



**GAUTENG PROVINCE**

e-GOVERNMENT  
REPUBLIC OF SOUTH AFRICA

# **STRATEGY**

Electrical and Electronic Waste  
(E-WASTE) Management Strategy

**2021-2026**

## **Acknowledgement**

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## **Executive Summary**

Electrical and electronic waste (WEEE or e-waste) is the fastest growing waste streams in most developed countries and a substantial number of developing countries. South Africa, including Gauteng, is no exclusion to this trend. Volumes of e-waste have grown exponentially over the last two decades. This growth has been fuelled by rapid technological change that has quickly rendered electrical and electronic items outdated and obsolete. These shorter lifecycles of products have contributed immensely to the fast-growing mountain of toxic e-waste that is polluting the planet and damaging the health of humans, animals, ecosystems and water sources.

Electrical and electronic waste describes discarded electrical or electronic devices. E-waste is a broad category that covers all sorts of electronics, many of which are commonly found in the workplace and includes six categories namely: Temperature Exchange Equipment, Screens and Monitors, Lamps and Fluorescent Equipment, Small equipment such as Vacuum cleaners, microwaves, Large Equipment such as Printers, Washing machines and Small IT and Telecommunications Equipment. The rapid expansion of technology and the consumer-driven society result in creating a tremendous amount of e-waste every minute. As the number of connected devices continues to grow, so does the problem of e-waste, particularly with a tech-hungry population that regularly upgrade to the next generation device.

In 2017, an estimated 7.1 kg of e-waste was produced per person in South Africa. Most WEEE is stored at national and provincial government as well as in the business sector with only 10 % recycled in 2017. Furthermore, the Government estimates that approximately 360,000 tons of e-waste enter South Africa annually. Thus, it is essential that efficient and effective e-waste management strategies are put in place.

The Gauteng Province is the economic powerhouse of South Africa. It is hardly surprising that, it generates the bulk of South Africa's e-waste. The Gauteng Government being fully cognisant of this trend has adopted a proactive stance to this growing and indeed an insidious challenge. The Gauteng Government's first strategic response to this alarming trend has been to draft this e-waste management strategy.

This strategy aims to provide a strategic framework for the management of e-waste in the province. The strategy seeks to guide the management of e-waste to ensure that ecologically sustainable development is promoted and waste generation is avoided or minimized by the province. Economic development and by extension, the economic development of youth and the township economy is promoted. The strategy is aligned to and takes its cue from all the waste management legislation and regulations that have been enacted to date. It ultimately aims to transition towards a circular economy in the electrical and electronic sector.

The province's strategic imperatives concerning the e-waste challenge necessitate identifying and adopting the following strategic pillars to leverage programmes to deal more effectively

and efficiently with e-waste. Thus, the Gauteng Province's strategy pillars for e-waste management based on the strategic imperatives identified are:

- i. minimisation of environmental degradation;
- ii. stimulation of economic development and job creation;
- iii. enhancing communication, public participation and public education;
- iv. establishing partnerships; and
- v. improving governance and the regulatory environment.

These pillars are composed of objectives that have actions aligned with them. These actions are then linked to key performance indicators that will assist with identifying performance standards required to impact the e-waste challenge. These key performance indicators are further supported by aligned targets and time frames, which helped to constitute a holistic program of action that guides this strategic and operational implementation strategy. The strategy also spells out the monitoring and implementation responsibilities of all relevant parties. Therefore, it is anticipated that this strategy will form the basis for the Gauteng Province's response to the e-waste challenge.

## Table of Contents

1.	Introduction .....	1
1.1	Background .....	1
1.2	The situation in Gauteng .....	1
1.3	Purpose of the strategy .....	2
2.	Situational Analysis .....	3
2.1	E-waste management landscape .....	3
2.1.1	Collection .....	4
2.1.2	Refurbishment .....	4
2.1.3	Recycling .....	6
2.2	Legislative and regulatory environment .....	6
2.2.1	The Constitution of South Africa, 1996 .....	6
2.2.2	National Environment Management Act (No. 107 of 1998) .....	6
2.2.3	National Environment Management: Waste Act (No. 59 of 2008) .....	7
2.2.4	National Environmental Management: Waste Act (No. 59 of 2008): Regulations regarding extended producer responsibility .....	7
2.2.5	National Environmental Management: Waste Act (No. 59 of 2008): Extended producer responsibility scheme for the electrical and electronic equipment sector .....	7
2.2.6	National Environmental Management: Waste Act (No. 59 of 2008): Extended producer responsibility scheme for the lighting sector .....	7
2.2.7	The National Environment Management: Air Quality Act ( Act 39 of 2004) .....	7
2.2.8	National Water Act (Act 36 of 1998) .....	7
2.2.9	The Environment Conservation Act (No. 20 of 1993) .....	8
2.2.10	Hazardous Substances Act (No. 15 of 1973) .....	8
2.2.11	Occupational Health and Safety Act (OHSA) (No. 85 of 1993) .....	8
2.2.12	Second-Hand Goods Act (No. 6 of 2009) .....	8
2.2.13	Precious Metals Act (No. 37 of 2005) .....	8
2.2.14	Basel Convention .....	9
2.3	PESTEL Analysis .....	9
2.3.1	Political .....	9
2.3.2	Economic .....	9

2.3.3	Social.....	10
2.3.4	Technological.....	10
2.3.5	Environmental.....	11
2.3.6	Legislative.....	11
2.4	SWOT Analysis.....	11
3.	Strategic Approach .....	13
3.1	Minimisation of environmental degradation .....	13
3.2	Stimulation of economic development and job creation.....	14
3.2.1	Skills Development.....	14
3.2.2	Establishment of Special Economic Zones .....	14
3.3	Enhancing communication, public participation and public education .....	15
3.4	Establishing partnerships.....	15
3.4.1	Electronic and Electrical Manufacturing Sector .....	17
3.4.2	E-Waste Management Sector.....	17
3.4.3	Informal sector .....	17
3.4.4	Government sector .....	17
3.5	Improving governance and the regulatory environment .....	18
4.	Responsibilities.....	20
4.1	Provincial Government .....	20
4.2	The Department of e-Government .....	20
4.3	Local Government.....	20
4.4	Private Sector .....	20
4.5	Informal Sector.....	21
4.6	Civil Society.....	21
5.	Implementation Plan.....	23
5.1	Short-term goals .....	23
5.1.1	Internal provincial e-waste management strategy.....	23
5.1.2	Skills development programmes.....	23
5.1.3	E-waste application .....	24
5.1.4	Public advocacy programmes .....	24
5.2	Medium and Long-Term Goals.....	24

6. Monitoring and Evaluation .....	30
7. References .....	31

## Abbreviations

ABBREVIATION	DESCRIPTION
APU	Accelerated Processing Unit
CBO	Community Based Organisation
COGTA	Cooperative Governance and Traditional Affairs
CPU	Central Processing Unit
DED	Department of Economic Development
DEFF	Department of Environment, Forestry and Fisheries
DFFE	Department of Forestry, Fisheries and the Environment
DRAM	Dynamic random-access memory
ECA	Environmental Conservation Act
EEE	Electrical and Electronic Equipment
EPR	Extended Producer Responsibility
EWASA	e-Waste Association of South Africa
GCR	Gauteng City Region
GDeGov	Gauteng Departments of e-Government
GPG	Gauteng Provincial Government
GWM&E	Government Wide Monitoring & Evaluation System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GPU	Graphics Processing Unit
ICT	Information and Communication Technology
IndWMPS	Industry Waste Management Implementation Plan
IWMP	Intergraded Waste Management Plan
LED	Light Emitting Diode
LCD	Liquid Crystal Display
MEC	Member of Executive Committee
NCPC	National Cleaner Production Centre
NEMA	National Environmental Management Act
NGO	Non-Governmental Organization
NWMS	National Waste Management Strategy
OHSA	Occupational Health and Safety Act
OoP	Office of the Premier
RDI	Real Disposable Income
SALGA	South African Local Government
SAWIS	South African Waste Information System
SAWPA	South African Waste Pickers Association
SITA	State Information Technology Agency
SMME	Small, Medium and Micro-sized Enterprises
SoWA	State of Waste Report
SRAM	Static random-access memory
TV	Television
TIA	Technology Innovation Agency



UEEE	Used Electrical and Electronic Equipment
UJ	University of Johannesburg
UN	United Nations
UNEP	United Nations Environment Programme
USA	United States of America
VUT	Vaal University of Technology
WEEE	Waste Electrical and Electronic Equipment

# 1. Introduction

## 1.1 Background

Electrical and Electronic Equipment (EEE) is defined as any “item with circuitry or electrical components with power or battery supplies” (StEP, 2014). This includes a broad range of goods including computers, televisions, fridges, medical equipment and cellphones to name a few. Waste electrical and electronic equipment (WEEE), or e-waste refers to EEE that has been discarded with no intention for reuse (StEP, 2014).

E-waste, is one of the fastest growing waste streams globally (Kumar, Holuszko and Espinosa, 2017). According to The Global E-Waste Monitor 2020, 53.6 million tons of e-waste was generated globally in 2019, and it is expected to grow to 74.7 million tons by 2030 (Forti *et al.*, 2020). The exponential growth in Electrical and Electronic Equipment (EEE) has been influenced by rapid technological innovations compounded by short product lifetimes which rapidly render “new” technology outdated obsolete (Kumar, Holuszko and Espinosa, 2017). The shorter lifecycles of these products have contributed immensely to the fast-growing mountain of toxic e-waste that is polluting the planet and damaging the health of humans, animals, natural ecosystems and water sources.

E-waste contains a number of valuable fractions including steel, aluminium, plastics, glass and phosphor powders as well as precious metals such as gold, platinum and palladium. The composition and concentration of these materials vary according to the product, for example, printed circuit boards are associated with varying gold compositions according to their use (Cucchiella *et al.*, 2015). E-waste also contains some hazardous materials which are toxic to both humans and the ecosystem. These materials include various combinations of organic and inorganic substances such as heavy metals, polycyclic hydrocarbons, polychlorinated biphenyls, brominated flame retardants, gold, silver, and palladium.

## 1.2 The Situation in Gauteng

The Gauteng Province, as the hub of the South African economy, has like other countries, encountered increasing volumes of e-waste which require a sustainable e-waste management solution. Currently, there is no coherent provincial response to address the challenges that e-Waste poses to the environment. All provincial government departments and entities produce e-Waste and while some have mechanisms in place to discard, recycle or donate their e-Waste products, there is not uniform and coordinated response that benefits the environment but also supports the intentions of the province related to ICT economy stimulation and job creation.

To address the challenges of poorly coordinated e-Waste Management in the province, the Gauteng Department of e-Government will, through the implementation of this e-Waste Management Strategy, put measures in place to ensure that the growing amounts of e-waste is

disposed of, recycled or re-purposed to ensure a clean, healthy and safe environment, but also stimulate the economy through SMME support and job creation.

### **1.3 Purpose of the Strategy**

The purpose of the strategy is to analyse the provincial e-waste situation and prescribe ways to address and manage the challenges faced by the province. The strategy seeks to ensure that ecologically sustainable development is promoted and waste generation is efficiently managed to reduce e-waste by adopting the e-waste hierarchy of the 9Rs *viz* refuse, rethink, reduce, reuse, repair, refurbish, remanufacture, repurpose and recycle. Through the implementation of the strategy the economic development of youth and the township economy will be promoted.

The strategy recognises e-waste as a resource to promote sustainable, environmentally sound, cost-effective, economically prudent practices through an integrated system of waste reduction, repair, refurbishment and recycling. Innovative technology and a people centred approach will be employed to curb environmental degradation and promote inclusive economic development which would result in economic growth, job creation, building a sustainable future for Gauteng citizens, and creation of an environment that is safe and secure for all.

The values that will underpin the implementation of the strategy are:

- innovation,
- integrity
- public education
- efficiency
- resourcefulness and
- partnership.

Effective e-waste management presents opportunities to various sectors and business enterprises, including green job creation, recovery of valuable materials and environmental protection. The job opportunities available are for collectors, separators, researchers, and entrepreneurs, amongst others. Their contribution in the sector will benefit government, the private sector (manufacturers, distributors/importers), and civil society (refurbishment centres, collectors, recyclers).

These opportunities enable the Strategy to serve as a catalyst for unlocking job opportunities for young people, women and people with disabilities, among others. These job opportunities will be unlocked through skilling and reskilling programmes aimed at keeping the human capital relevant in this component of the rapidly changing ICT sector.

## 2. Situational Analysis

In order to develop a targeted and effective strategy it is important to understand the status quo. Thus, a situational analysis was conducted of the current e-waste management landscape in Gauteng and South Africa at large. This included a review of the legislative and regulatory landscape as well as current challenges, barriers and opportunities faced by value chain actors.

### 2.1 E-waste management landscape

Over the past two decades, research has been conducted into the generation of e-waste in South Africa however, there remains significant uncertainty surrounding the quantities due to inadequate accounting (Finlay, 2005; DEA, 2012; Lydall, Nyanjowa and James, 2017). As part of the draft Industrial Waste Management Plan, the E-Waste Recycling Authority estimated that 360 000 tons of e-waste was generated in 2018 (ERA, 2018). Based on this estimate, the Global E-Waste Monitor estimated a per capita e-waste generation rate of 7.1 kg in 2019 (Forti *et al.*, 2020). The uncertainty surrounding e-waste generation also extends to the quantifying the fate of e-waste. In 2015, an estimated 23.6 % of e-waste was recycled, based on a survey of 27 firms (Lydall, Nyanjowa and James, 2017). However, in 2017, a recycling rate of 9.7 % was reported in the State of Waste Report (DEA, 2018).

In South Africa, there are a number of management options for e-waste; it can either be landfilled, repaired, refurbished or recycled. The fate of e-waste is dependent on a variety of factors including its condition and perceived value. Stockpiling has also been identified as a common practice by households and institutions including government departments (Finlay and Liechti, 2008; Bob *et al.*, 2017), with an estimated 86.4 % of e-waste generated in 2017 reported as stockpiled (DEA, 2018). According to Lydall, Nyanjowa and James (2017), national and provincial government departments are the largest source of e-waste accounting for 45 % of flows in 2015, followed by business (35 %) and households (20 %).

The flows of e-waste within the e-waste value chain is complex with e-waste changing hands dependent on its value and composition (Figure 1). Furthermore, the heterogeneity (approximately 69 elements from the periodic table can be included in an EEE) of the materials contained in electronic goods results in a value chain that feeds into many downstream industries including the scrap metal industry, plastic recycling and refineries.

**There are a number of actors in the e-waste value chain as shown in**

Table 1. The primary difference between “small” and “large” recyclers is their processing capacity; large recyclers have the technology for mechanical size reduction and separation of components from dismantling.

**Table 1: E-waste value chain actors**

<b>Value Chain Actor</b>	<b>Description</b>
Collector	Recover e-waste for diversion from landfill
Refurbisher	Specialise in the refurbishment of goods
Small recycler	Specialise in the dismantling and sorting of e-waste Tend to handle smaller waste volumes
Large recycler	Have the technology for mechanical size reduction and separation of value fractions
Processor	Recover secondary resources for use in secondary markets e.g. smelters and refiners, plastic recyclers
Exporter	Specialises in the export of value fractions for further processing

### **2.1.1 Collection**

As shown in Figure 1, e-waste is recovered from a wide variety of sources including from businesses and institutions, via take-back schemes and drop off points and imports (discussed further in section **Error! Reference source not found.**). E-waste is also diverted from landfill by informal collectors who off sell to buy-back centres, small recyclers or scrap metal dealers. Buy-back centres consolidate e-waste for sale to e-waste recyclers. Some recyclers – small and large – also participate directly in collection via drop-off centres or sourcing directly from businesses, institutions and auctions (Lydall, Nyanjowa and James, 2017; Snyman, Vorster and Jacobs, 2017; Sadan, 2019).

### **2.1.2 Refurbishment**

Refurbishment refers to the restoration of a product to its original function and bring it up to date. This may include repair of hardware or software upgrades. Refurbished goods are sold on the second-hand market or donated to non-profit organisations and/or disadvantaged communities (Finlay and Liechti, 2008). The most commonly refurbished goods are personal computers, with many refurbishers importing second-hand machines to meet demand (Anahide, 2007; Finlay and Liechti, 2008; Snyman, Vorster and Jacobs, 2017). Finlay and Liechti (2008) estimated that 20 000 – 100 000 units of PCs were imported into South Africa annually by refurbishers, whilst approximately 60 000 mobile phones were imported monthly.

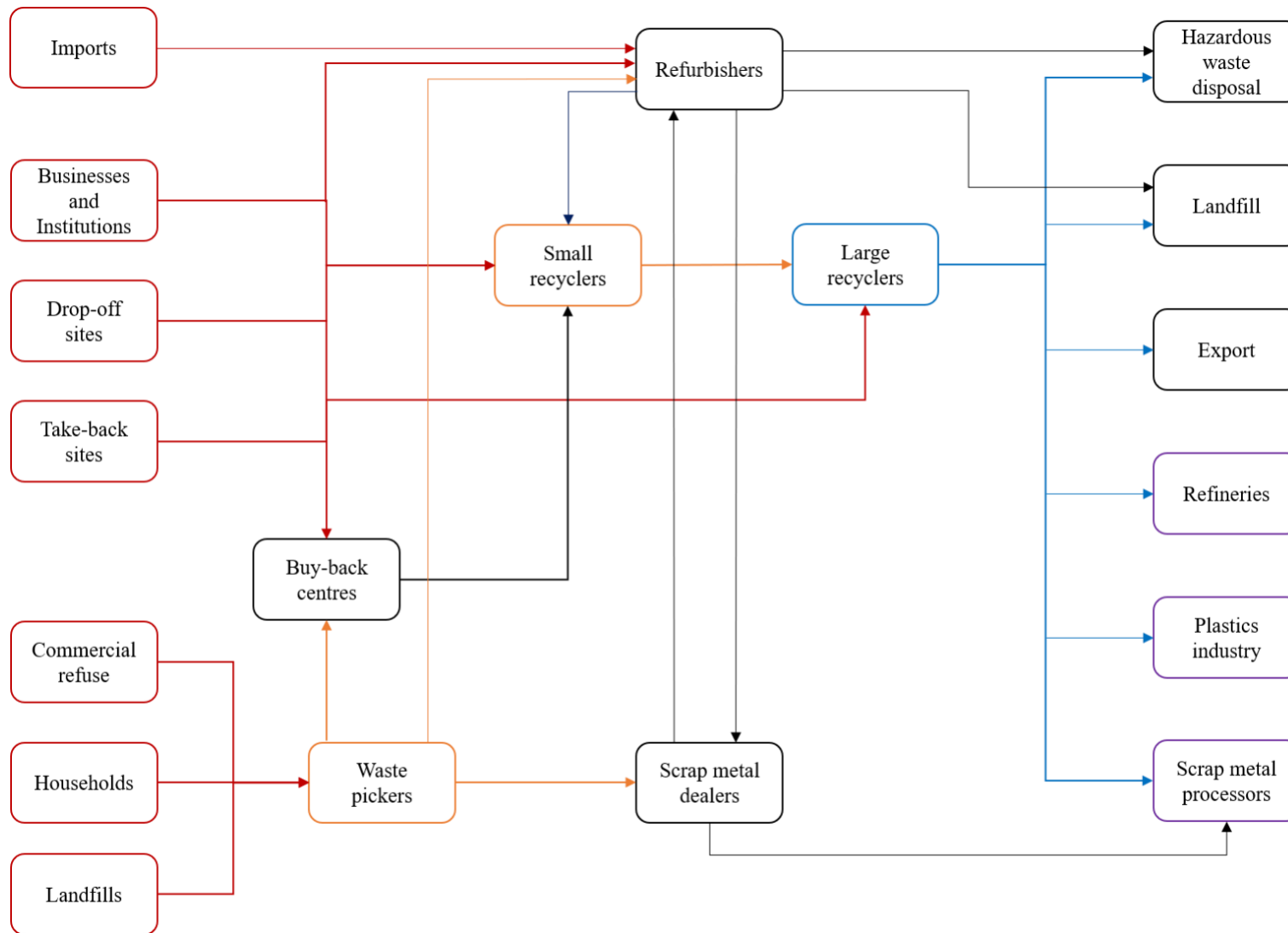


Figure 1: South African e-waste value chain adapted from (Anahide, 2007; Finlay and Liechti, 2008; Lydall, Nyanjowa and James, 2017; Snyman, Vorster and Jacobs, 2017; Sadan, 2019)

### **2.1.3 Recycling**

The e-waste recycling process can be split into four general steps:

- Collection
- Sorting and dismantling
- Pre-processing
- Processing

As described in section 0, e-waste is collected via an array of channels. Following collection, e-waste designated for recycling is dismantled and sorted. The purpose of dismantling is to separate the different components for further processing to recover the value fractions. In addition, dismantled and sorted fractions command a higher price in comparison to whole goods (Snyman, Vorster and Jacobs, 2017). In South Africa, dismantling and sorting is conducted manually. It does not have a high skills requirement with in-house training often provided by employers. It is predominantly conducted by small recyclers and informal collectors who want to maximise on the increased value. Dismantling is also conducted by large recyclers who participate in collection.

The dismantled goods are sold to “large recyclers” for pre-processing. Pre-processing takes place in two steps: firstly, the mechanical size reduction of e-waste with the aim of liberating different materials. The product of this is a mix of materials with different chemical and physical properties. These materials are then separated using physical processes to recover desired value fractions.

## **2.2 Legislative and Regulatory Environment**

The management of e-waste is subject to the legislative and policy environment of the country. Thus, the strategy must take into consideration all relevant laws, policies and regulations and ensure compliance.

### **2.2.1 The Constitution of South Africa, 1996**

The Constitution of South Africa is the supreme law of the country and all legislation and policy is subject to it. Section 24(a) of the Constitution stipulates that “Everyone has the right to an environment that is not harmful to their health or well-being”. This fundamental right underpins environmental policy and law, particularly the framework for environmental legislation established by the National Environmental Management Act (NEMA), (No. 107 of 1998).

### **2.2.2 National Environment Management Act (No. 107 of 1998)**

This Act is the principal framework for environmental protection in accordance with Section 24 of the constitution. It is from this Act that many policies and acts concerned with environmental conservation and subsequently waste management are promulgated.



### **2.2.3 National Environment Management: Waste Act (No. 59 of 2008)**

This Act regulates waste management for the protection of human health and the environment. It regulates all waste management related activities (i.e. collection, storage, treatment and disposal) including stipulation of licencing requirements for waste management activities. Thus, all e-waste management activities are subject to this act.

### **2.2.4 National Environmental Management: Waste Act (No. 59 of 2008): Regulations regarding Extended Producer Responsibility**

These Regulations aim to promote the transition towards a circular economy through the use of extended producer responsibility (EPR) as a policy instrument to ensure the effective and efficient management of identified waste products. They provide a framework for the development and implementation of EPR schemes by producers.

### **2.2.5 National Environmental Management: Waste Act (No. 59 of 2008): Extended Producer Responsibility Scheme for the Electrical and Electronic Equipment Sector**

WEEE has been identified as a priority stream for EPR Regulation. This Notice specifies collection and recycling targets for e-waste products, for the next five years. This Notice must be read in conjunction with the EPR Regulations described above. Whilst batteries are included in this Notice, a separate Notice was published for lighting equipment.

### **2.2.6 National Environmental Management: Waste Act (No. 59 of 2008): Extended producer responsibility scheme for the lighting sector**

This Notice specifies collection and recycling targets for lighting equipment for the next five years. It must be read in conjunction with the EPR Regulations described above.

### **2.2.7 The National Environment Management: Air Quality Act (Act 39 of 2004)**

The National Environment Management: Air Quality Act 39 of 2004 intends to reform the law regulating air quality to protect the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development while promoting justifiable economic and social development. The act provides national norms and standards regulating air quality monitoring, command and control by all government spheres for particular air quality measures; and matters incidental to it.

### **2.2.8 National Water Act (Act 36 of 1998)**

The purpose of this Act is to ensure that the nations and water resources are protected, used, developed, conserved, managed and controlled in ways which consider amongst other factors:

- Meeting the basic human needs of the present and in future generations;
- Promoting equitable access to water;
- Redressing the results of past racial and gender discrimination;

- Promoting the efficient, sustainable and beneficial use of water in the public interest
- Facilitating social and economic development
- Protecting aquatic and associated ecosystems and their biological diversity:
- Reducing and preventing pollution and degradation of water resources:
- Meeting international obligations

### **2.2.9 The Environment Conservation Act (No. 20 of 1993)**

This Act authorizes the central government to protect and improve environmental quality, control and reduce pollution from all sources, and prohibit or restrict the setting and/or operation of any industrial facility on ecological grounds. It also empowers the central government, to establish authorities charged with the mandate of preventing environmental pollution in all its forms and, to tackle environmental problems that are peculiar, to different parts of the country.

### **2.2.10 Hazardous Substances Act (No. 15 of 1973)**

This Act provides for the control of substances which may cause injury, ill health or death to human beings, because of their toxic, corrosive, irritant or explosive nature. The Act also provides for the substances to be divided or classified, concerning the degree of the danger they pose. In addition to this, the Act also provides for the prohibition and the control of the importation, manufacture, sale, use, operation, application, modification, disposal and dumping of hazardous substances.

E-waste is currently categorized as hazardous waste due to the presence of hazardous components including lead, mercury and radioactive elements. Upon the removal of hazardous components, the e-waste can then be categorized as general waste.

### **2.2.11 Occupational Health and Safety Act (OHSA) (No. 85 of 1993)**

The OHSA Act is primarily designed to provide a broad framework for improving workplace health and safety standards by reducing work-related injury and illness. It endeavours to do this by securing employees' health, safety, and welfare, protecting people from health and safety risks of business activities and involving employers, employees, and the organisations that represent them, in the formulation and implementation of health, safety, and welfare standards.

### **2.2.12 Second-Hand Goods Act (No. 6 of 2009)**

This Act regulates the buying and selling of second-hand goods with the aim of reducing incidents of theft and promoting ethical practices within the sector.

### **2.2.13 Precious Metals Act (No. 37 of 2005)**

This Act regulates the extraction, refining and trade in precious metals such as gold, platinum and palladium.

#### **2.2.14 Basel Convention**

The Basel Convention is an international treaty on the “Control of Transboundary Movements of Hazardous Wastes and their Disposal”. Its main objective is the protection of human health and the environment from the potential impacts associated with the disposal and treatment of hazardous. It also regulates the movement of hazardous waste with a focus on preventing the dumping of hazardous waste in developing countries from developed countries. The sustainable management of e-waste is a focus area of the Basel Convention with the adoption of the “Nairobi declaration on the environmentally sound management of electrical and electronic waste” in 2006 (Basel Convention, 2006). South Africa is a signatory to the Basel Convention and is thus subject to the regulations of the agreement.

### **2.3 PESTEL Analysis**

To understand the various internal and external factors at play in the e-waste industry, a PESTEL analysis was conducted. This entailed an analysis of the various Political, Economic, Social, Technological, Environmental and Legislative factors influencing decision-making within the industry.

#### **2.3.1 Political**

E-waste has been identified as a priority waste stream by the South African government, with the NWMS identifying the increase of recovery and recycling rates as a key objective for waste minimisation (DEFF, 2020). In furtherance of this, the electronic and electrical sector was identified for the implementation of EPR (discussed in sections 2.2.4 and 2.2.5). The regulations aim to increase circularity within the sector, specifying targets for collection and recycling.

As mentioned in section 2.1, the government is a major contributor to e-waste generation. However, there are inconsistencies in the management of e-waste across departments, municipalities and provinces. A nationwide survey of e-waste management conducted by Bob et al. (2017) identified up to 10 e-waste management practices including auctioning, donating or disposal with general waste. In addition, 62.6 % of participants indicated that their departments stored e-waste in storerooms or offices, indicating that stockpiling is a prevalent practice (Bob *et al.*, 2017). Thus, unlocking of government stockpiles has the potential to free up significant volumes of e-waste for treatment.

#### **2.3.2 Economic**

Previous studies have suggested that there is a high demand for second-hand goods particularly in the ICT sector (Finlay and Liechti, 2008; Snyman, Vorster and Jacobs, 2017) The COVID-19 pandemic has highlighted the need for easily accessible and affordable ICT equipment with many educational institutions turning to remote, online based learning. Thus, investment in repair and refurbishment activities present an opportunity to not only increase circularity within the ICT industry but, also meet the needs of communities in need of affordable equipment.

Furthermore, in comparison to recycling, refurbishment reportedly has higher profit margins (Manjengwa, 2019).

The e-waste industry presents various opportunities for job creation across different skill levels, with an estimated job factor of 30 jobs per tonne of e-waste (GreenCape, 2017). Dismantling and sorting is a labour-intensive process but employees do not necessarily require formal training or education; in-house training or on the job training is commonly provided to employees (Snyman, Vorster and Jacobs, 2017). However some form of training is needed to prevent unsustainable dismantling practices from happening and thereby polluting the environment.

Sufficient infrastructure for the efficient and effective collection and recovery of e-waste remains a constraint in the industry (Snyman, Vorster and Jacobs, 2017). Furthermore, the practice of stockpiling across governments, institutions and households renders e-waste inaccessible (Finlay and Liechti, 2008; Bob *et al.*, 2017; Manjengwa, 2019; Sadan, 2019). This is a particular concern for the development of large-scale processing capacity as insufficient and inconsistent volumes are a barrier to achieving economies of scale (Lydall, Nyanjowa and James, 2017; Manjengwa, 2019; Sadan, 2019).

### **2.3.3 Social**

The informal sector plays a vital role in the recovery of recyclables and diversion from landfill (Lydall, Nyanjowa and James, 2017). Whilst participation provides a pathway to socio-economic empowerment, they are vulnerable to exploitation (Finlay and Liechti, 2008; Manjengwa, 2019). Furthermore, informal sector participants are potentially exposed to many health and safety hazards. As mentioned in section 2.1.3, dismantled goods command a higher price. Thus, some informal collectors engage in dismantling and sorting in the hopes of greater returns. However, in the absence of proper training and facilities dismantlers are potentially exposed to hazardous materials present in the component. Furthermore, some informal sector participants engage in metal recovery setting up so called “backyard operations”, including burning of cables and acid leaching of PCBs (Widmer and Lombard, 2005; Finlay and Liechti, 2008; Manjengwa, 2019; Sadan, 2019).

### **2.3.4 Technological**

Technological capacity for e-waste processing is a major constraint in South Africa. Currently, there are only two local end-processors: Rand Refinery and SA Precious Metals. Furthermore, there are no facilities dedicated to the processing of PCBs. The limited capacity may in part be attributed to low and irregular e-waste flows which makes it difficult to achieve economies of scale (Manjengwa, 2019; Lydall, Nyanjowa and James, 2017; Sadan, 2019). In addition, the high cost of investment associated with setting up processing facilities presents a high barrier for entry (Manjengwa, 2019).

An additional consideration to keep in mind is the potential for decreasing concentrations of precious metals as technology advances. This may lead to more complex processing requirements with lower profit margins (Manjengwa, 2019).

### 2.3.5 Environmental

WEEE contains hazardous components which present a risk to the environment if improperly disposed. This includes substances such as mercury, flame retardants and chlorofluorocarbons. The proliferation of backyard processing operations (e.g. burning of cables, acid leaching of PCBs and fridge degassing) increases the likelihood of uncontrolled release of harmful substances due to a lack of health and safety protocols.

### 2.3.6 Legislative

As detailed in section 2.2, e-waste management is subject to a number of legislative and regulatory instruments. These requirements for e-waste handling may be viewed as onerous by value chain actors. As such, they present a potential barrier for entry due to the resources (e.g. time and financial costs) required for compliance (Manjengwa, 2019; Sadan, 2019).

## 2.4 SWOT Analysis

To examine the factors that influence the e-waste landscape a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis was conducted. The SWOT framework allows for the consideration of favourable and unfavourable, internal and external factors (Table 2). The results of the SWOT analysis are presented in Table 3.

**Table 2: SWOT Analysis Framework**

	<b>Helpful</b> to achieve the objectives	<b>Harmful</b> to achieve the objectives
<b>Internal Origin</b> (Attributes of the Organisation)	<b>Strengths</b>	<b>Weaknesses</b>
<b>External Origin</b> (Attributes of the external environment)	<b>Opportunities</b>	<b>Threats</b>

**Table 3: SWOT Analysis of Gauteng e-waste landscape**

<b>Strengths</b>	<b>Weaknesses</b>
<ul style="list-style-type: none"> <li>● Relatively well-resourced province</li> <li>● Relatively well-developed infrastructure</li> <li>● The relatively highly developed skills base</li> <li>● Relatively high knowledge of technology usage</li> <li>● Relatively strong economy</li> <li>● National hub of e-waste handling and processing</li> </ul>	<ul style="list-style-type: none"> <li>● Uncertainty surrounding e-waste generation rates</li> <li>● Stockpiling</li> <li>● WEEE recycling non-profitable for SMEs</li> <li>● Long value chain with many intermediaries</li> </ul>
<b>Opportunities</b>	<b>Threats</b>
<ul style="list-style-type: none"> <li>● Government is a major e-waste generator</li> <li>● Presence of Higher Education Institutions for skills development</li> <li>● High demand for second-hand goods</li> <li>● Repair and refurbishment associated with relatively high profit margins</li> <li>● Low barrier of entry for collection, dismantling and sorting</li> <li>● Local pre-processors have capacity to immediately absorb higher volumes of WEEE as they are operating below capacity</li> <li>● Processors, Rand refinery and SA Precious metals both in Gauteng</li> <li>● Job creation across different skill levels</li> <li>● Well established scrap metal industry</li> <li>● Extended Producer Responsibility Regulations to be implemented in May 2021</li> </ul>	<ul style="list-style-type: none"> <li>● Lack of consumer awareness</li> <li>● Environmental degradation</li> <li>● No dedicated e-waste legislation</li> <li>● Onerous legislative requirements (licencing and registration)</li> <li>● Informal sector vulnerable to exploitation</li> <li>● Informal sector exposed to health and safety hazards</li> <li>● Proliferation of unsafe and illegal backyard operations</li> <li>● Insufficient infrastructure for e-waste collection and recovery</li> <li>● Unknown volumes and characteristics of e-waste</li> <li>● Economies of scale – current volumes cannot support large scale processing</li> <li>● High barrier to entry for pre-processing and processing due to high investment costs</li> <li>● No facilities dedicated to processing of printed circuit boards</li> <li>● Decrease in concentration of precious metals as technology advances</li> <li>● Export revenues significantly exceed domestic revenues</li> </ul>

### 3. Strategic Approach

The strategic imperatives faced by the province in relation to the e-waste challenge, necessitate the identification and adoption of strategic pillars to leverage programmes to deal more effectively and efficiently with e-waste management. Thus, the Gauteng Province’s strategic approach to promote the Growing Gauteng Together 2030 Action Plan priorities evolve around the following five pillars for e-waste management:

- i. Minimisation of environmental degradation;
- ii. Stimulation of economic development and job creation;
- iii. Enhancing communication, public participation and public education;
- iv. Establishing partnerships; and
- v. Improving governance and the regulatory environmental.

#### 3.1 Minimisation of Environmental Degradation

The waste hierarchy presents a generic approach to waste management which aims to minimise environmental degradation. It is based on the 3 Rs (reduce, reuse, recycle). These can be expanded to 9 Rs as illustrated in **Error! Reference source not found..** Implementing the waste management hierarchy requires a shift in consciousness, attitudes and behaviour for businesses, organisations and households. It also requires the eventual development of a provincial wide infrastructure to enable a transition towards the higher end of the waste hierarchy and thereby a circular economy.

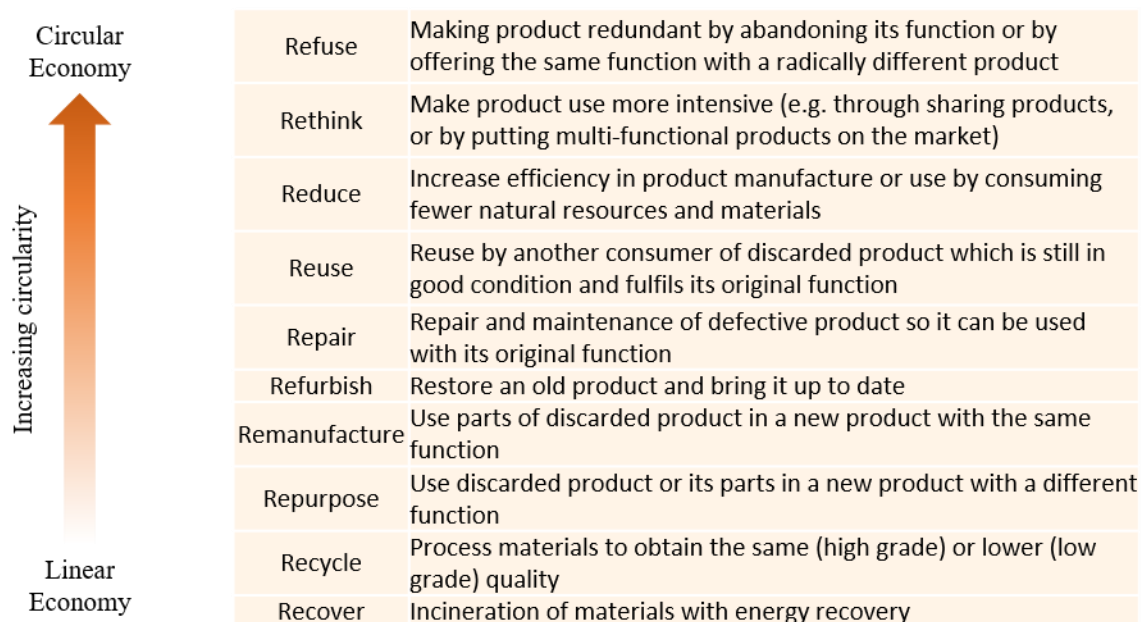


Figure 2: The 9R Framework adapted from (Potting *et al.*, 2017)

The e-waste strategy aims to promote a shift up the waste hierarchy through the promotion of reduction in waste generation, reuse, repair and refurbishment. Equipment leasing is a potential

avenue to reduce the generation of waste. Once EEE has reached its perceived lifetime, the lessor replaces the equipment ensuring the lessee remains abreast of the newest technologies whilst the old equipment can be diverted to other uses. Thus, the Gauteng Provincial Government will investigate and trial leasing in its departments.

Following “reduce”, “reuse” is the next desirable management option for WEEE. Thus, programmes will be initiated to encourage reuse of equipment within the provincial government. Old and broken machines may be donated to NPOs for repair and refurbishment. In addition, they may be donated for use in training programmes to develop skills in repair and refurbishment.

The e-waste management strategy will also promote recycling as an alternative to landfill. However, it will only be recommended in cases where reuse, repair and refurbishment are not an appropriate treatment method for the e-waste in question.

### **3.2 Stimulation of Economic Development and Job Creation**

The national government has identified the waste economy as a vehicle for job creation and economic development. In this regard, e-waste has been identified as a priority stream for the realisation of these aspirations.

#### **3.2.1 Skills Development**

To achieve this outcome, the Department will implement the Gauteng ICT Skills Development Strategy to provide training to youth and government employees. This will ensure that Township-based ICT entrepreneurs are supported, and that staff are fully capable to utilize the existing technology more efficiently and effectively to provide government services to Gauteng citizens. This will be done in collaboration with ICT partners and Higher Education Institutions. The inclusive digital economy can contribute to job creation, along with more safety and security, education and skills transfer, secondary manufacturing (production) and innovation.

Old and broken machine/laptops can be donated to township organisations that teach computer literacy as well as a usage to start repair and refurbishing business. Such organisations will best use older equipment to teach youth on repairing and upgrading these gadgets thereby helping to manage electronic equipment and minimise environmental degradation associated with disposal. Self-sustaining jobs will be created for the local youth through the e-waste projects.

#### **3.2.2 Establishment of Special Economic Zones**

Special Economic Zones (SEZs) are “geographically designated areas of a country set aside for specifically targeted economic activities, which are then supported through special arrangements (which may include laws) and support systems to promote industrial development”. The establishment of SEZs is another mode to advance government's strategic policy of Transformation, Modernization and Reindustrialisation whereby divergent jobs and



entrepreneurial opportunities will be created for young people, women, and people with disabilities. The programme will immensely contribute towards making Gauteng the economic hub of the country by attracting both domestic and foreign direct investment.

The Develand landfill has been identified as SEZ for piloting and the other SEZs will be progressively identified. The landfills have great potential for economic growth. There are entrepreneurs who manage their informal business at the landfills and some have employed several employees, however, they need proper infrastructure to manage their business transactions and need additional skills to conduct their enterprise in an organised manner.

To advance the implementation of the SEZ programme a clear and well-coordinated programme focusing on e-waste will be developed. The programme will be inclusive of both governance and funding conditions. The SEZ programme requires a new approach to provide comprehensive, coherent capacity, skills development programme, sustainable infrastructure development, integrated logistics systems, embracing of new technology, research, developmental measures to promote innovation and protection of the environment.

### **3.3 Enhancing Communication, Public Participation and Public Education**

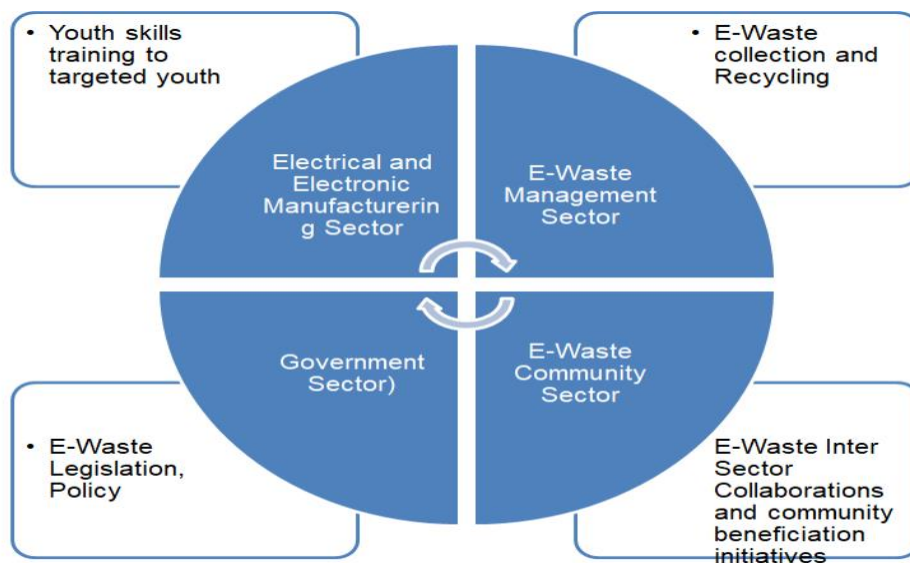
Enhancing communication, public participation and public education is integral to increase responsible e-waste management. Thus, the Gauteng Provincial Government will introduce and coordinate a long-term advocacy campaign on e-waste management, to be implemented sustainably and incrementally to achieve widespread behavioural changes. This will be achieved via partnerships with private, public and other sectors to develop a coordinated e-waste management awareness campaign that will spread a common message.

### **3.4 Establishing Partnerships**

Implementing the waste management hierarchy and achieving the Waste Act's objectives will require coordinated action by many players, including households, businesses, community organisations, NGOs, parastatals and the three spheres of government. This means that a consultative and partnership-based approach is essential for realising the NWMS; government action alone cannot be effective. Municipalities and local stakeholders must play an active role in establishing such partnerships and participatory community projects. Therefore, the government is committed to following a co-regulatory and consensual approach that brings different actors on board and allows for local initiative and creativity.

Creating strategic partnerships in the e-waste value chain, from industrial electronics manufacturers, e-waste recyclers, to waste management companies and households, can provide a much-needed stimulus to the South African economy. To unlock the economic potential of e-waste, South Africa needs to make use of existing collaborations in the e-waste sector. The department of e-GOV needs to play a catalytic role in coordinating and consolidating partnerships in the e-waste industry in and around the province of Gauteng.

The Gauteng e-waste partnership model is depicted in figure 5 below:



**Figure 3 Gauteng e-waste partnership model.**

Private Service Providers play critical roles in all management stages, including waste service delivery and recycling. An expansion of waste services to un-served communities will require Municipalities in the province to explore alternative service delivery mechanisms, including public, private partnerships. The private sector is encouraged to make universal service provision a reality and grow the green economy. The private sector should also respond creatively to new technologies in waste processing and treatment, and establish capacity in these areas as technologies become commercially viable.

Civil society consumers and households play an essential role in the generation of waste from the products they consume. End-users need to reduce, re-use and recycle waste wherever feasible, and dispose of this waste responsibly. They should be aware of the environmental impact of the products they buy and pass on a sense of ecological responsibility to families and colleagues. NGOs, non-profit organizations, community-based organizations, cooperatives and trade unions also play essential roles in all phases of the waste management hierarchy, Strategy. Civil society formations are encouraged to participate in the development and implementation of the Gauteng e-waste.

The e-waste strategic partners shall comprise the following sectors, namely:

- EEE producers as defined by the EPR Regulations including original equipment manufacturers, value added retailers and importers
- E-waste industry players including different actors along the value chain involved in e-waste handling and processing
- Informal sector players involved in the handling and processing of e-waste

### **3.4.1 Electronic and Electrical Manufacturing Sector**

Partnerships with this sector seek to mobilize the producers and distributors of electronic products, including Original Equipment Manufacturers (OEMs) as well as Value Added Retailers (VARs) to:

- Impart valuable ICT skills to the disadvantaged youth in Gauteng, particularly as a talent pipeline for computer engineering students
- Provide job opportunities to the youth on aspects as data destruction, repair, refurbishments and recycling.

### **3.4.2 E-Waste Management Sector**

Through partnerships within this sector, the aim is to bring together representatives in the e-waste handling and processing to:

- Bolster e-waste collaboration programmes and initiatives
- Monitor and evaluative critical programme within e-waste management
- Establish e-waste processing areas and recycling systems
- Identify and address barriers to entry within the industry
- Promote and implement best practices in e-waste handling and processing

### **3.4.3 Informal Sector**

Partnerships within this sector aim to recognise the important role that the informal sector plays in e-waste management. The partnerships aim to:

- Promote best practices in e-waste handling, dismantling and processing
- Decrease the proliferation of backyard operations

### **3.4.4 Government Sector**

This sector will play an essential role in establishing a strong legal framework and a user-pay finance model to fund specific e-waste programmes, including an assist in:

- Giving strategic direction to the e-waste programmes and well as guiding private sector initiatives
- Providing a platform for interaction between the various stakeholders around relevant environmental legislative and policy matters

As a first step, the various waste management measures that the Act envisages will be designed and implemented in a consultative manner. This includes monitoring the effectiveness and impact of the efforts after implementation. The Waste Act requires public consultation when developing each waste management measure, including national and provincial norms and standards, integrated waste management plans, industry waste management plans under certain circumstances, and priority waste declaration.

### **3.5 Improving Governance and the Regulatory Environment**

The Provincial Government, is the primary regulatory authority for waste activities, except for which the Minister is the authority. It must promote and ensure the NWMS and the Gauteng e-waste strategy and national norms and standards. Similar to local government, it must designate a provincial waste management officer responsible for coordinating waste management matters in the province. It must also prepare a Provincial Integrated Waste Management Plans (IWMP) and an annual performance report on its implementation, both of which must be submitted to the Minister for approval. Provinces have some discretionary powers, some of which may only be exercised in consultation with the Minister.

These powers include setting provincial norms and standards, declaring a priority waste, listing waste management activities, registering waste transporters, requesting industry waste management plans, identifying contaminated land, and establishing a local waste information system. To provide a nationally harmonised regulatory environment for waste management, the provinces will only exercise these discretionary powers where clear and compelling reasons exist, after consultation with DEFF.

To achieve the goals and objectives of the NWMS and the Gauteng e-waste strategy a tiered and consensual approach will be followed. This approach will optimally combine regulation and compliance measures with self-regulatory components, voluntary initiatives, economic incentives, and fiscal mechanisms. The approach establishes baseline regulations for the waste sector as a foundation for a co-regulatory system that relies on industry initiative and voluntary compliance. If industry response is insufficient for dealing with waste challenges or where a market failure prevails, more interventionist regulatory tools may be deployed. The approach treats the measures set out in the Waste Act as a “toolbox” of instruments that can address specific waste management challenges.

Local government must provide waste management services, including waste removal, storage and disposal services, as per Schedule 5B of the Constitution. Municipalities must provide additional bins for separation at source, and are responsible for diverting organic waste from landfill and composting it. They must facilitate local solutions such as Material Recovery Facilities and buy-back centres, rather than provide the entire recycling infrastructure. Thus, municipalities must work with industry and other stakeholders to extend recycling at the municipal level.

Municipalities must also register transporters of waste above certain thresholds on a list of waste transporters. At their discretion, municipalities may set local waste service standards for waste separation, compacting, management, and solid waste disposal, amongst others. Local standards must be aligned with any provincial and national standards where these exist.

A certain amount of self-regulation will have to prevail. Industry, organisations and households have a critically important role to play in managing their waste streams. In several examples

of successful self-regulation, businesses have managed a similar waste stream because managing waste collectively is more efficient than managing it individually. The greater the extent of responsible self-regulation, the less government needs to intervene and regulate, so the government will have to find the appointment balance between regulation and self-regulation. This frees up scarce government resources for more constructive initiatives.

## **4. Responsibilities**

### **4.1 Provincial Government**

In terms of the Waste Act, Provincial MECs are responsible for developing IWMPs. This was only imperfectly achieved during the implementation of the 2011 NWMS and will focus on the implementation of the 2020 NWMS. Primary functions that provincial waste management plans should perform include:

- The DFFE, through SAWIS, will support the provincial government by providing guidelines for the monitoring, reporting and evaluation of IWMPs;
- Planning and guiding public and private investment in regional waste management facilities (including landfills, material recovery facilities and recycle processing plants) that may draw waste from multiple local municipalities and/or districts; and
- Addressing waste management issues that are specific to the provincial economic, social, and environmental profile.

### **4.2 The Department of e-Government**

The Department of e-Government will through the establishment of a provincial e-Waste Project Management Office manage the implementation of provincial e-Waste Strategy.

### **4.3 Local Government**

Metropolitan (Metro), district and local municipalities are critical for planning and delivery of waste collection and disposal services and infrastructure. Waste collection and disposal to landfill is typically undertaken by local municipalities and metros. In some cases – particularly for metros – these services may be accomplished by subcontracting waste services companies (DEFF, 2020). As part of the implementation of the NWMS 2020, local government needs to shift the focus of waste collection services to incorporate separation at source to promote diversion of waste from landfills through reuse, repair, recycling and recovery (DEFF, 2020).

### **4.4 Private Sector**

The private sector is involved throughout the waste sector as generators of waste, providers of waste related services, recyclers of waste, consumers of recycled materials, and as a critical interface to consumers. The EPR Regulations make e-waste producers custodians of their EEE. This includes co-operating with municipalities to increase recovery of WEEE (DEFF, 2021). The involvement of the private sector is therefore essential for the implementation of the e-waste management strategy.

Private sector companies, particularly in the recycling sector, play an important role in raising consumer awareness around the waste. With the rollout of a national waste awareness campaign and the introduction of extended producer responsibility in relation to priority wastes, there will be opportunities for government and the private sector to collaborate on

raising public awareness, particularly with regard to recycling of priority wastes, food waste, and safe disposal of hazardous domestic wastes and absorbent hygiene products (DEFF, 2020).

#### **4.5 Informal Sector**

Waste Picking is unregulated, the working conditions may be dangerous, and the monetary rewards generally only provide marginal livelihoods. At the same time, waste pickers have been estimated to save municipalities approximately R700 million per year in collection and disposal costs (DEFF, 2020). The Gauteng e-waste management strategy is not intended to exclude the informal sector from waste management. It views waste pickers as playing a crucial role in the recycling industry. The concerns of government about waste pickers are:

- To minimize health risks to waste pickers including women, youth and persons living with disabilities through raising public awareness around safe disposal of e-waste and integrating waste pickers into collection and disposal services, particularly for separation at source programs.
- To improve the market value of recyclables through stimulating demand and thereby improving waste picker livelihoods.

The DFFE recognizes that there is scope for entrepreneurship within the informal sector that can lead to a formalization of jobs and improve livelihoods and working conditions. Municipalities and EPR programmes can support this process – for instance, waste collectors can be incorporated into municipal collection services to increase recyclables' recovery rates (DEFF, 2020).

#### **4.6 Civil Society**

Public awareness of the impact of e-waste is critical to achieving a culture of compliance and civic responsibility around waste, littering and illegal dumping practices. There are some local and international Non-Governmental Organisations (NGOs) and Community-Based Organisations (CBOs) and civil society institutions such as churches that should be the potential focus for community-based action on waste. These organisations also aim to ensure that initiatives aimed at improving waste management services also improve the role of women, youth, and people living with disabilities (DEFF, 2020).

In terms of community participation in preventing and cleaning up litter and illegal dumping, public spaces such as playgrounds and parks represent an obvious source of social impact and environmental impact, wetlands, estuaries, beaches and rivers are essential. While in EPWP programmes are mitigating these issues, the government recognizes that behaviour change and community engagement are fundamental components of a sustainable solution (DEFF, 2020).

In relation to achieving a culture of compliance, particularly with regard to the workplace and occupational health and safety issues of waste, trade unions have an essential role to play in ensuring employers comply with regulations and norms and standards around garbage, as well

as in raising worker's awareness both in terms of workplace issues around waste, or more general awareness around waste (DEFF, 2020) .



## **5. Implementation Plan**

The Department of e-Government will manage the coordination and implementation of the provincial e-waste Strategy through the establishment of a Provincial e-waste Project Management Office. The Project Management Office will be established within the Department of e-Government, within its existing structure and budget with operational activities reprioritized.

The e-waste Project Management Office will consist of six members, a Project Manager responsible for the implementation of the Strategy, and five (5) reportees responsible for management and implementation of e-waste initiatives in each of the 5 economic corridors. The Project Manager will report to the DDG: ICT in the Department of e-Government, who is the custodian of the Strategy, on a monthly basis.

The implementation plan, including the strategic actions, is detailed in Table 4. The actions have been categorised into three implementation timeframes:

- Short-term (within 6 months)
- Medium-term (6 months to 2 years)
- Long-term (2 to 5 years)

### **5.1 Short-term Goals**

The implementation plan can be categorised into short term goals which can be viewed as “quick wins”, and medium to long-term goals which will require substantially more time and resources to achieve.

The following quick wins have been identified:

#### **5.1.1 Internal Provincial e-waste Management Strategy**

The development of an internal e-waste management strategy which provides guidelines and uniform standards for the management of e-waste across all GPG departments is a quick win which enables the government to be a proactive actor in the e-waste industry. This will include protocols for the diversion of e-waste to repair, refurbishment and recycling as appropriate as well as facilitating the unlocking of government stockpiles and a reduction in the practice. The internal strategy will also include a protocol for the procurement and remuneration of e-waste handlers to ensure consistency across all government departments.

#### **5.1.2 Skills Development Programmes**

The skills development programmes will be implemented across the 5 corridors on entrepreneurial skills targeting:

- Collectors
- Dismantlers

- SMMEs in recycling
- SMMEs in refurbishment

### **5.1.3 E-waste Application**

A mobile app will be developed to facilitate e-waste collection. It will include the following features:

- Landfill locations
- Contact details of nearby e-waste collectors

### **5.1.4 Public Advocacy Programmes**

Public programmes will be run to raise awareness on the proper handling and disposal of e-waste. In addition, symposiums will be conducted in partnership with private, public and civil society.

## **5.2 Medium and Long-Term Goals**

The Medium and Long-Term Goals of the Project Management Office are the following:

*Review the current regulatory framework to:*

- Improve the roles of Government Departments, municipalities and end-users
- Issue licenses for managing and processing e-waste in a timely manner

*Infrastructure development including:*

- Improvement of collection infrastructure
- Efficient collection procedures and processes

*Job creation and Economic Growth which includes:*

- Repair, upgrade and sale of stockpiled equipment
- Commissioning of research into key aspects of e-waste management
- Exploring the formation of cooperatives in communities
- Creation of co-working spaces
- Facilitating the incorporation of the e-waste management in the school curriculum (i.e. repairs and refurbishment of equipment; and explore innovative ways to manage e-waste)

**Table 4: Implementation, Monitoring and Evaluation Plan**

<b>Pillar</b>	<b>Strategy (Key Objective)</b>	<b>Strategic Actions</b>	<b>Target Outcome</b>	<b>Key Performance Indicator</b>	<b>Timeframe</b>
1	Development of an GPG internal e-waste management strategy	Commission a baseline study on e-waste generation and management	Report on the status quo across government departments	Baseline indicators for e-waste stocks and flows to treatment and disposal.	Short term
		Develop a centralised e-waste management protocol including frameworks for donations and diversion of e-waste to repair, refurbishment and recycling.	E-waste management protocol adopted by all departments.	Adoption of e-waste management protocol by all departments.	
		Develop a remuneration framework for e-waste handlers	Centralised protocol for procurement and reimbursement of e-waste handlers.	Adoption of remuneration frameworks by all departments.	
1	Reduce government e-waste generation rate.	Develop a revised procurement strategy which includes the potential for leasing.	Adoption of leasing in the procurement protocol.	Trial of leasing in select government departments.	Short term
1	Unlocking of government stockpiles	Development of a protocol to unlock current government stockpiles of e-waste and to discourage further stockpiling.	Decrease in stockpiles.	Percentage of stockpiles unlocked per annum.	Short term
1	Increase of government e-waste diversion to reuse, repair, refurbishment and recycling as necessary.	Facilitate the diversion of e-waste to reuse, repair, refurbishment and recycling.	Increase of e-waste diverted to reuse, repair, refurbishment and recycling as necessary.	Amount of e-waste diverted to reuse, repair, refurbishment and recycling per annum.	Short term
1	Reduction of illegal and unsafe backyard operations	Greater law enforcement.	Decrease in backyard operations.	Number of operations shut down per annum.	Medium to long term

		Facilitate a pathway to compliance through education and awareness.			Medium to long term
1	Increasing the volumes of e-waste flowing into the processing industry.	Improvement of collection infrastructure.	Increase in the amount of e-waste collected and diverted from landfill.	Amount of e-waste recovered per annum.	Medium to long term
1	Empowerment of the informal sector	Training sessions for safe practices during e-waste handling.	Decreased risk of harm to informal sector players.	Number of trainings conducted per annum. Number of attendants at trainings per annum.	Short term
2	Empowerment of the informal sector	Ensure fair compensation.	Reduced exploitation of the informal sectors.	Average informal sector compensation rates per annum.	Short term
2	Increased skills development for e-waste handling and processing.	In partnership with a HEI and/or TVET, develop a skills development programme for repair and refurbishment.	Increased participants in repair and refurbishment.	Number of people trained per annum. Number of trained people gaining an income from their skills per annum. Number of SMMEs created by participants per annum.	Short term
		In partnership with a HEI and/or TVET, develop a skills development programme for collection of e-waste.	Increased participants in e-waste collection.		Short term
		In partnership with a HEI and/or TVET, develop a skills development programme for e-waste dismantling and sorting.	Increased participants in e-waste dismantling and collection.		Short term
		Impart valuable ICT skills to the disadvantaged youth in Gauteng, particularly as a talent pipeline for computer engineering students	Increased disadvantaged youth will ICT skills.		Number of people trained per annum.

2	Provide job opportunities to the youth on aspects such as refurbishments and recycling of electronic equipment.			Number of youths employed in e-waste management value chain per annum.	Medium to long term
2	Creation of safe and complaint work spaces.	Creation of co-working spaces.	Increase in safe and complaint e-waste handling.	Number of co-working spaces created per annum.	Short to medium term
3	Increase public awareness of proper e-waste management practices	Conduct public awareness campaigns via various communication platforms including radio, television, brochures, fliers, pamphlets and social media	Increased public awareness of proper e-waste management	Public engagement with campaigns (e.g. social media interactions) per annum.	Short term
		Long term advocacy programme for school learners		Number of youths reached through advocacy campaigns per annum.	
		Annual high school student competitions on innovative ideas for e-waste management	Increased education and awareness amongst school students.	Number of entrants per annum.	Short term
		Annual e-waste symposium with private, public and civil society sectors	Increased engagement in the e-waste management industry	Number of attendants per symposium. Symposium feedback.	Short term
4	Improved understanding of the e-waste management landscape.	Identify research institutions for partnership.	Partnerships with research institutions.	Number of partnerships created with HEIs.	Short term
		Identify and commission research on e-waste managements.	Research studies focussed on the e-waste industry.	Number of studies produced per annum.	Short to medium term

		Commission a market research study on the reuse and refurbishment of e-waste.	An understanding of the reuse and refurbishment market.	Market research report.	Short to medium term
4	Creation of strategic partnerships	Create partnerships with HEI and TVETs	Signed partnerships/ SLA agreements with identified partners.	Number of partnerships formed per annum.	Medium term
5	Improve legislative and regulatory compliance	Biannual workshops on legislative and regulatory compliance	Increase in compliant e-waste operations	Number of people in attendance per workshop. Number of people engaging in the process after the workshop.	Short term
		Streamline the regulatory process to reduce processing times and financial costs.		Average processing time for issuing licences per annum.	Short term
5	Improvement of monitoring and evaluation infrastructure	Database of township businesses in the e-waste sector	Up to date database.		Short term
		Database of SMMEs in the e-waste sector.			Short term
		Audit of e-waste sector player demographics.			Short term
		Monitor and evaluate key programmes within e-waste management	Number of e-waste management evaluation reports.	Medium to long term	
5	Best practices for e-waste recovery and processing.	Develop measures for the segregation of e-waste at source, collection, transportation and processing.	Approved measures.	Approved guidelines and monitoring & evaluation strategies for their implementation.	Short term
		Develop measures for the development of dismantling and recovery facilities.			

		Develop measures for conducting trade-in of electronic and electrical equipment (SMMEs)			
		Develop measures for the promotion and establishment of e-waste buy back centres.	Approved guidelines.		
		Develop guidelines for regulating and supporting activities of e-waste pickers.			
		Develop guidelines on the basic requirements for the establishment of e-waste collection centres and recycling facilities			
		Develop guidelines for skills development programmes to provide regular training for recycling e-waste stakeholders (i.e. promotion of TER)			
		Develop and implement regulations and guidelines for processing and recycling e-waste			Short term
		Develop standards for the management of various e-waste streams and classes.	Approved standards.		Short term
		Implement and monitor compliance with policy and adherence to standards.		Number of incidences of non-compliance per annum.	Medium to long term
5	Maximum compliance with the regulatory and governance environment.	Law enforcement in respect of disposal processes, collection, separation, recycling, refurbishment and transportation.	Increased regulatory and legislative compliance.	Number of incidences of non-compliance per annum.	Medium to long term
		Public awareness of the existing legislation.			

## **6. Monitoring and Evaluation**

The actions outlined in the implementations planned will be regularly assessed according to the Key Performance Indicators specified in Table 4.

In addition to the various KPIs the entire strategy will be comprehensively reviewed every 5 years to ensure its relevancy. In addition, a five-year progress report will be compiled.



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