the South African context it doesn't matter if the item is refurbishable, in a working condition, or indeed at end of life.

e-Waste is both hazardous and valuable, posing unique collection and recycling challenges. While handling e-waste in an environmentally sound manner poses very little risk, mismanagement can have adverse effects on human health and the environment.

Heavy metals and chemicals such as lead (solder, CRT Glass, lead-acid batteries), mercury (CFLs, flat screens, thermostats), cadmium (resistors, batteries), PCBs (capacitors, resistors) and arsenic (light emitting diodes) can lead to health problems for e-waste workers when not handled properly and cause heavy metal contamination for soil and water if landfilled or treated in backyard e-waste recycling operations as is found in China (Guo et al 2009).

Many of the metals are considered carcinogens and adverse health effects include lung cancer (beryllium), skin infections (arsenic), brain swelling (barium), hormonal disorders (dioxins), kidney damage (cadmium), DNA damage (chromium) and lead poisoning (lead).

On the flip side copper (wiring, cables, circuit boards), gold (circuit boards), aluminium (capacitors), and iron (fixings, cases) have high value when recovered. Rare earth metals such as scandium (aerospace components), yttrium (spark plugs) and lanthanum (camera lenses) can be recovered. In a world where resources are dwindling recovery of valuable resources will continue to grow in importance. Already some applications of urban mining can be less cost intensive than traditional mining operations. Open burning of copper cables to remove the plastic casing is common practice in the informal sector in South Africa, despite precious metals legislation and controlled metals regulations.

1.1 Automotive industry

The automotive industry in South Africa is well-developed with vehicle manufacturers (BMW, Ford (incorporating Mazda), General Motors, Mercedes Benz, Nissan, Renault, Toyota and Volkswagen) and component manufacturers (i.e. Arvin Exhaust, Bloxwitch, Corning, Senior Flexonics) having production plants in South Africa. The sector is well-placed for investment and has shown growth in the last few years. The sector contributes 6% to the country's GDP and represents 12% of manufacturing exports.

New vehicle dealerships are also members of their respective Dealer councils, which amongst other matters sets standards, policies and best practice guidelines for its members. These Dealer councils, we believe will play a pivotal role in the success of launching an e-waste initiative in the automotive sector, particularly if a national roll-out is envisaged.

Insofar as used car dealers, motor repair facilities (non-franchised) and motor spares dealers, they belong to the Retail Motor Industry Federation, which is made up of some 15 ancillary associations representing a vast array of businesses that make up the total supply chain in the automotive sector.

Furthermore, some of the franchised workshops such as Bosch, have their own Dealer Council which operates on a similar basis to the new car dealership councils. Likewise, they are an important stakeholder in the proposed e-waste collection model, tabled below.

More than 28 000 people are directly employed in automotive manufacturing, with 65 000 employed in the component manufacturing industry. About 200 000 are employed in retail and aftermarket activities, with 6 600 employed in the tyre manufacturing industry (Automotive Industry Export Council, 2010).

1.2 Automotive e-waste

As illustrated below, there are a growing number of electronic components in modern-day cars and other vehicles. Components such as entertainment systems, alarm systems and GPS units are already finding their way to e-waste management companies.

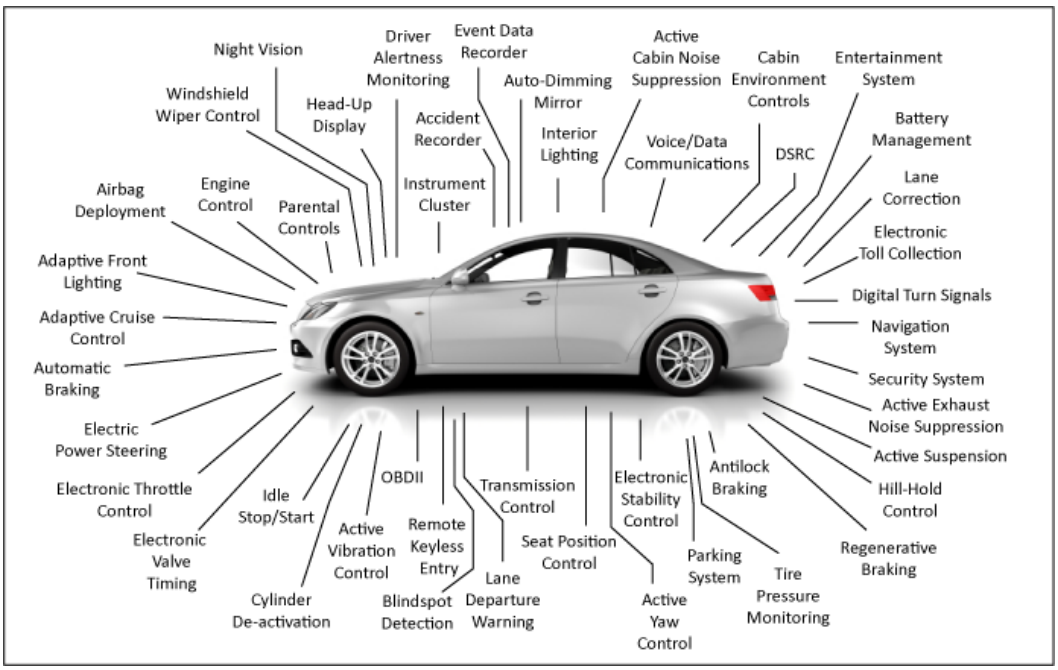

Figure1: Automotive e-waste - source: http://www.cvel.clemson.edu/auto/systems/auto-systems.html

In addition to the systems pictured above, most cars contain sensors (microphones, optical imaging, oxygen sensor) and actuators (spark plugs, motors, air bag inflators) that can be considered e-waste.

As technology advances, electronic components in vehicles are growing and changing to adapt to the needs and wants of drivers. Even the most basic cars now have some electronic systems with central locking, alarm systems and electric windows standard.

Electronic components in vehicles contain metals (aluminium, platinum, nickel, copper, palladium, rhodium), PC Boards, batteries, capacitors and many other items that are familiar in e-waste management.

1.3 Where does it go?

While the scrap metal recycling sector is well developed and organised with the MRA and RASA, most scrap metal dealers only deal with scrap body work of vehicles (steel recycling in South Africa is estimated at 90%), it seems not much e-waste ends up in this channel. In our surveys we found that most scrap metal dealers did in fact receive large household appliances and occasionally other e-waste items. Many reported redirecting people to e-waste management companies. When vehicles are serviced at new and second hand car dealerships around the country, workshop staff hand the parts that were replaced to the customer who then has to dispose of it. In practice much of this waste will end up in landfill sites or storage. For new vehicles serviced under warranty dealership report sending faulty parts back to head office. Under the Consumer Protection Act that dealerships will be required to take hazardous waste back, as soon as e-waste is no longer accepted at landfill (2018)[2]. This could be used as an incentive to get dealerships on-board with a collection initiative.

[2] National Environmental Management: Waste Act 2008: R636. National Norms & Standards for Disposal of Waste to Landfill: Para 5 (1) Waste Disposal Restrictions and Consumer Protection Act 2008: Chapter 2, Part H, Para 59. Recovery and safe disposal of designated products and components.

Figure 2: e-Waste collected at scrap metal yards

South African battery manufacturers collect 90% of lead acid batteries for recycling at their plants (Fry's Metals, First National Batteries, Lead Processing and Dixon Batteries). The take-back system for lead acid batteries was initiated in 1942, with a legal requirement that you could only exchange a battery on a one for one basis. Should you not return a battery you have to pay the mandated levy at point of sale. In other words consumers have to return the old battery to get a new one. The levy ranges from R20 for motorbike batteries to R173 for car batteries and is administered by the Battery Manufacturers Association.

It appears that some of the end-of-life electronic components are sent back to mother companies outside of the country for recycling, while some scrap metal dealers indicated that second-hand dealers strip the valuable e-waste components out before sending the bodywork to the scrap yards. However, most of the e-waste companies surveyed confirmed that they receive automotive e-waste, including wiring that scrap metal dealers indicated are often left in the bodywork and deemed not worth their while to strip-out. The pie chart below illustrates the percentage of the companies' surveyed that accept the automotive e-waste fraction.

Of the companies surveyed the following percentage indicated that they accept the automotive e-waste fractions we listed.

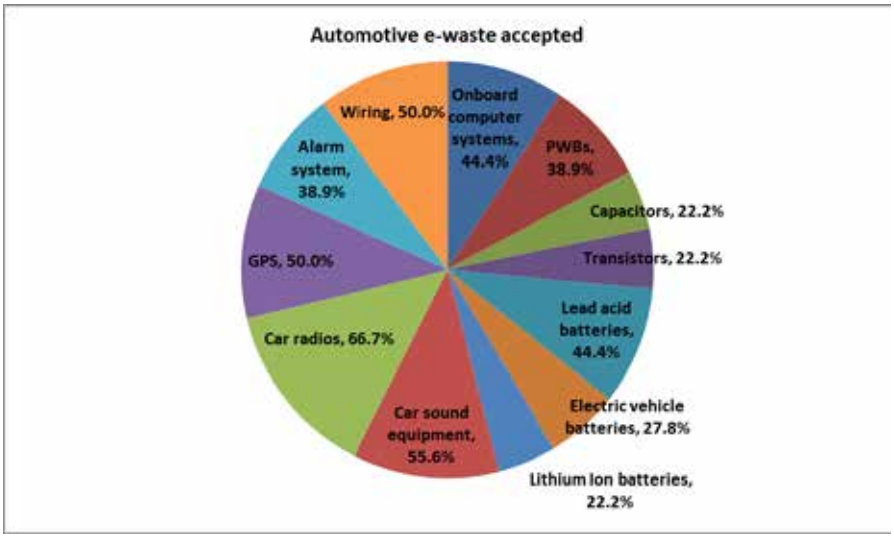

Figure 3: Automotive e-waste accepted at e-waste management companies

According to RASA, their members won't accept automotive e-waste, since it can contaminate their materials and prefer to refer collectors to e-waste management companies. Wiring and lead-acid batteries are accepted by all, and managed accordingly. The copper inside wiring no doubt has enough value and pose no challenge in scrap metal recycling processes.

At landfill sites, which the consultant visited to ascertain if automotive e-waste ended up on the sites and collected by informal waste pickers, there were only a few e-waste pickers and they were not prepared to share information. While it is difficult to guess why people were reluctant to talk it could be for fear of losing an income or admitting to a perceived crime. It could be as simple as distrust in a new person that is not known to the waste pickers. Discussions with stakeholders in the area indicated that waste pickers could be less eager to talk to 'strangers' than to someone they are familiar with. This implies that further long-term study would be required to better understand what these pickers collect and how the programme could best integrated them with the formal e-waste collection system.

2. ESTABLISHING A COLLECTION CHANNEL FOR AUTOMOTIVE E-WASTES

In discussions with new and second-hand car dealers in EThekwini there is a clear willingness to have e-waste waste collection bins in workshops as an alternative to giving the old parts to the customer. These bins would be collected by e-waste collection companies and taken for sorting, dismantling and recycling. In the feasibility study we discuss a pilot collection scheme that could be expanded nation-wide to collect the fractions of automotive and other e-waste that appears to be falling through the cracks at the moment.

2.1 Technical feasibility of automotive waste

In the diagram below we show which automotive e-waste fractions the existing e-waste companies already collect. Since automotive e-waste is not a separate category for reporting in terms of the WIS regulation we could not quantify the tonnage of automotive e-waste collected.

2.2 Market feasibility for automotive e-waste collection

There are a number of scrap yard dealerships around eThekwini and they all accept various e-waste components for a number of different makes of cars. Some are reselling these parts to various consumers in and outside eThekwini as second hand goods. In their process flow of stripping some cars for resale there are other components which are used for recycling where a number of metals are recovered.

Discussions with car dealers indicate that new vehicle parts are sent back to head office while parts that were replaced during services are in general handed back to the customer as proof that it was indeed replaced,. Much of these parts probably end up in general landfill. E-waste companies report receiving automotive e-waste.

Through initial discussions with new and second-hand car dealerships in EThekwini indicate a willingness to set-up e-waste collection bins in workshops to collect the e-waste instead of passing the problem onto the consumer. These bins should be collected on a weekly basis through formalised agreements with existing e-waste collectors and feed-in to the e-waste management networks in the province. This pilot programme could be rolled out in the province in 2014/5, after finalising discussions with new and second-hand car dealers, the Retail Motor Association and the Durban Automotive Cluster.

It is difficult to estimate volumes that will be collected at the moment, but volumes will become clear when we initiate a pilot. The pilot could be extended to dealerships nation-wide once we see what works best.

2.3 Financial Feasibility for pilot e-waste collection scheme

A preliminary costing for a pilot e-waste collection system in EThekwini is based on the use of 240l wheelie bins that are serviced by existing e-waste management companies. Depending on the volumes the initiative could create between 1 and 2 jobs per collection point, provided each point is permanently manned by a person/s to assist with sorting and transport of e-waste. The pilot programme should provide clarity on real numbers and collection points.

Table 1: Estimated cost for eThekwini automotive e-waste collection pilot

Equipment required	Cost	Dealership collection points	Total
Wheelie bins	R 633	60	R 37 980
PPE for workers	R 700	60	R 42 000
Total for eThekwni pilot programme			R 79 980

This pilot could be an example of extended producer responsibility in terms of the waste act and consumer protection act.

2.4 Organisational feasibility of automotive waste

With existing automotive dealerships willing to participate in a collection initiative automotive e-waste could easily be collected to feed-into the existing formal e-waste collection system. Depending on volumes a social enterprise/co-operative to prepare e-waste for formal recycling (manual dismantling and sorting) could be established, since the Hammersdale facility is not yet up and running. This would have to be discussed with existing NGOs and social enterprises should the need arise. For the duration of the pilot it is foreseen that existing e-waste management companies will be able to process the additional e-waste collected at the collection points.

3. CONCLUSION AND RECOMMENDATIONS

Due to timing of the case study, within the timeframe of the larger ILO Study, in depth discussion of all the key stakeholders was not possible. It is recommended that a follow-up study is conducted to further validate the initial findings. Questions that need to be answered include:

- Buy-in from dealerships to place collection bins at dealerships
- Buy-in to collect more than just automotive e-waste
- Buy-in to run collection points in-house or if they want and outsourced service
- Possibility to expand the initiative country-wide
- Clarity on where automotive e-waste is going at the moment.
- Will e-waste increase or will green design have influence on materials recovery

Nonetheless there is clear opportunity to expand e-waste collection to an industry with relatively low awareness of local recycling opportunities for the e-waste that it generates. A pilot programme could be initiated at relatively low cost and expanded country-wide with the possibility of expanding the existing e-waste collection network.

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