Formalisation of E-Waste Recycling: Making it a Reality

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ABSTRACT

Statistics indicate that there is an increase in electrical and electronic waste (e-waste) in South Africa each and every year. E-waste recycling, which helps to minimise this e-waste problem is taking place in South Africa but it is mainly dominated by the informal sector. Informal e-waste recycling impacts negatively on human health and the environment, hence e-waste stakeholders such as government and electronic equipment producers prefer formal recycling of e-waste. In spite of its disadvantages and avoidance/discouragement by the industry, informal recycling persists and this points to serious short-comings in the formalisation efforts by all present. Key in the list of factors that make informal recycling to persist are start-up costs, operational costs, and unrealistic policies preventing the biggest consumer (government) of electronic equipment from supplying e-waste to recyclers. Addressing and resolving these factors may be the key that unlocks a great progress in the formalisation of e-waste recycling.

1. INTRODUCTION

Waste from used or obsolete electrical and electronic equipment – commonly known as e-waste or WEEE – is one of the fastest growing solid waste streams around the world today. The best strategy to manage e-waste is the recycling of it. For the purposes of this paper the word “recycling” will refer to processes where e-waste is collected and separated into various material (dismantling), hence those responsible for collecting and dismantling e-waste will be referred to as recyclers. Those responsible for processing recovered materials from e-waste into new products will be referred to as re-processors.

E-waste recycling in South Africa is mainly saturated by informal recyclers. There are 40,000 plus informal general waste collectors estimated to be working in South Africa (EWASA, 2008).It is likely that most of them, at some time or another, have dealt with e-waste. E-waste recyclables have more value (in terms of money) than general waste recyclables, it is therefore also highly likely that most of them will also have become e-waste recyclers. This informal recycling of e-waste is good for the management of e-waste in South Africa, however the negative impacts it has on human health and environment has made it to be least favoured option amongst most e-waste stakeholders. Various initiatives have attempted to structure or formalize e-waste recycling but they have been unsuccessful.

This lack of success in formalizing e-waste recycling in South Africa can be confirmed through the implementation process of the "Durban Declaration on e-Waste Management in Africa" during the WasteCon2008 in Durban, South Africa. It was agreed that every country requires its own process to define its specific roadmap, however the following general recommendations were suggested:

* Improve cooperation among stakeholders
* Establish an institutional framework
* Create awareness at all levels of governance & the general public
* Support markets
* Collect and manage data
* Develop a legal framework
* Develop a qualified and efficient e-waste recycling sector

South Africa has had some progress in implementing the recommendations of this declaration, such as:

* EWASA produced a technical guidelines document on the recycling of e-waste in September 2009.
* In November 2013,the Africa Institute supported by Finnish Environmental Institute (SYKE), in association with the African Telecommunications Union and Information Technology Association Producer Environmental Group (ITA EPR) organized a public-private sector policy dialogue in addressing e-waste management in Africa which endorsed the declarations recommendations of improving cooperation among e-waste stakeholders and of establishing an institutional framework.

* In 2012, Re-Ethical in partnership with the Institute of Waste Management of Southern Africa (IWMSA), Jeffares & Green Engineering & Environmental Consultants and various shopping centres around South Africa organised a national e-waste collection drive which created massive e-waste awareness. In the Pietermaritzburg 3 500 tons of e-waste were collected from the drive. Due to the great success of the one in 2012, they organised it again in 2013 and it looks like it is going to be an annual event.

Formalization of e-waste recycling is the only recommendation that is having a very slow implementation progress. This slow progress in achieving formalization of e-waste recycling as recommended by the declaration is an indication of an environment bias towards the opposite. The failure to formalize e-waste recycling is mainly due to the refusal by e-waste recyclers to operate formally. It then becomes imperative for one to understand why e-waste recyclers refuse to operate formally. This understanding will then determine the initiatives to be taken in ensuring that e-waste formalization is successfully implemented.

This paper therefore seeks to look into detail at the reasons that make e-waste recyclers to mainly recycle e-waste informally despite the negative impacts associated with informal e-waste recycling. It also seeks to look at what measures can be taken by all e-waste stakeholders in ensuring that the formalisation of the e-waste recycling sector becomes a reality.

2. E-WASTE ON THE VERGE OF BECOMING A CRISIS IN SA

South Africa is one of the African developing countries that has established a stronger economy than the rest of other African developing countries. This stronger South African economy coincided with the digital revolution which has led to explosive production and extensive use of electronic and electrical devices and goods. As a result South Africa has become one of the leading developing countries in the consumption of electronic and electrical goods. This has then led it to be one of the leading developing countries in e-waste generation.

UNEP in 2009 developed a report which stated that South Africa, with an e-waste generation of almost 60 000 tonnes in 2007, was the fourth highest e-waste generating developing country and the first highest e-waste African developing country as illustrated by Table 1 below.

Table 1: Quantity of different e-waste goods (in metric tonne) generated by developing countries in the 2005 - 2007 year range

Countries	China	India	Mexico	Brazil	South Africa	Peru	Morocco	Columbia	Kenya	Uganda	Senegal
Assessment Date	**2007**	**2007**	**2006**	**2005**	**2007**	**2006**	**2007**	**2006**	**2007**	**2007**	**2007**
PCs	300 000	56 300	47 500	96 800	19 400	6000	13 500	6 500	2 500	1 300	900
Printers	60 000	4 700	9 500	17 200	4 300	1 200	2 700	1 300	500	250	180
Mobile Phones	7 000	1 700	1 100	2 200	850	220	1 700	1 200	150	40	100
TVs	1 350 000	275 000	166 500	137 00	23 700	11 500	15 100	18 300	2 800	1 900	1 900
Refrigerators	495 000	101 300	44 700	115 100	11 400	5 500	5 200	8 800	1 400	900	650
Total e-waste	**2 212 000**	**439 000**	**269 300**	**231 300**	**59 650**	**24 420**	**38 200**	**36 100**	**7 350**	**4 390**	**3 730**

Amongst other things, the UNEP report also predicted that in South Africa, China and India, from 2007 to 2010, e-waste from old computers will have jumped by between 200 to 400 percent in China and South Africa and by 500% in India. StEP (http://step-initiative.org/index.php/WorldMap.html), has produced the first of a kind e-waste world-map, which provides comparable, country-level data on the amount of electrical and electronic equipment put on the market and the resulting amount of e-waste generated in most countries around the world. This map indicates that in 2012 South Africa generated almost 340 000 tonnes of e-waste while India and China generated just above 2 750 000 and 7 250 000 tonnes of e-waste respectively (illustrated in Figure 2).

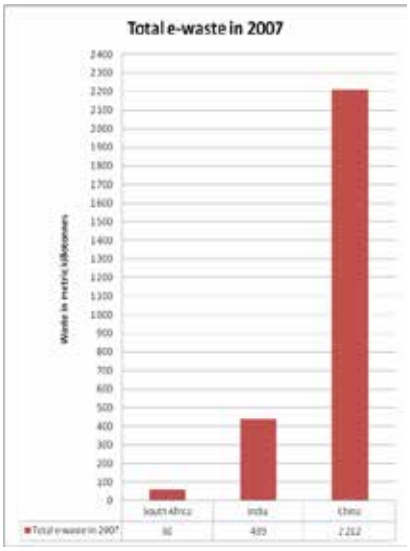

Figure 1: Quantity of e-waste generated by developing countries in 2007 (UNEP, 2009)

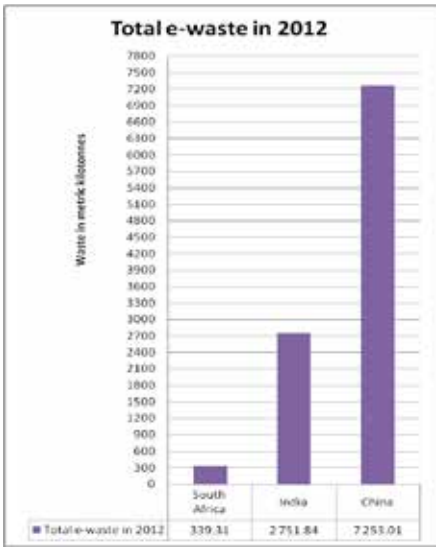

Figure 2: Quantity of e-waste generated by developing countries in 2012 (StEP)

Comparing UNEP's e-waste generation figures by these three countries (South Africa, India and China) in 2007 (Figure 1) with StEP's e-waste generation figures (Figure 2) by the same countries in 2012, UNEP's e-waste generation prediction by these countries from 2007 to 2010 is proved to be almost correct (the prediction is slightly lower for South Africa and India but it is on point for China). South Africa went from generating almost 60 000 tonnes of e-waste in 2007 to generating almost 340 000 tonnes in 2012 (566 percent jump). India went from generating 439 000 e-waste tonnes in 2007 to generating above 2 750 000 tonnes in 2012 (627 percent jump) while China went from generating 2 212 000 e-waste tonnes in 2007 to 7 253 000 tonnes in 2012 (328 percent jump).

UNEP had predicted China and South Africa's e-waste generation percentage jump to be the same (between 200 and 400%) between 2007 and 2010, yet in 2012 South Africa has almost doubled that of China with its 566 % jump compared to the 328% of China. Taking into consideration that China has a population that is way above that of South Africa, this indicates that the high rate at which e-waste is generated in South Africa is not very far from becoming a crisis, if it is not managed properly.

3. MANAGEMENT OF E-WASTE IN SOUTH AFRICA

E-waste management practises may be summarised into four major mechanisms, namely (Dr. Mathias Schluep, 2010):

* Policy and legislation
* Monitoring and control
* Marketing and awareness
* Technology and skills

3.1 Policy and legislation

Table 2 below shows some of the international and South African legislation impacting on e-waste (Yose, Mnyaka & Binda, 2012).

The rest of the mechanisms (Monitoring and control, Marketing and awareness, Technology and skills) are the same as the recommendations suggested in the Durban e-waste management declaration. The way in which they are implemented has been discussed in section 1.The technology and skills mechanism which Dr. Mathias Schluep describes as the formalization of an informal e-waste recycling sector is the only mechanism not being currently implemented in South Africa is. As stated in section 1, to successfully implement e-waste formalisation, one must first understand why e-waste recyclers favour informal recycling over formal recycling.

Table 2: Some of the international and South African legislation

INTERNATIONAL	**CONTENT**	**Country**
Waste Electrical and Electronic Equipment Directive	Promote e-waste recycling thus achieving reduction of e-waste landfilling.	European Union
Waste Electrical and Electronic Equipment Regulations	Assigns responsibilities to certain producers of electrical and electronic devices.	European Union
Restriction of Hazardous Substances (RoHS) Directive	Restriction of certain hazardous materials in the production of electrical and electronic devices.	European Union
Restriction of Hazardous Substances (RoHS) Regulations	Deals with exemptions for RoSH list and concentration limits for the listed chemicals.Restriction and phasing out of hazardous materials	European Union
Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)	Covers the responsibility of Industry in assessing and managing risks associated with their products by providing safety information.	European Union
NATIONAL	**CONTENT**	**Country**
National Environmental Management Act , 107 of 1998	Environmental protection legislation.	South Africa
National Environmental Management: Waste Act, 59 of 2008	Promotion of waste hierarchy to encourage recycling.	South Africa
Second Hand Goods Act of 2009	Registration of 2nd hand goods dealers with the National Police Commissioner and Identification of second hand goods sellers for ease of investigation.	South Africa
National Waste Information System Regulations	A system for capturing recycling statistics for the country.	South Africa
Waste Classification Regulations	Decision on whether waste is hazardous or general.	South Africa
Consumer Protection Act, 68 of 2008	Rights of consumers	South Africa

4. FORMAL VS INFORMAL OPERATION FOR A SOUTH AFRICAN E-WASTE RECYCLING BUSINESS

4.1 Formal e-waste recycling operation

Recycling e-waste formally in South Africa means adhering to the following 7steps:

* Step 1: Be declared as a legal entity
* Step 2: Obtain supply of the e-waste to be recycled
* Step 3: Obtain start-up capital
* Step 4: Be authorized to operate
* Step 5: Acquire and secure all operation necessities
* Step 6: Obtain customers for the dismantled recyclables
* Step 7: Have transportation for the e-waste

Step 1: Be declared as a legal entity

To have a business declared as a legal entity in South Africa, it must mainly be registered with Companies and Intellectual Property Commission (CIPC) and the South African Revenue Services (SARS).

The first thing to do when registering a business with CIPC is to reserve a list of names for the company and the application cost for the reservation is R75. One then registers the company and the company registration cost is R475. Provided that you have at least one name that is not already in use in the list of names reserved, the duration process of the registration is about 2 to 3 months. If all the names are in use one has to pay another R75 and reserve another set of names until there is name that can be allocated to the company and this name reservation process can run for weeks before one can register the company. The company registration with CIPC has to be renewed on an annual basis with a renewal fee of R100.

Once the business has been registered and registration documents have been issued, one must then register for taxation with SARS. The registration at SARS is immediate and at no cost but one of the requirements for the registration with SARS is the possession of a bank account by the company and the application of that account can take up to a week. This is mostly due to the fact that when applying for a business bank account number one has to first set a consultation appointment with a bank business advisor, who will mostly advise the company on how to best use the banking resources to suit their business. Only after consulting with the bank business advisor can the company apply for a business account number. The application fee for a business bank account ranges between R200 and R2000 depending on the bank. Some banks have step ladder categories for business banking with each category only having the services that are applicable to the particular stage your business is at, while some banks offer you the full business banking services in one go, hence the difference in the application fee.

The whole process of having your business declared as a legal entity takes an average duration of 4 months and has a fee cost in the range of R750 – R2 550.

Step 2: Obtain supply of the e-waste to be recycled

For the e-waste recycling business to run as a formal business it needs constant supply of the e-waste to recycle. To access this e-waste one has to liaise with the e-waste generators such as government departments, private companies and households.

To procure anything from a government department one has to first register with the Department of Treasury and be on their database. Once registered with them and in possession of the Department of Treasury database number, you may then proceed to register with the supply chain section of the desired government department. Since all government departments are e-waste generators one has to therefore register with all of them. The registration process with government department entails filling a vendor database registration form of the desired government department. The vendor database registration form one has to fill in is 60 pages long and the following documentation has to be attached:

* Original tax clearance certificate
* Certified copy of Broad-Based Black Economic Empowerment(B-BBEE) verification certificate
* Certified copies of identity documents of directors
* Certified copies of business registration documents
* Bank statement
* Proof of business address
* Certification of correctness of information which has to be completed in the presence of a commissioner of oaths

Given that we have close to 50 government departments in South Africa it takes an average of 1 month to prepare all the documents needed for these registrations.

The B-BBEE verification certificate mentioned above as one of the necessary documents needed for vendor registration with any government department is issued to you by a B-BBEE verification agency once it has audited your company in terms if the B-BBEE Act. The audit and processing of a B-BBEE certificate for a new company takes a minimum of 2 weeks and costs R950. The B-BBEE certificate is renewed annually for an equivalent of the same amount based on the inflation. Registration for a B-BBEE status mandates one to appoint an accountant whose fees range of R500- R6 000 depending on the service provided by the accountant. For operating businesses, the fee ranges between R350 – R750 per hour for the duration of the audit. A transport fee of R4 per kilometre from the B-BBEE verification to your business premises is also charged for operating businesses.

Obtaining supply of the e-waste to be recycled is a long process, where you may have to compile a business profile or presentations and use those to pitch his/her business in order to procure the e-waste to be recycled. The registration with government department with its B-BBEE registration requirement is just the first stage in the long process of procuring e-waste to be recycled, and it takes an average duration of 1 month and has an average fee cost R2 722.70.

Once you have been registered and are on the government department database, the government department requires you to be accredited by E-waste Association of South Africa (EWASA).To be audited and accredited by EWASA you need to be an EWASA member. The subscription fees for EWASA membership are as follows:

* Entrance fee (non refundable) = R500
* Annual subscription fee = R2000
* Fee/ per employee (capped at 651 employees) = R20 * 5. For a viable e-waste recycling business a minimum of 5 workers must be employed (Yose, 2012).

The total cost in the first year of application is R2600 along with the annual subscription fee of R2000.

Step 3: Obtain start-up capital

Every new formal business needs start-up capital and an operating capital for the first 6 months. There are several sources of business finance available but all those sources require a business plan Creating a business plan takes an average of 2 months and the range of costs for creating it, is R7 000 – R12 000.

Step 4: Be authorized to operate

Legal considerations for recycling e-waste as a small business include applying for a Waste Management License. When wanting to apply for a waste management license one must appoint an Environmental Assessment Practitioner (EAP) that will handle the waste management license application. E-waste recycling for a small business is listed in Category A on the latest waste management activity list. It therefore requires the application of a basic assessment. This basic assessment is conducted by the appointed EAP, it takes a minimum of 60 days to be conducted and costs range from R40 000 – R50 000. When the business grows it may become listed in Activity B category which will now require scoping and an environmental impact assessment (EIA). Conducting the scoping and EIA takes a minimum duration of 105 days with relative steep costs depending on the specialist appointed to conduct it.

Step 5: Acquire and secure all operation necessities

Operating an e-waste recycling business requires certain necessities such as:

* Premises to operate on
* Protective wear for employees such as safety shoes, work suit, gloves, ear muffs, etc.
* Tools to dismantle the e-waste with such as screw drivers, pliers, etc.
* Security of the premises, tools, etc. from breakins, theft, etc.
* Insurance for the business, premises, tools, in case any unfortunate event may befall them

    - Premises

Acquiring and securing premises takes an average of 1 month and the monthly rental fee for premises suitable for a small recycler ranges between R9 000 – R 13 000. The first month rental fee is required to be accompanied by a deposit fee ranging between (R20 000 and R25 000).The premises need to have the basic utilities such as water and electricity and ablution facilities. There is a cost to open an account for these utilities and there is also a monthly fee that is charged based on the rate of their usage.

    - Protective wear equipment and tools

The protective wear equipment and tools needed to operate a small recycling business costs approximately R43 300 as shown in Table 3 below.

Table 3: Costs of protective wear equipment and tools for a small business

Five Workers			
Recycling Tools	**Price**	**Number**	**Total**
Basic Magnetic Screw Driver Set	R 89.00	5	R 445.00
Torch magnetic screw Drivers set	R 177.00	5	R 885.00
Claw 450g	R 80.00	5	R 400.00
Wood chisel 10mm	R 40.00	5	R 200.00
Trimming knife	R 80.00	5	R 400.00
Spare knife blades	R 3.00	5	R 15.00
Strong cutter	R 100.00	5	R 500.00
Pliers S/cutter 150mm	R 35.00	5	R 175.00
Pliers long-nose 200mm	R 57.00	5	R 285.00
Plier MTS 200mm	R 100.00	5	R 500.00
Scissors Professional 20 mm	R 50.00	5	R 250.00
Testing screwdriver	R 180.00	3	R 540.00
Pellet Jack	R 2 500.00	2	R 5 000.00
Hand cart	R 750.00	2	R 1 500.00
Total	**R 4 241.00**		**R 11 095.00**
Refurbishing Tools	**Price**	**Number**	**Total**
Heat sink grease	R 100.00	4	R 400.00
HD protector	R 280.00	10	R 2 800.00
Vacuum cleaner	R 3 875.00	1	R 3 875.00
Multimeter	R 650.00	3	R 1 950.00
Air gun	650	4	R 2 600.00
Total	**R 5 555.00**		**R 11 625.00**
PPE	**Price**	**Number**	**Total**
Suits	R 900.00	5	R 4 500.00
Gloves	R 100.00	24	R 2 400.00
Goggles	R 90.00	5	R 450.00
Masks	R 5.00	300	R 1 500.00
Shoes	R 800.00	5	R 4 000.00
Antistatic wrist strap	R 50.00	40	R 2 000.00
Back braces	R 2 500.00	2	R 5 000.00
Total	**R 4 445.00**		**R 19 850.00**
Others	**Price**	**Number**	**Total**
First aid kit	R 500.00	1	R 500.00
Fire extenguishers	R 200.00	1	R 200.00
Total	**R 700.00**		**R 700.00**
Total	**R 14 941.00**		**R 43 270.00**

Once all the operation requirements have been acquired, security measures have to be in place to protect them mostly against damage and theft. Also insurance for the business against any unfortunate event that may befall it, has to be in place. The cost of installing a basic alarm system in a small business is in the R4 000 – R7 000 range along with a monthly monitoring fee of approximately R750 including armed response. The monthly fee for insuring a small recycling business is in the R3 000 – R6 000 range.

The total costs for acquiring, securing and insuring operational equipment is in the R70 000 – R80 000 range.

Step 6: Obtain buyers for the dismantled recyclables

E-waste recyclables have a market in both South Africa and countries outside South Africa. Recyclables of one desktop (tower, monitor, keyboard and mouse) in South Africa fetch between R51 and R62 (Yose *et al*., 2012) while in countries outside South Africa they fetch between R109 and R120 with exporting costs also included. The R50 difference between the South African market and international market makes e-waste recyclers favour exporting their recyclables instead of selling them here in South Africa. When exporting recyclables to another country the recycler needs to apply for an exporter's code through SARS and that takes a maximum of a month.

Another requirement for exporting is an affiliation with a local business chamber. Business chamber registration fees are based on the number of workers employed in the company. For a viable e-waste recycling business a minimum of 5 workers must be employed (Yose, 2012) and the business chamber registration fee for 5 workers is R1 772.70. This registration is renewed annually for an equivalent of the same amount based on the inflation. This affiliation also helps greatly when building relationships with private companies in order to access defunct electronic equipment from them.

Step 7: Have transportation for the e-waste

The e-waste recycling business is mainly categorized by three stages such as:

* Collection of e-waste
* Dismantling and refurbishing of e-waste
* Selling of refurbished e-waste and recyclables found in the e-waste

Two of those stages (collection of e-waste and selling of recyclables found in the e-waste) require transportation. The costs of transporting e-waste are very complex to calculate as there are many factors to take into consideration but to give an idea of the costs, an 8 ton truck which can load a maximum of 190 computers in a radius of 80 km costs an average of R2500.

Over the above mentioned requirements for operating as a formal business, a recycler needs to be literate and have a good command of the English language, because most things, such as SARS forms, B-BBEE application forms, etc, are written in English. In cases where the recycler is illiterate (which are most cases), he will need to employ a very efficient personal assistant and the minimum salary range for personal assistants in the R4 000 – R6 000 range.

A most important aspect of functioning as a formal business is having a small office where all your paperwork is kept. This office needs to have the basic communication equipment such as a computer and a phone. The minimum cost of a computer and a phone is R5 000.

In summary, to operate as a formal small recycling business in South Africa requires the following (shown in Table 4)

- Start-up up cost in the range of R165 000 – R197 000
- Monthly operating costs in the range of R40 000– R48 000 (including salaries but not taking into account the transportation costs)
- 10 – 12 months to set up the business

Table 4: Summary of all costs and time frames involved in trying to operate a formal e-waste recycling business

Expenses	Cost Lowest Range (LR)	Cost Highest Range (HR)	Monthly cost LR	Monthly cost HR	Time (Months)LR	Time (Months) HR
Registering a company	R 550.00	R 550.00	R 8.33	R 8.33	2	3
Taxation	R 0.00	R 0.00	R 0.00	R 0.00	0	0
Opening a bank account	R 200.00	R 2 000.00	R 90.00	R 90.00	0.25	0.25
Registration fee for BBBEE	R 950.00	R 950.00	R 950.00	R 950.00	0.5	0.5
Business chamber registration	R 1 772.70	R 1 772.70	R 147.73	R 147.73	0.5	0.5
Business Plan	R 7 000.00	R 12 000.00	R 0.00	R 0.00	2	2
Waste Management license	R 40 000.00	R 50 000.00	R 0.00	R 0.00	2	3
EWASA registration	R 2 500.00	R 2 500.00	R 175.00	R 175.00	0.5	0.5
Premises	R 29 000.00	R 34 000.00	R 9 000.00	R 9 000.00	1	1
Electricity and Water deposit	R 1 000.00	R 0.00	R 0.00	R 0.00	0	0
Tool & PPE	R 43 270.00	R 43 270.00	R 0.00	R 0.00	0.25	0.25
Security	R 4 000.00	R 7 000.00	R 750.00	R 750.00	0.25	0.25
Insurance costs	R 3 000.00	R 6 000.00	R 3 000.00	R 6 000.00	0	0
Exporter's Code	R 0.00	R 0.00	R 0.00	R 0.00	1	1
E-waste transportation						
Travel expenditure	R 2 000.00	R 3 000.00	R 2 000.00	R 3 000.00	0	0
Computer	R 5 000.00	R 5 000.00	R 0.00	R 0.00	0	0
Director's Income	R 8 000.00	R 10 000.00	R 8 000.00	R 10 000.00	0	0
Salaries	R 12 500.00	R 12 500.00	R 12 500.00	R 12 500.00	0	0
Illiteracy cost	R 4 000.00	R 6 000.00	R 4 000.00	R 6 000.00	0	0
Total	**R 164 742.70**	**R 196 542.70**	**R 40 621.06**	**R 48 621.06**	**10.25**	**12.25**

To make profit and thus maintain the sustainability of the business, a monthly income of R60 000 has to be made by the business. As mentioned above recyclables from one computer in South Africa will fetch between R51 and R62 (Yose *et al*., 2012) while in countries outside South Africa they fetch between R109 and R120, this target monthly income will therefore only be reached if a range of 500 – 550 computers is dismantled monthly and the recycler exports the recyclables. If the recycler does not export the recyclables and sells them locally, a range of 970 – 1200 must be dismantled monthly.

4.2 Informal operation

Informal sector is defined as (Feng Wang, 2010):

- Self-employment and the jobs that are done by self-employed people, and which are neither declared to, nor regulated by, the authorities. (http://www.tuition.com.hk/)
- The informal sector or informal economy is that part of an economy that is not taxed, monitored by any form of government or included in any gross national product (GNP), unlike the formal economy.(wikipedia)
- Informal sector is characterized by small-scale, labor-intensive, largely unregulated and unregistered, low-technology manufacturing or provision of services (Wilson, Whiteman, & Tormin, 2001)

By definition all that you mainly require to operate an informal e-waste material recovery facility is access to e-waste. Comparing that to the R165 000 minimum start up costs, R40 000 minimum monthly operating costs and the 10 months minimum it takes to set up a formal e-waste recycling business for operation, it is quite clear why e-waste recyclers opt to ignore all the dangers involved with e-waste recycling and operate their businesses informally.

5. INTERVENTIONS THAT CAN MAKE THE FORMALISATION POSSIBLE

From above it can be deduced that to informally operate an e-waste material recovery mainly three things need to be considered:

* Start – up funding to set up operation
* Large e-waste volumes to generate enough income to sustain the business
* Transportation costs of the e-waste

Besides the e-waste recyclers, there are three other major stakeholders (government, electronic equipment producers and the electronic equipment consumers) in the e-waste sector. The two stakeholders (government and electronic equipment producers) are the main ones that are majorly concerned with managing e-waste and therefore have a huge role to play in ensuring the manifestation of the e-waste formal sector occurs. Table 5 below illustrates a few issues that concern recyclers that are interested in operating formally.

Table 5: Issues that mainly concern recyclers wanting to operate formally

ISSUE	REMEDY	STAKEHOLDER FOR CHANGE
Start – up funding to set up operation		
All the avenues that are available to fund an e-waste recycling business require the possession of a waste management license.	Funders should therefore not use waste management license to as a bench mark for obtaining funding.	Most of these funders are government funders or parastatals, therefore government can be the one to implement this and put it into motion.
Most recyclers do not have the minimum R40 000 to obtain a waste management license in order to obtain funding.	Development of e-waste recycling norms and standards. Also a possible solution although short term would be to get post graduation Environmental Management student to process WMLs as part of their experiential training.	Government, Industry, and Academia
Large e-waste volumes to generate enough income to sustain business and transportation costs of e-waste		

According to the government asset disposal policies when there is disposal of any asset, the remaining value of the asset is calculated recovered through sale of the asset or captured as a loss of revenue.	E-waste different from other equipment in that it is hazardous and not economically to repair. Therefore its disposal requires departments to pay disposal fees at the hazardous landfill site. Asset disposal policies should therefore be amended so that they take into these facts when it deals with e-waste.	Government
E-waste recyclers currently place the logistic costs of the e-waste to that e-waste generator who requests recycling of their e-waste. The current asset disposal policies therefore make it difficult for government to pay logistic costs for something that is already considered a loss. The result is stock piling of e-waste which deprives recyclers of volumes that can support formal business operations.	A fully implemented strategy by electronic producers on handling the logistic costs of e-waste will encourage more recyclers to formalize. This can be achieved through extended producer responsibility (EPR).	Government and Industry
South African citizens pay for the disposal of their non-hazardous (household refuse) waste and do not want to pay for disposal of e-waste even though it is disposed with higher fees at hazardous landfill sites. In fact, contrary to what happens to other household recyclables, owners general expect e-waste recyclers to buy their e-waste when they collect it.	South African citizens should be paying for recycling or disposal of e-waste as they pay for disposal or recycling of solid waste.	Government, Industry, and Communities

6. CONCLUSION

Formalisation of e-waste recycling is a brilliant strategy in managing e-waste. It has many benefits with some rarely mentioned such as the fact that it can be used to collect e-waste data. This is a very important benefit since in South Africa we have very little information about e-waste. Yet with all those benefits, where some are as great as protecting and saving the lives of the informal recyclers from the hazardous components of e-waste, this formalization will never be a reality unless the informal recyclers are motivated enough to start formalizing. This motivation needs to come from only three things;

- Availability of the large volumes of e-waste that generate enough income to run a formal business
- Addressing the logistic costs of e-waste
- Charging for e-waste disposal like the solid waste disposal is charged for.

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