



# Training Manual

for Formal Collectors of Electronic Waste in Nigeria



# ACKNOWLEDGEMENTS

This manual was prepared with funding from IHS Nigeria Limited as one of the components of the EPRON-IHS WEEE Transform project. A study titled **“Consumers’ behaviour and their perception of circularity in the Nigerian Electrical and Electronic Equipment (EEE) sector”** was undertaken which delved briefly into existing practices of e-waste collectors and its findings strengthened the need to build the capacity of collectors on appropriate e-waste management practices. We would like to warmly thank all those who contributed to its content namely: Dr. Gilbert Adie, Mrs. Ibukun Faluyi and Prof. Innocent Nnorom. Our special appreciation also goes to the following organizations and individuals for their valuable inputs and comments especially during the review process:

- IHS Nigeria Limited;
- Circular Economy Innovation Platform (CEIP);
- International Labour Organization (ILO);
- National Environmental Standards and Regulatory Enforcement Agency (NESREA);
- Sustainable Research and Action for Environmental Development (SRADEV Nigeria);
- Dr. Segun Odeyingbo; and
- Mr. Olamide Pedro

The contributions of the technical and administrative Staff of EPRON is also appreciated – Ijeoma Ekeoma and Setin Hunkokoe.

## **For enquiries, please contact:**

E-waste Producer Responsibility Organization of Nigeria (EPRON)  
13B Ikorodu Road  
Maryland, Lagos  
Nigeria  
[info@epron.org.ng](mailto:info@epron.org.ng).

## **Authors:**

Faluyi, I.E<sup>1</sup>, Adie, G. U<sup>2</sup> and Nnorom I.C<sup>3</sup>

<sup>1</sup>E-waste Producer Responsibility Organization of Nigeria (EPRON), 13B Ikorodu Road  
Maryland, Lagos, Nigeria.

<sup>2</sup>Department of Chemistry, University of Ibadan, Ibadan, Nigeria.

<sup>3</sup>Department of Pure and Industrial Chemistry, Abia State University, Uturu,  
Nigeria.

## **Please cite this publication as:**

Faluyi, I.E, Adie, G and Nnorom I.C (2023). WEEE SMART. EPRON-IHS WEEE Transform project 2023. EPRON, Lagos, Nigeria.

# ABBREVIATIONS

BAN	Basel Action Network
B2B	Business to Business
B2C	Business to Consumers
BFR	Brominated Flame Retardants
CCFL	Cold Cathode Fluorescent Lamps
CRT	Cathode Ray Tube
EEE	Electrical and Electronic Equipment
EPA	Environmental Protection Agency
EPR	Extended Producer Responsibility
EPRON	E-waste Producer Responsibility Organisation of Nigeria
ESM	Environmentally Sound Management
EU	European Union
HCFC	Hydrochloroflouro Carbons
HH	Household
HSE	Health, Safety and Environment
ICT	Information and Communication Technology
Kg	kilogram
LCD	Liquid Crystal Display
LED	Light Emitting Diodes
NESREA	National Environmental Standards and Regulations Enforcement Agency
PBB	Poly Brominated Biphenyls
PBDE	Poly Brominated Diphenly Ethers
PCBs	Polychlorinated Biphenyls
PIC	Prior Informed Consent
PPE	Personal Protective Equipment
PRO	Producer Responsibility Organisation
PWB	Printed Wiring Board
SOP	Standard Operating Procedure
StEP	Solving the E-waste Problem
SVTC	Silicon Valley Toxics Coalition
UEEE	Used Electrical and Electronic Equipment
UNU	United Nations University
WEEE	Waste Electrical and Electronic Equipment

# CONTENTS

## TABLE OF CONTENTS

<b>CONTENTS</b> .....	4
Purpose of the manual .....	8
Outline of the Training Programme .....	8
Notes to the Facilitator .....	9
Duration of the training .....	9
<b>MODULE A</b> .....	10
Understanding E-waste and the Value of Environmentally Sound Management of E-waste .....	10
Training Objectives .....	11
Definitions of e-waste .....	11
Global Generation of E-waste .....	12
E-Waste Composition .....	13
E-Waste Categories .....	15
<b>MODULE B</b> .....	17
Overview of the National Policy, Legal/Administrative Framework Governing E-waste .....	17
Module B Training Objectives .....	18
Overview of the Nigeria E-Waste Sector and Legislation .....	18
Legal Provisions Guiding E-Waste Collection and the EPR in the EEE sector .....	19
General Legal Responsibilities of EPRON .....	21
Legal Responsibilities of a Formal E-waste Collector .....	21
Legal Responsibilities of an Informal E-waste Collector .....	23
Prohibited Activities of Informal E-Waste Collectors .....	23
Regulatory Criteria that E-Waste Collection Centre Operators must Meet .....	24
Regulatory Requirements that must be met to Set-up an E-waste Collection Centre .....	24
Physical Requirements for an E-waste Collection Centre .....	24
<b>Module C</b> .....	26
Guidelines for E-waste Management - Collection, Transportation and Storage .....	26
Module C Training Objectives .....	27
Guidelines for operating E-Waste Collection Centers .....	27
Guidelines for E-waste Transportation .....	29
Guidelines for Storage of E-waste .....	31
<b>MODULE D</b> .....	34
Substances of Concerns in E-waste Handling .....	34
Module D Training Objectives .....	35
Brominated Flame Retardant (BFR) Containing Plastics .....	35
Cathode Ray Tubes (CRTs) Screens .....	36

Lamps .....	37
Batteries and Accumulators .....	37
General Bad Practices .....	38
Bad Practices associated with Specific E-waste Components and Collection Centre Activities .....	39
Pre-Processing Cooling Appliances .....	39
Copper recovery from burning cables .....	40
Good Practices .....	42
Housekeeping in Collection Centres .....	44
<b>Module E</b> .....	45
Data Protection and Documentation in E-waste Collection .....	45
Module E Training Objectives .....	46
Inventory keeping and reporting .....	46
Inventory keeping .....	46
Reporting .....	47
Data protection and Security .....	47
<b>Module F</b> .....	49
Health and Safety management in Collection Centres .....	49
Module Training Objectives .....	50
Health, Safety and Environment .....	50
<b>REFERENCES/FURTHER READING</b> .....	59
Annex 1: Description of Black box .....	61
Glossary and Definitions .....	62

## TABLES

---

Table A1. Selected definitions of electrical and electronic wastes or e-waste .....	11
Table A2. WEEE categories adopted by National Environmental (EE Sector) Regulations 2022 .....	15
Table A3. Categories of EEE covered in medium- and long-term collection and recycling targets .....	16
Table D1. Cluster of Bad/worst practices and corresponding good practices .....	42
Table F1. Potential adverse health effects of toxic components of e-waste on humans .....	50

## FIGURES

---

Figure A1: Types of e-waste .....	12
Figure A2: E-waste Types and the Hazardous Components that they Contain .....	13
Figure A3: E-waste Types with Valuable Components .....	14
Figure A4: Breaking e-waste to extract the valuable materials .....	14
Figure B1: The Regulatory Framework for Environmental Management including E-waste .....	18
Figure B2: The Nigerian EPR Model .....	19
Figure B3: EPR Model for the electronics sector in Nigeria, Source: Guidance Document for the EEE Sector .....	20
Figure C1. Flow chart showing various steps involved in e-waste collection .....	28
Figure C2. A covered truck loading e-waste .....	30
Figure C3. Unacceptable e-waste stockpiling .....	31
Figure C4. Correct way of loading e-waste .....	32
Figure C5. Pictures of E-waste stored appropriately in the right kind of receptacles .....	33
Figure D1. Dumping of low-quality plastics, usually BFR plastics .....	35
Figure D2. Improper disposal of CRT glass within a dismantling site .....	37
Figure D3. Examples of bad practices of dismantling cooling devices by the informal sector .....	40
Figure D4. Informal collectors burning waste cables to recover copper wires .....	40
Figure D5. Poor housing keeping practices in an informal facility .....	41
Figure D6. Informal transportation of hazardous e-waste in uncovered vehicles .....	42
Figure D7. Organised informal collectors with uniform and labelled carts .....	43
Figure F1. Exposure routes of harmful chemicals contained in e-waste .....	51
Figure F2. Impact of persistent chemicals on human body .....	52
Figure F3. Children playing around e-waste dump/storage sites .....	52
Figure F4. Main elements of the OSH management system .....	53

# Introduction

---

Electrical and Electronic Equipment (EEE) including Information and Communication Technologies (ICTs) offer great opportunities for the world's development, guarantees higher living standards and satisfy several needs. However, end of life equipment such as phones, laptops, sensors, televisions, washing machines, air-conditioners, fridges and many others pose considerable risks on human health and on the environment, especially if treated inadequately or mismanaged. This is because this waste stream popularly known as electronic waste (e-waste) contains hazardous substances and therefore requires specialized collection and treatment services. However, Nigeria like most other African countries does not have a fully developed system for environmentally sound management of e-waste. Therefore, most of the e-waste generated are managed by the informal sector which employs crude methods that are rather polluting and create health risks for the workers.

To transit to a formal well documented system of collection and recycling, the Government of Nigeria, has developed appropriate regulatory framework for e-waste management in the country. This framework has necessitated the incorporation of E-waste Producers Responsibility Organization of Nigeria (EPRON) a Producer Responsibility Organisation for the electrical and electronic equipment sector. The organisation has the responsibility for implementing the extended producer responsibility (EPR) programme in the sector; coordinating take-back of e-waste and ensuring it is managed in an environmentally sound manner; supporting the e-waste management industry to domesticate existing standards.

The WEEE Smart training manual is one of the arrangements put in place by EPRON to support the critical stakeholders in the e-waste value chain - collectors. It is an important tool for developing the capacity of these actors and for driving a formal waste management and recycling system for WEEE in Nigeria.

The training manual is one of the components of the "WEEE Transform project", a multi-component project funded by IHS Nigeria Limited to further the cause of Environmentally Sound Management (ESM) of electronic waste(e-waste) in Nigeria. The project was conceptualized to institute sound e-waste management practices and speed up the transition of the Nigerian e-waste sector handled majorly by the informal operators (with highly polluting methods) to a formal system that conserves resources, adopts best practices and ensures the protection of human health and the environment. Following the launch of this manual, registered e-waste collectors in the project participating regions namely Abia, Adamawa, Federal Capital Territory (FCT), Kano, Lagos, Ogun and Rivers State will be trained based on the manual to ensure the utilisation of the required safe work operating procedures.



## Purpose of the Manual

The WEEE Smart training manual was designed as a national tool for training operators of e-waste collection centers typically called formal collectors. It is a guide to provide e-waste collectors, with the knowledge and skills required to fulfil their obligations in the Nigerian e-waste value chain. It is an operational pre-requisite, developed to enable collectors identify the potential hazards associated with their work, understand their obligations and the principles to effectively carry out their task without jeopardizing the environment, health of workers and other Nigerians. It seeks to answer important questions including the following:

- What is e-waste?
- What are its local generation patterns?
- What legislation guides e-waste management in Nigeria?
- Who are the critical actors in the EEE value chain?
- What are the roles of a collector in relation to all the other actors?
- What are the risks associated with handling of WEEE?
- How should e-waste collected be stored in an environmentally sound manner?

The manual was developed by considering the provisions from the existing National regulatory requirements, specifically National Environmental (Electrical and Electronic Sector) Regulations, 2022; the Guidance Document for the Implementation of the Extended Producer Responsibility Programme for the Electrical/Electronics Sector in line with Circular Economy; and the Nigerian Industrial Standards on wastes of Electrical and Electronic Equipment (EEE) (DNIS 1208:2023EE). Appropriate consideration was also given to other international manuals/guidelines such as the Ghana E-Waste Training Manual funded by GIZ/BMZ (GIZ/BMZ, 2019), Technical Guidelines for e-waste management in Ghana funded by Sustainable Recycling Industries” (SRI, 2019) and ILO Guidelines on Occupational Safety and Health Management Systems.

The manual has been thoroughly reviewed by experts, requisite regulatory agencies and relevant value chain Stakeholders. A test application has also been conducted for e-waste collectors.

## Outline of the Training Programme

This manual is designed for a three-day training course on e-waste collection that would take the learner from the basics of e-waste and the adverse impact of unsafe handling, legal requirements, sound collection, storage, transportation requirements and treatment in environmentally sound manner. It also includes provisions for some practical case studies that will be addressed in smaller groups and a field visit to an e-waste collection facility. Finally, the manual identifies good practice choices, allowing adoption of the most suitable WEEE collection methods.

The manual contains six modules, namely:

- Module A: Understanding E-waste and the Value of Environmentally Sound Management
- Module B: Overview of the National Administrative Framework Governing E-waste
- Module C: E-waste Management - Collection, Transportation, and Storage
- Module D: Substances of Concerns in E-waste Handling
- Module E: Data Protection and Documentation in E-waste Collection
- Module F: Health Safety and Environment considerations in E-waste collection , handling, transportation and storage

## Notes to the Facilitator

E-waste is a very interesting but complex subject to teach. This complexity makes comprehension and knowledge pivotal for the broad concept of e-waste collection to be fully understood. Moreover, e-waste collectors are the key element for achieving the behavioral changes required to transit EEE to a full circular economy through closing the loop methods, since they (collectors) bridge the link between consumers and recyclers. Therefore, the collectors need to be adequately supported to understand the dynamics of ESM of e-waste to be able to effectively deploy their role in the e-waste value chain. In this regard, adequate and effective communication on ESM of e-waste as it affects collection and other sections of the value chain to transit to the circularity model becomes key. To start, there are some key points to note:

- When communicating about e-waste management in collection centers, participatory approaches should be adopted.
- Emphasis should be made on the importance of collectors as the first link in the e-waste management value chain.
- Aspire to get participants (collectors/transporter) actively involved in information sharing. By doing this, there would be a tendency of obtaining as well as impacting knowledge on polluting practices and good practices to transit to.
- It is paramount to adopt a language that is easily understood by majority of the participants and where need be, a local interpreter(s) could be engaged to ensure everyone is carried along. There would therefore be a need for a preliminary briefing of the interpreter(s) before-hand to get familiar with the key concepts of the manual.
- Please be cautious about the use of diverse and culture-sensitive expressions in order to make all participants feel at home.
- Case studies and examples that the target participants can understand and relate to should be used.
- Create humour by attempting to express yourself in the local language (if not your mother tongue) of the collectors to get them relaxed and interested in the training.
- It is not necessary to follow the time allotted for the exercises very strictly. This manual serves as a guide for the training of sector players.
- At the beginning of each module and training, seek to know the expectations of the participants and try to provide the information required.

This training manual is designed to be flexible in terms of context adopted to train and take care of the needs of the target participants in order to have successful outcomes. However, it is obligatory that the content of the manual must not be changed. If there is a need to modify significantly the content, a written request to the Technical Manager of EPRON highlighting the needs for modification shall be made and approval obtained before the modification shall be effected.

## Duration of the training

The training modules in this manual are designed to be carried out in three days. If there is need for modification of the duration, an official communication in writing should be made to the Technical Manager of EPRON for approval. The communication should state the reason(s) for the proposed modification and the new timeline if need be.

While this manual was developed as a tutor guide for group training to crossbreed ideas and share information on responsible collection, handling, storage and transportation of e-waste, individuals could also independently read it to learn about the requirements of ESM of e-waste. It is recommended that for maximum impact, individual readers should go through the introductory texts for each session, then run through the exercises independently as if in a group.

# Module A

## Understanding E-waste and the Value of Environmentally Sound Management of E-waste

The first module of this manual is an introduction to the concept of e-waste, its definition, generation pattern, composition and categories. It also highlights the reason why e-waste requires ESM.



### Facilitators Guide

1

At the beginning of the workshop, administer the pre-training evaluation forms to all the participants

2

- i. Welcome the participants
- ii. Invite each one for self-introduction in one minute (name, job or position, company)
- iii. Each to answer the question “Why are you here” and “what do you hope to learn?” (their expectations!!)

4

Explain the purpose and outline of the training course, referring back to the participants’ expectations where relevant.

3

Make notes of the expectations and keep them for reference during the session and the review at the end of the workshop.

## Training Objectives

At the end of this module, participants should be able to:

- define e-waste;
- understand its generation pattern;
- understand the valuable and hazardous components of e-waste;
- understand the adverse effects of hazardous chemicals in e-waste;
- understand the economic value of precious and rare earth metals in e-waste;
- understand why e-waste requires ESM;
- understand e-waste categorization and the priority categories under consideration;
- understand e-waste as a resource in a circular economy model.

## Definitions of e-waste

E-waste can otherwise be called waste electrical and electronic equipment (WEEE). This waste category has no global standard definition however, most countries or regions define e-waste according to their own interpretations and regulations (UNEP, 2007). Debates are still ongoing on a unified definition of e-waste to be adopted globally. Simply stated, e-waste is any device that uses electric current or batteries that is no longer functional. However, some of the notable definitions are presented in **Table A1**.

**Table A1. Selected definitions of electrical and electronic wastes or e-waste**

	Definitions	References
1	Electrical or electronic equipment which is waste including all components, sub-components and consumables, which are part of the product at the time of discarding. Directive 75/442/EEC, Article 1(a) defines waste as any substance or object which the holder disposes of or is required to dispose of pursuant to the provisions of national law in force.	EU, 2003
2	E-waste encompasses a broad and growing range of electronic devices ranging from large household devices such as refrigerators, air conditioners, cell phones, personal stereos and consumer electronics to computers which have been discarded by their owners	BAN/SVTC, 2000
3	Any electrically powered appliance that no longer satisfies the current owner for its original purpose	OECD, 2001
4	E-waste or WEEE: 'Electrical and electronic equipment that is no longer suitable for use or that the last owner has discarded	Widmer et al., 2005
5	E-waste is a term used to cover all items of electrical and electronic equipment (EEE) and its parts that have been discarded by its owner as waste without the intention of re-use.	StEP, 2012
6	E-Waste means 'waste electrical and electronic equipment (WEEE) including old, end-of-life or discarded electrical/electronic appliances that use electricity	Osibanjo, 2009



### Facilitator's Guide

Attempt to harmonize the definitions by bringing the key elements common to all the definitions and relevant to the collectors to align on the term.

The draft National Standard On Waste Electrical And Electronic Equipment (WEEE) Management defined EEE to include any equipment, device or thing, the operation of which is in some way dependent on, or designed for the generation, transfer or measurement of, an electric current and/or an electromagnetic field and designed for a supply voltage not exceeding 1000 volts for alternating current and 1500 volts for direct current.



### Box A1- Types of Electronic Waste

## Global Generation of E-waste

Electrical and electronic waste stream has been judged the fastest growing waste stream globally, growing three times faster than any waste (Singh et al. 2020). E-waste constitutes nowadays one of the fastest growing streams of solid waste estimated to reach 74 million MT by 2031 (Osiko, 2022). The recently launched Global E-waste Monitor 2020 by the GESP highlighted that a record of 53.6 million metric tonnes (Mt) of e-waste was generated in 2019, with an estimated increase equals to 21% in respect of the 2014 data. Most recently, it was also reported during the 2021 International E-waste Day that 57.4 million MT of e-waste was generated in 2021, growing at an average of 2 Mt per year. Incidentally, only 17.4% of e-waste was indicated to be collected and properly recycled. The e-waste recycling market was valued at \$49,880 million in 2020. Nigeria imports assorted used EEE mixed with e-waste annually estimated at about 60,000 tons (Odeyingbo et al. 2017).

The consistent growth in e-waste quantities has been linked to the growing number of people using EEE and ICTs worldwide, perhaps due to increasing technological development and phasing out of old technologies, to shorter product life-cycle and designs that do not support redesign, repair or reuse. Majority of the e-waste (83% on a global scale) is not managed in an ESM with most of it ending up in landfills mixed with other waste streams. As a consequence, valuable resources, including gold and rare earths, are wasted and hazardous substance are released into the environment without any de-pollution or protective activity.



### Facilitator's Guide

Use real e-waste to teach about the composition of e-waste. Explain the need to conduct environmentally sound management of e-waste, highlighting the economic gains and adverse effects on human health. Show many illustrations like gold medals made from e-waste during Japan World Cup.

## E-Waste Composition

It has been reported that electronic equipment contains more than 1000 different substances performing different functions (Widmer et al. 2005). On the one hand, some of the substances are toxic while on the other hand, others have great economic value. Some of the toxic substances present in the waste that have been restricted by EU are lead, cadmium, mercury, chromium, arsenic, polybrominated biphenyls (PBBs) and polybrominated diphenyl ethers (PBDEs).



### Box A2 E-waste Types and the Hazardous Components that they Contain

Others such as gold, silver, copper, palladium, tin, etc. have very high economic value. Therefore, there is a need for the formulation and implementation of approaches for the processing of wastes arising from EEE perhaps to reduce environmental burden from the amount of waste disposed of, and increasing extraction of secondary raw materials to be reintegrated into the value chain through a circular economy approach. Since the e-waste sector in Nigeria is dominated by the informal sector, this manual is intended to be a guide for the ESM of e-waste collection with inclusivity of the informal sector.

Note that currently more emphasis is laid on reuse of devices and components as this extends the lifespan of EEE thereby reducing energy use and pollution. Reuse according to the draft National Standard on Waste Electrical and Electronic Equipment (WEEE) Management is the act of checking, cleaning or repairing operations, by which products or components of products that have become waste are prepared so that they can be re-used without any other pre-processing



### Box A3. E-waste Types with Valuable Components

In Nigeria, like in many developing countries and countries in transition, a greater proportion of e-waste is managed by the informal sector that employ crude methods that are not environmentally friendly to extract only valuable components such as copper, gold, silver, aluminium and other non-ferrous rare earth metals, etc. and dump the less valuable components such as plastics with flame retardants in any available space or burn them.

Some of the crude methods used are open burning of copper cables to extract copper, breaking of cathode ray tubes (CRTs) to extract copper, open de-soldering of printed wiring boards and leaching of gold with toxic cyanide solution, burning of plastics with flame retardants, releasing dioxins and furans into the atmosphere, etc. (Nnorom and Osibanjo, 2008; Dai et al., 2020).



Box A4. Breaking e-waste to extract the valuable materials



### Facilitator's Guide

Explain the different types of e-waste classifications and leverage on the categories that the Nigerian Government has prioritized and the reasons for prioritizing these categories. Explain the difference between electrical and electronic equipment, white, grey and brown goods. It could be helpful if the Facilitator can give specific examples of the social, economic, resource and environmental impact of equipment in each of the categories based on their content and composition.

## E-Waste Categories

For quantification and analysis purposes, the EEE can be categorized according to their similarity in functions, average weight, average lifetime, material composition (in terms of hazardous substances and valuable materials), as well as end of life processes and final destinations.

The categories of e-waste covered in this manual are the ones prioritized by the Nigerian Government as indicated in the National Environmental (Electrical and Electronic) Sector Regulations, 2022 S. I. No 79, 2022 with provisions in First Schedule of the Regulations supported by Regulation 2 (3) and the Guidance document for the implementation of the Extended Producer Responsibility (EPR) programme for the Electrical/Electronic sector in line with circular economy. The full categories of e-waste by NESREA is found on pages B3474 - B3477 of the Regulations and the abridged summary of the classification is shown on Table A2. Presented in Table A3 is the classification of e-waste for medium- and long-term collection and recycling target by EPRON.

Table A2. WEEE categories adopted by National Environmental (EE Sector) Regulations 2022

No.	Category	Label
1	Large household appliances (white goods)	Large Household
2	Small household appliances (white goods)	Small Household
3	IT and telecommunications equipment (grey goods)	ICT
4	Entertainment and Consumer equipment (brown goods)	CE
5	Lighting equipment	Lighting
6	Electrical and electronic tools (with the exception of large-scale stationary industrial tools)	E & E tools
7	Toys, leisure, betting and sports equipment	Toys
8	Medical devices (with the exception of all implanted and infected products)	Medical equipment
9	Monitoring and control instruments	M & C
10	Automatic dispensers	Dispensers



**Table A3. Categories of EEE covered in medium- and long-term collection and recycling targets**

Category	Cluster of E-waste	Typical EEE covered
1	Cooling and freezing equipment	Refrigerators, freezers, air conditioners, central cooling units
2	Screens and monitors	Televisions, monitors, laptops, notebooks, and tablets
3	Lamps	Fluorescent lamps, high intensity discharge lamps, LED lamps
4	Large equipment	Large printing machines, copying machines, desktops, telecommunication equipment, central heating equipment, PV panels, large IT (servers, routers, copiers) professional luminaries, tools, medical equipment
5	Small equipment	Microwave ovens, electrical and electronic toys, small electrical and electronic tools, irons, kitchen appliances, electric tooth-brushes and hair drying and removal devices
6	Small IT and Telecom equipment	Mobile phones, pocket calculators, personal computers, printers, telephones

*Guidance Doc. section one (Table 1)*



**Participants Exercises A**  
(Time allowed: 30 minutes)

- i. What is e-waste?
- ii. Give 2 examples each of white, grey and brown goods.
- iii. What are the local generation patterns of e-waste in Nigeria?
- iv. Name the 10 categories of EEE
- v. Why did EPRON prioritize the six e-waste categories?
- vi. Why is e-waste a source of concern in Nigeria?
- vii. Mention as many as possible different parts of the body and adverse effect from chemicals in e-waste.
- viii. What are the common ways of e-waste handling or extraction that expose individuals to health hazards?

# Module B

## Overview of the National Policy, Legal/Administrative Framework Governing E-waste

---

This module aims to bring participants up to speed with the existing regulatory framework in relation to e-waste. It provides a general overview of the administrative basis for environmental management and how e-waste fits into it. It will enable the collectors to identify all the actors in the field and their responsibilities in relation to the actors. It would also enable them to understand which organisations they would be accountable to and the compliance requirements.



### Facilitators Guide

1. Use PowerPoint presentation to train participants capturing the set objectives of the module.
2. Make use of the facilitator's guide in preparing the PowerPoint in order not to miss salient points.
3. Put participants in group to discuss:
  - a. perceived challenges that could be associated with working with informal sector and suggestions on how to address the challenges.
  - b. each group should pick a communication approach to create awareness among consumers on take back schemes and the existence of the collection centre
  - c. Expectations from Regulators and EPRON.
4. A representative from each group will present the summary for each point at plenary
5. The module will be concluded with exercise B1 at plenary or group stage as decided by the facilitator

**Training Duration: 2 hours**

## Training Objectives

At the end of the training, participants will understand;

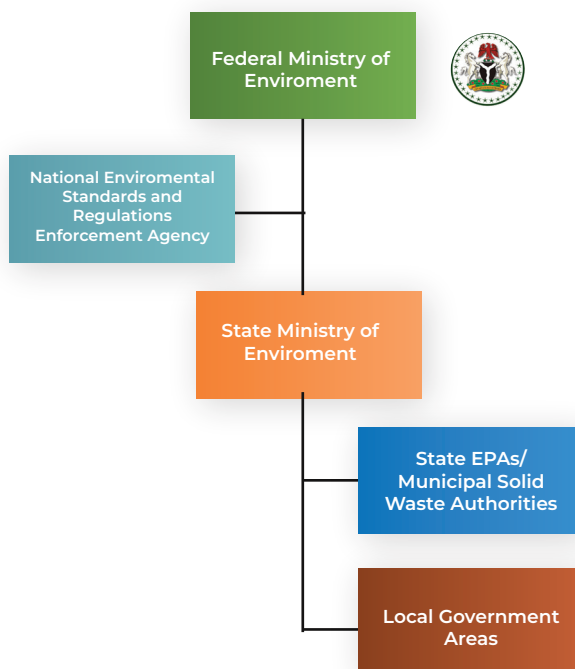
At the end of the training, participants will understand

- The e-waste regulations and actors in Nigeria
- The Extended Producer Responsibility programme in the EEE sector
- Identify and understand the role of each of the stakeholders
- International agreements related to e-waste that Nigeria is a signatory to
- The legal requirements of all e-waste collectors
- Obligations of formal collectors towards the informal collectors

## Overview of Nigeria E-Waste Sector and Legislation

Apart from the release of hazardous substances with deleterious effect on human health and the environment, improper management of e-waste has some lost opportunities on the recovery of valuable materials from it through recycling, thereby defeating the much-desired circular economy model.

To address these challenges, the Nigeria Government through the Federal Ministry of Environment (FMEnv) as the national focal point on e-waste management and NESREA, the enforcement arm of the ministry has developed some more general extant policies and regulations, such as the National Environmental (Sanitation and Waste Control) Regulation (2009) to monitor and control the management of waste, including hazardous wastes. In 2011, the Government gazetted specific e-waste management Regulations, the National Environmental (Electrical/Electronic Sector) Regulations (S.I. No. 23, 2011) with provisions on how to manage e-waste in environmentally sound manner from point of generation to disposal. The Regulations also have provisions for the Extended Producer Responsibility (EPR) programme, this programme obliges producers (importers, manufacturers, assemblers and major distributors) to take back their products at end-of-life. It involves a life cycle approach in the management of e-waste, which is in line with the principle of circular economy and the polluters pay principle.



**Box B1. The Regulatory Framework for Environmental Management including E-waste**



### Facilitators Guide

1. Highlight the relevant conventions, that Nigeria has ratified or signed on to and that have led to the development of existing regulations on e-waste, e.g. Basel convention, etc.
2. Indicate ongoing efforts of the Nigerian Government for a transition to a Circular Economy such as the: circular economy road map etc. Furthermore, highlight the link between other e-waste regulators not mentioned here and how they complement one another

## Legal Provisions Guiding E-Waste Collection and the EPR in the EEE sector

To consolidate efforts on the EPR programme, the Nigerian Government developed an operational guideline for the implementation of EPR across different waste streams in Nigeria. This guideline specified the model for the multi-stakeholder operationalization of the EPR in the country where all identified stakeholders have a responsibility for the effective management of WEEE (Figure B2). The guideline highlights all the critical components of the EPR system and defines their responsibility.

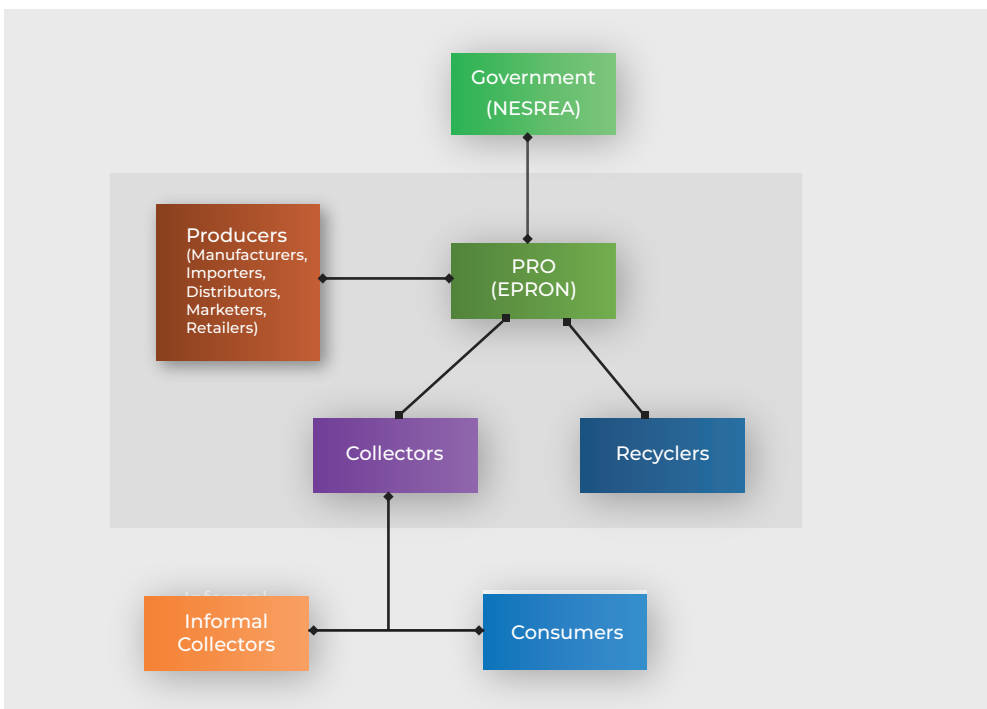


Figure B2. The Nigerian EPR Model, Source: Extended Producer Responsibility (EPR) Programme in Nigeria, Operational Guidelines, 2014

The development of the EPR necessitated the creation of a Producer Responsibility Organization (PRO) to operationalize the EPR programme in the EEE sector. E-waste Producer Responsibility Organization of Nigeria (EPRON), a non-profit organization was therefore founded in March 2018 in Nigeria. EPRON, is the first PRO for e-waste, incorporated to implement the EPR programme in the EEE sector and ensure the environmentally sound management (ESM) of electronic waste (e-waste) in Nigeria. EPRON provides a cost effective and transparent platform for fulfilling producers' obligations. It is the coordinating link between all players in the e-waste value chain (producers, formal and informal collectors, repairers, transporters, recyclers) as prescribed in the EPR Operational Guideline.

As seen in the schematic representation of EPRON's operational model presented in Figure B2, the organization interfaces between NESREA and the producers, collectors, transporters and recyclers (Figure B3).

The organization is therefore responsible for facilitating product take back at end-of-life (EoL) and arranging for the safe treatment/disposal of the products according to specified regulatory standards and as specified by the EPR operational guidelines.

To ensure that the responsibilities of each of the stakeholders in the EEE value chain are well defined and to establish a road map with timebound targets for the effective implementation of the EPR in the sector, the Nigerian Government published the Guidance Document for the Implementation of the Extended Producer Programme for the Electrical and Electronic Sector in line with Circular Economy Approaches in August 2022 with the support of the United Nations Environment Programme under the Global Environment Facility (GEF) funded circular economy approaches for the electronics sector in Nigeria project.

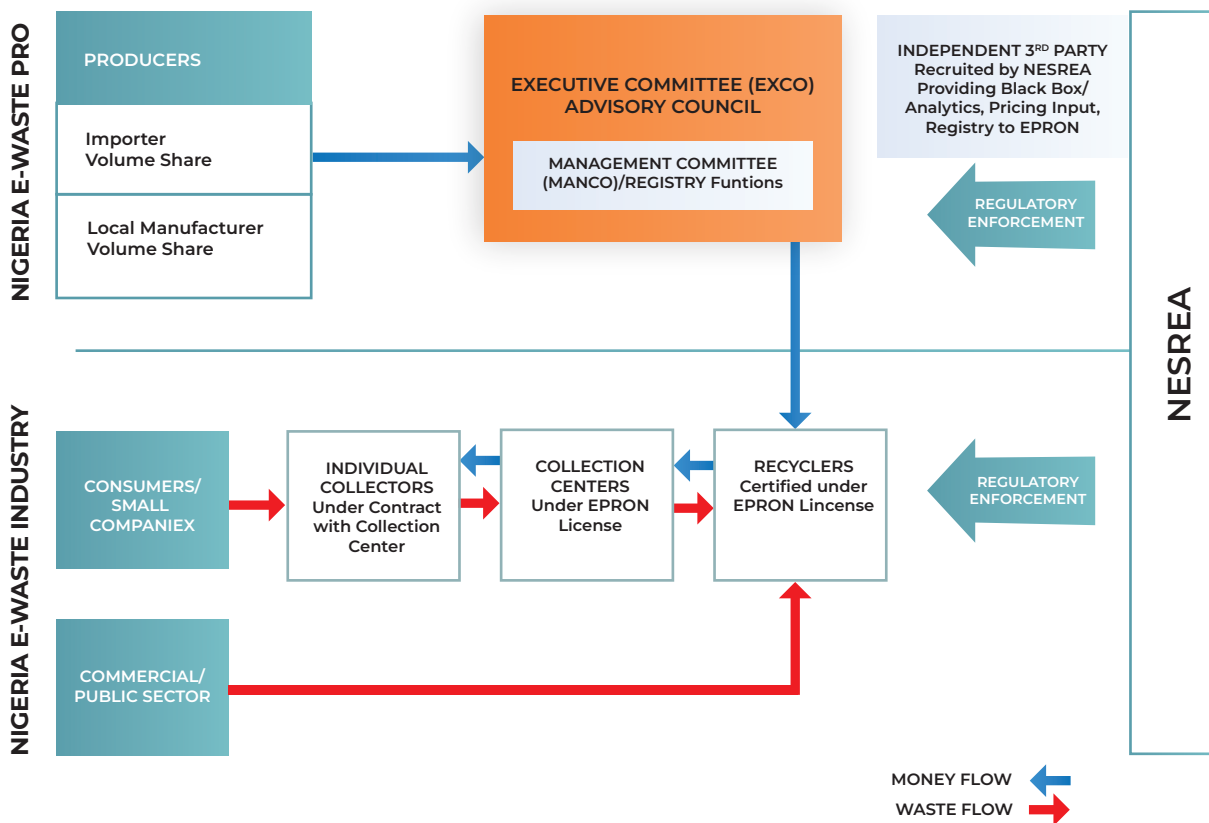


Figure B3. EPR Model for the electronics sector in Nigeria, Source: Guidance Document for the EEE Sector

In January 2023, the Nigerian Government published the National Environmental Electrical/Electronic Regulation 2022 S.I. No 79, 2022. This regulation was an amendment to the National Environmental (Electrical and Electronic Sector) Regulations, 2011. The legislation strengthened Nigeria's EEE sector EPR programme making producers accountable for their products at end of life (UNEP, 2023). The revised regulations mandated all manufacturers and importers of EEE, e-waste collection centres, and recycling facilities to register with EPRON, marking an essential step towards implementing a financially self-sustaining circular electronic network in the country.

Manufacturers, importers and retailers are now legally and financially responsible for the management of their waste products while importers are now no longer allowed to import non-functional electronics into the country.



### Facilitators Guide

Provide clearly the reasons or benefits of adopting the EPR scheme and its role in the e-waste sector

## General Legal Responsibilities of EPRON

The legal responsibilities of EPRON include the following:

1. to register all producers<sup>1</sup> of EEE operating in Nigeria;
2. to setup and manage a database of producers and their products in the black box system<sup>2</sup>;
3. regularly update the database in the black box system and make it available to NESREA quarterly;
4. set up appropriate agreements or contracts with officially recognized collection centres and treatment operators by NESREA, to carry out activities on collection, recycling and treatment of e-waste on behalf of registered producers;
5. conduct inspection of registered collection center or facilities to ensure compliance with the guidelines;
6. carry out periodic auditing of producers, collectors and recyclers of data systems authenticity and accuracy;
7. develop an operating manual of the black box system, in order to enable all stakeholders to understand the security and integrity of the system for managing sensitive data and determining market share;
8. collect appropriate fees and levies from producers, in line with approved levy structure based on an agreed methodology by stakeholders and the 'black box' system;
9. pay collectors and recyclers fees as appropriate;
10. source for funds besides fees and levies to adequately finance research and development, awareness raising, training, capacity building and infrastructure support etc;
11. prepare and submit to NESREA, quarterly and annual summary reports on its activities which are audited by an accredited independent third party;
12. encourage stakeholders to maintain appropriate standards in all operations in line with extant laws, regulations, standards and guidelines;
13. provide professional advisory services to the critical stakeholder along the value chain;
14. create and keep records of registered collection centres, recyclers and treatment operators;
15. collaborate with NESREA, State EPAs and other interest groups to create public awareness on ESM of e-waste and fund such programs based on availability of funds;
16. publish reports regularly to communicate the implementation progress of the PRO; and
17. promote gender mainstreaming in e-waste management in line with Nigeria's National Gender Policy.



### Facilitators Guide

Explain the importance of the black box system and how it works

## Legal Responsibilities of a Formal E-waste Collector

A formal collector is a person or organization that operates a centre or point where e-wastes are collected and aggregated temporarily for the purpose of recycling. It also includes a person who picks up or accepts discarded e-waste from consumers and the informal sector.

<sup>1</sup>Producer as specified by the Nigeria e-waste regulation includes both EEE manufacturers and importers

<sup>2</sup>Black box system is a system that is designed to collect, store, manage, analyse and produce market share information on all producers of EEE in the country for the EPR programme

The following are the major responsibilities of an e-waste collector:

1. register with EPRON and comply with renewal requirements, including submission of quarterly collection plans;



#### Facilitators Guide

Highlight the procedure for application to get approval to operate a collection centre with NESREA and with EPRON. Refer to NESREA website link where requirements can be found.

2. apply for and get approval to operate a collection centre and then register with relevant regulatory and monitoring agencies;
3. collaborate with NESREA, EPRON and States Governments to organize the informal collectors into cooperatives or associations (where they are non-existent), and assist in coordinating their activities;



#### Facilitators Guide

Highlight the procedure for registering with a cooperative in the state and/or starting a new cooperative

4. assist in registering such cooperatives or association with the appropriate government agency;
5. provide incentives (monetary, points etc.) for informal collectors to participate in a more organized structure, (e.g. registered cooperative society or association);



#### Facilitators Guide

Highlight the incentive plan for the state in question for the 6 categories of e-waste adopted by EPRON

6. provide information to consumers on e-waste collection facilities and take-back systems in their neighborhood;
7. comply with standard procedures defined by NESREA and apply best management practices for handling e-waste as specified by Regulations 9(3) of the National Environmental Electrical/Electronic Regulation 2022 S.I. No 79, 2022 ;
8. keep accurate database of categories and quantities of e-waste handled, as well as their sources/origins and mode of delivery in the black box system. The database should be submitted quarterly to NESREA and EPRON monthly. A copy of the reporting template is provided in Annex I;



#### Facilitators Guide

Explain the reporting template presented in Annex I.

9. ensure that your e-waste is stored only in the facility approved for you by NESREA, EPRON and the State regulatory authorities where applicable;
10. submit records of e-waste moved out from collection centres and their destinations quarterly to NESREA and weekly to EPRON;
11. establish and maintain close working relationships/collaboration with duly registered associations and unions involved in handling e-waste in Nigeria; and
12. provide information to producers through EPRON that can be used to design or label products to facilitate collection and recovery when necessary.

To successfully fulfill these requirements, a collector needs to be armed with updated information on the cost of incentives from EPRON to enable appropriate bargaining and compensation of consumers and the informal sector at all times.

## Prohibited Activities of Formal E-Waste Collectors

An e-waste collector shall not be involved in the following:

1. engage in any disposal activities outside the collection centers;
2. engage in any e-waste processing activity (such as dismantling, acid leaching or breaking);
3. burn whole or components of e-waste;
4. deliver whole or components of e-waste to a collection center that is not registered with NESREA and EPRON;
5. deliver whole or components of e-waste to a recycler that is not registered with NESREA and EPRON;
6. dispose of any negative value fractions of e-waste (especially brominated flame retardant(BFR) containing plastics); and
7. export whole or components of e-waste.

## Legal Responsibilities of an Informal E-waste Collector

Given the fact that Collectors will work with informal collectors, it therefore becomes imperative for them to understand what the role of informal workers are and how they can help them to fulfil it successfully. The guidance document for the Implementation of the Extended Producer Programme for the Electrical and Electronic Sector in line with circular economy approaches provides some information on the activities of informal collectors. The informal operators are expected to:

- collect e-waste from consumers (generators of e-waste);
- register with one or more collection centres within an assigned jurisdiction;
- work closely with the assigned collection centres and supply their collected e-waste (without dismantling or pre-processing) with appropriate record keeping by both parties;
- provide data of e-waste collection as required (type, volume, location);
- register with a cooperative of waste collectors and retain active membership annually;
- use approved transportation system/carts;
- ensure the use of appropriate personal protective equipment (PPE);
- receive payment from major collectors or operators of collection centres; and
- provide payment for consumers to take back e-waste.

Note that informal collectors are not permitted to dismantle or separate any electrical or electronic waste collected. In light of the foregoing, operators of collection centres must assist informal collectors associated with their centres to meet all these specified requirements. EPRON/NESREA shall organize periodic training programmes for informal collectors on safe collection and handling of e-waste. The informal collectors shall be expected to undergo, pass and adhere to knowledge/information obtained during such training programmes. Collection centres operators shall cooperate with EPRON/ NESREA to enable their collectors benefit from these training. They shall also organize more frequent trainings to remind these informal workers of the requirements.

## Prohibited Activities of Informal E-Waste Collectors

An informal collector according to **Regulation 28(2) of the National Environmental Electrical/Electronic Regulation 2022 S.I. No 79, 2022** shall not:

1. pre-process any kind of e-waste, either by burning, dismantling etc;
2. dispose of e-waste with domestic or municipal waste;
3. dispose of e-waste in a dumpsite, landfill, water body, or any other location not approved by NESREA/EPRON;
4. break cathode ray tube;
5. release chlorofluorocarbons (CFCs) from refrigerators or any other cooling system;
6. leach precious metals from PWBs with toxic cyanide solution; and
7. give e-waste to an unofficial collectors. E-waste must be handed over only to a Government accredited and EPRON registered formal collector.





#### Facilitators Guide

Lay emphasis on prohibited activities of collectors and concomitant consequences if not adhered to.

## Regulatory Criteria that E-Waste Collection Centre Operators must Meet

For a collection centre to be operational, it must meet certain conditions. This section of the manual highlights these provisions that collection centres must meet.

### **Regulatory Requirements that must be met to Set-up an E-waste Collection Centre**

The following are the requirements for operating an e-waste collection centre according to the **Guidance Doc. Section Two (2.1)**: The operator shall:

1. register with EPRON;
2. obtain e-waste collection centre permit from NESREA (please note that EPRON will not enroll a collector that does not have an operational permit from NESREA);



#### Facilitators Guide

Facilitator must find out registration requirements for the State in question before hand and highlight it during the presentation.

3. ensure a physical traceable Nigerian address, telephone number, e-mail, etc. of such centre shall be known to the public;
4. provide a plan for a registration system for the informal collectors;
5. provide secured storage for collected e-waste until they are sent for further treatment or disposal;
6. shall operate a collection and storage location/premises that do not predispose personnel to harm/accident and is adequately protected to prevent unauthorized persons access to steal stored materials;
7. ensure that all workers use appropriate PPEs at all times; and
8. ensure that the work conditions provided in the facility does not expose workers to hazards associated with e-waste.

## Physical Requirements for an E-waste Collection Centre

An e-waste collection centre shall meet the following conditions specified by **Section two (2.2) of the Guidance Doc.**

1. Premises with sufficient space, access control and appropriate anti-theft measures.
2. Sufficient space dedicated for e-waste storage and having the following features:
  - i. adequate covering to ensure that e-waste is not exposed to rain water, percolation, liquids, sunlight or any source of heat or weather conditions;
  - ii. controlled temperature (not exceeding the ambient temperature 30 -40);
  - iii. adequate lighting and ventilation;
  - iv. shelves properly arranged with gangways for easy movement;
  - v. impermeable floor (with tiles/ or concrete, etc.);
3. Weighing scales and other necessary measuring instruments that shall be calibrated annually and calibration certificates from the Original Equipment Manufacturer (OEM) assigned calibrator.
4. Provide fire emergency and safety equipment.
5. Provide personal protective equipment (PPE) for personnel, safe and conducive environment for workers.



## Participants Exercises B

- i. Which organizations in this State will regulate your e-waste collection activities?
- ii. What will they be looking out for?
- iii. What are the roles of collectors?
- iv. What will you benefit from EPRON?
- v. List any five conditions expected in a facility during inspection.
- vi. Why should collectors not engage in dismantling activities?
- vii. Why do you think there are restrictions on the open burning of e-waste components?
- viii. Mention 5 activities that are prohibited by collectors.
- ix. What legislation guides e-waste management in Nigeria?
- x. Who are the critical actors in the EEE value chain?

# Module C

## Guidelines for E-waste Management - Collection, Transportation and Storage

---

This module contains the technical aspects of e-waste collection, storage and transportation. It provides details of the guidelines for collecting, transporting and storing e-waste. Information of best practices for handling selected components of e-waste, especially the hazardous contents are provided in this section of the manual. The module also highlights the scope of activities of collectors and collection centres.



### Facilitators Guide

1. Presentation slides will be used for the initial delivery of this component of the training.
2. A ledger form that shows quantities and movement of e-waste should be used to explain how e-waste quantities/weights are documented.
3. A field visit to an e-waste collection centre will be incorporated into this module and participants will be trained practically on how to correctly collect, handle, store, transport and document e-waste quantities and movement.
4. A wrap up session will be held after the field visit at workshop venue or as convenient to discuss experiences during the field trip and make recommendations on way forward.
5. Conclude with exercise C

**Training Duration: 5 hours**

## Training Objectives

At the end of this module, participants should be able to:

- have a good grasp of the collection requirements for e-waste collectors and collection centres;
- understand facility requirements to store e-waste;
- understand best practices for e-waste transportation;
- understand how to handle different components of e-waste especially the ones containing hazardous fractions; and,
- understand the need to apply precautions in storing and transporting e-waste.


## Guidelines for Operating E-Waste Collection Centers

There are operational requirements for e-waste collection facilities which a business or individual collector must meet. The following are the requirements for establishing an e-waste collection centre as specified in **Regulation 27 (2) of the National Environmental Electrical/Electronic Regulation 2022 S.I. No 79, 2022**.

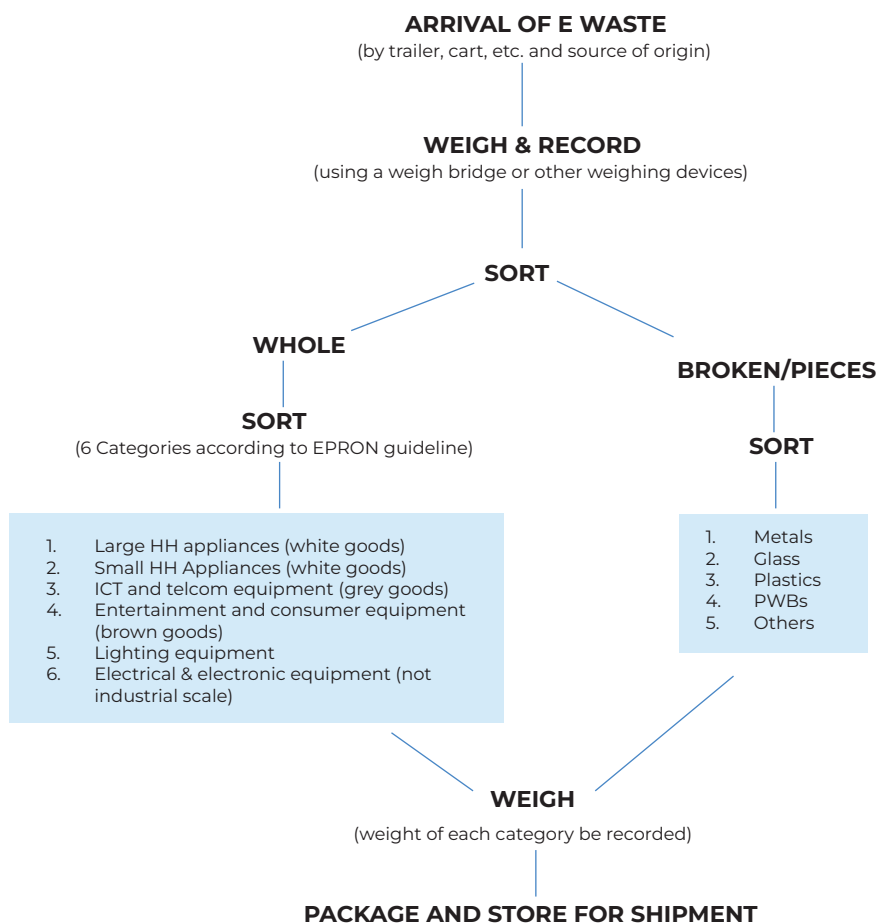
To operate a collection center or provide e-waste collection service, the interested person or business:

1. shall ensure collection centers meet the minimum infrastructure requirement set by EPRON and NESREA, the minimum space requirement for a collection centre that will carry out both Business to Business(B2B) and Business to Consumers(B2C) collection activities is 14m by 9m. Any other collection centre less than this dimension can only be permitted to operate strictly as a B2C collection centre;
2. shall ensure the floor of the storage facility is tiled or impenetrable to liquid that may spill during storage;
3. shall ensure the environment is conducive and safe by providing: fire extinguishers, access space, gang way, safety signs, and shelves in place;
4. shall ensure there is preventive and emergency plan for any environmental risk such as fire from batteries, refrigerant discharge and any other spillage of hazardous materials;
5. shall encourage consumers to remove their personal data from their devices before they are collected and transferred for further treatment;
6. shall ensure that e-waste in storage are NOT exposed to sunlight, heat, rain, or exposure to any form of liquid;
7. shall avoid uncontrolled tipping of e-waste, particularly those that contain hazardous components (e.g. ink cartridge, CRTs, lamps, etc.);
8. shall in the event that international shipment of e-waste needs to be done from a collection centre, it shall comply with the Prior Informed Consent (PIC) procedure of the Basel Convention on Trans-boundary Movements of Hazardous waste and necessary permits obtained from the FMEnv. It must also be done with the express knowledge and permission of EPRON;
9. shall ensure compliance with annual data reporting to the relevant agencies;
10. shall ensure containers, pallets, or packages containing various e-waste components (especially those to be depolluted) are marked clearly and appropriately;
11. shall record accurately in the logbooks quantities of different categories of e-waste accepted, stored and transported to downstream vendors/recyclers;
12. shall ensure e-waste is handled properly at collection point, in order to avoid damages to e-waste components or the release of hazardous substances;
13. shall ensure appropriate measures for e-waste handling and storage are put in place to control allowable stored amounts, and provisions for proper storage of hazardous components (e.g. batteries, CRTs, lamps, etc.);
14. shall ensure there is sufficient space for separating e-waste from other waste types if the facility handles non e-waste (e.g. consumer plastic waste);

15. shall ensure staff are trained on proper handling of e-waste based on technical requirements, on proper use of PPE and emergency responses to health, environment and safety risks;
16. shall ensure that they deal with downstream vendors/recyclers that have relevant certifications from appropriate authorities;
17. shall ensure that a record of collectors operating within the geographical area of the collection centers is kept and always up to date;
18. shall ensure that no e-waste component is dismantled except with written permission from EPRON/NESREA, and that precautionary principle is applied;
19. shall ensure records of types and quantities of incoming and outgoing e-waste from the collection center are kept appropriately;
20. shall ensure safe transportation that ensures that no damage is caused to the environment;
21. shall maintain weekly inventory of all e-waste collected is sent to EPRON;
22. shall ensure annual returns are filed with NESREA on or before the 30th day of June following the financial year to which the returns relate;
23. shall ensure records of the e-waste handled should be made available to NESREA/EPRON; and
24. shall provide evidence showing compliance with section 2.1 and 2.2 of the guidance

 **Facilitators Guide**  
 Explain clearly the steps required to follow in a collection centre when e-waste arrives in the facility.

The flow diagram in **Figure C1** depicts the steps required during collection and handling of e-waste.



**Figure C1.** Flow chart showing various steps involved in e-waste collection



Box C1. Pictures of cartridge, CRT and lamps

## Guidelines for E-waste Transportation

These guidelines apply to a person, a group of people or company that transports e-waste. Before and during transportation of e-waste, appropriate documentation shall be maintained. To transport e-waste locally, the materials shall be accompanied by a consignment note stating the category, quantities, source and destination. Though collectors are not empowered to export e-waste and its components in Nigeria, it is still pertinent to point out that for the export of e-waste the exporter must fulfil all the conditions of the Prior Informed Consent (PIC) of the Basel Convention on Transboundary Movement of Hazardous Waste. Details of the procedure can be obtained from the FMEnv/NESREA.



### Facilitators Guide

Detailed explanation should be made on training of drivers and their attendants

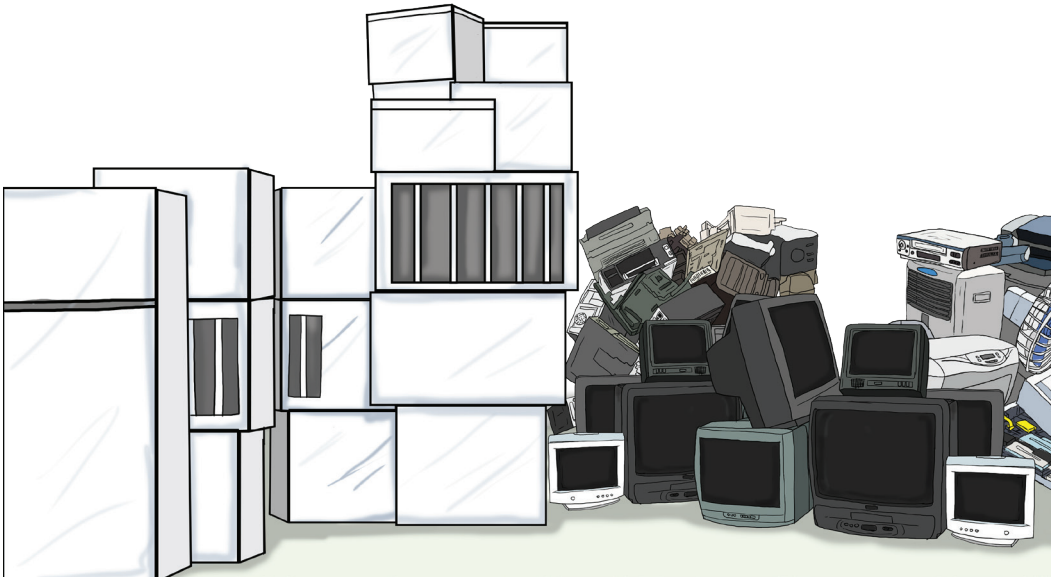
The following guidelines shall apply to the transportation of e-waste:

1. transporters shall be registered with EPRON;
2. transporters shall undergo training/briefing to ensure they understand the requirements;
3. transporters must have all the applicable licenses and permits including local/state/federal governments permits for transporting e-waste;
4. trucks used for transporting e-waste shall not be used for food contact;
5. transporters shall:
  - i. make sure all hazardous substances are stacked properly in the transport vessel to avoid release of hazardous material into the environment;
  - ii. enumerate standard operating procedures (SOP) for handling of e-waste and solutions for emergencies during transportation;
  - iii. ensure that all the e-waste shipped must be transported in a closed unit. An open vehicle is allowed to transport e-waste only when the e-waste are stored and transported in tightly closed receptacles; and
  - iv. alert road users by using hazard signages on the vehicles transporting e-waste, notify appropriate authorities in case of an accident;



**Box C2. A covered truck loading e-waste.**

6. must not convey e-waste with other materials during transportation;
7. uncontrolled tipping of containers with e-waste such as CRTs, flat panel display equipment, temperature exchange equipment, gas discharge lamps, equipment containing gas discharge lamps and any other equipment that have potential to release hazardous components when broken shall not be permitted to prevent accidental discharges. Example: If mercury containing lamp is broken during the tipping process, the mercury would easily evaporate into the ambient air with concomitant health hazard to both humans and environment;
8. transporters shall comply with the Basel convention provision on trans-boundary movement of e-waste in terms of international shipments;
9. transporters shall not:
  - i. divert e-waste to another destination except the agreed destination by the collector and EPRON;
  - ii. transfer e-waste to unregistered collector or recycler, in the event that a vehicle becomes faulty in transit or there is an accident or mechanical fault during the movement in the process of e-waste movement from one point to another, EPRON should be notified;
  - iii. dispose of e-waste without permission of EPRON/NESREA;
  - iv. burn whole or components of e-waste;
  - v. engage in dismantling, treatment, storage of e-waste;
10. transporters shall ensure that the capacity of e-waste transported complies with road traffic regulations; e.g. avoid overloading of e-waste in the vehicle, using closed containers to convey e-waste, except where otherwise permitted;
11. transporter shall use proper receptacles and procedures to avoid release of hazardous substances due to breakages of the materials being transported and leakages of hazardous substances.
12. special attention shall be given to CRTs, flat panel displays, equipment with mercury and lamps, printed circuit boards, batteries, and refrigerant gases;
13. breakable end-of-life EEE, assemblies, components and parts shall be packaged and loaded to ensure they are not damaged during loading and transportation;
14. appropriate PPEs are worn during handling including loading and offloading of the UEEE;
15. transporters shall ensure appropriate labeling of the e-waste category as well as proper notification procedures;



### Box C3. Pictures of unnecessary stockpiling

16. loading and offloading of e-waste shall be carried out using the appropriate tools, to prevent breakages thereby releasing hazardous materials into the environment;
17. transporters shall ensure that the means of transportation is appropriate and adequate for the type and quantity of e-waste to be moved;
18. there shall not be any dangling or protruding parts outside the vehicle;
19. the vehicle shall be certified road worthy to avoid unnecessary breakdowns along the route;
20. provide appropriate firefighting equipment in the vehicle such as fire extinguishers;
21. the consignment shall be covered to protect from rain and excessive hot weather conditions;
22. incompatible categories of e-waste cannot be transported together except they are in separate and well-sealed containers that will not spill open in the event of an accident;
23. if e-waste is loaded in receptacles, such containers shall be clearly identified and labelled according to applicable regulations. As with storage, it is particularly important to label containers according to their contents, so that they are not later mismanaged or processed incorrectly;
24. appropriate procedures for lifting, handling such as forklifts and mobile truck loaders should be used for loading and unloading to ensure movement of the waste carried does not bring about damage; and
25. transporters of e-waste shall participate in mandatory training programmes organised by the relevant government agencies such as EPRON and NESREA.

### Guidelines for Storage of E-waste

These guidelines shall apply to a person or company that stores e-waste in a collection centre to be transferred for further treatment.

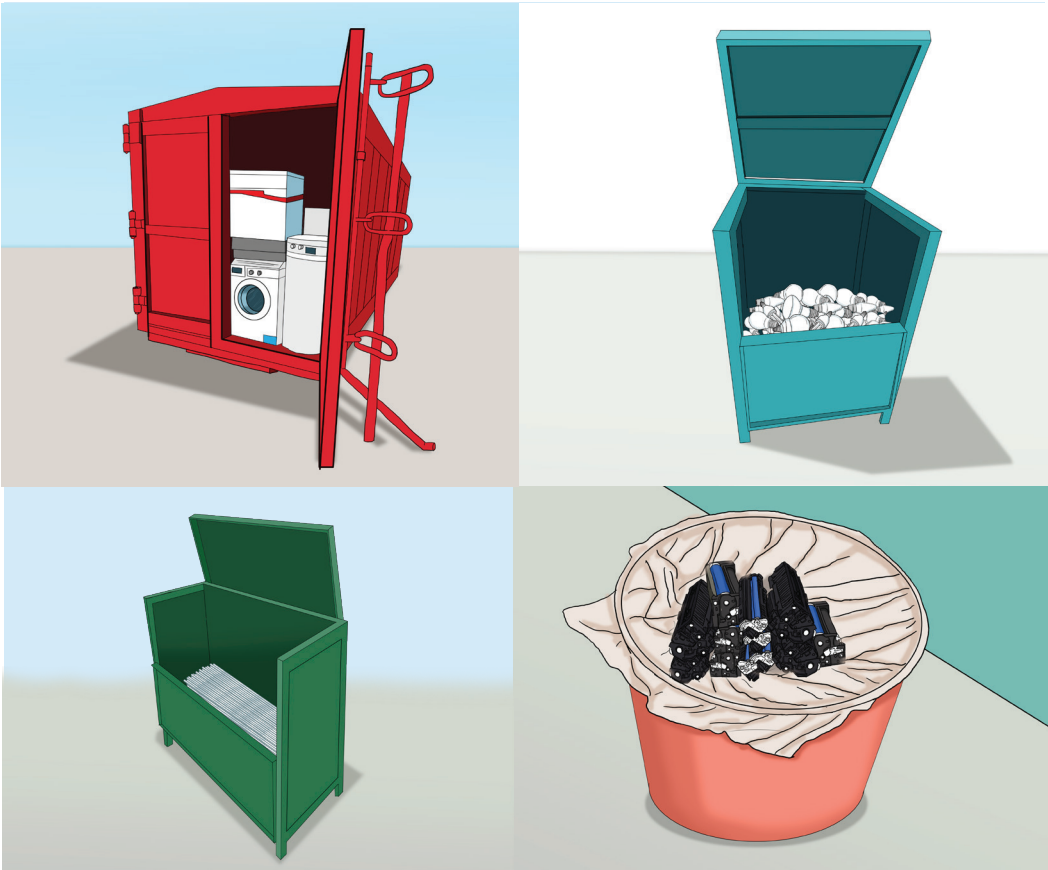
1. Facilities shall be secured against theft and unauthorized entry.
2. Stored e-waste shall not exceed the storage capacity of the facility.
3. E-waste shall be stored in receptacles according to their respective categories and types. Components containing radioactive substances, toner cartridges, substance containing asbestos, batteries, printed circuit boards, cathode ray tubes etc. shall be specially stored to avoid breakage and subsequent leakage of hazardous materials to the environment.





#### Box C4. loading ewaste on a truck

4. E-waste shall be stockpiled according to categories, on shelves and in appropriate receptacles, properly labelled with appropriate housekeeping and fire fighting equipment provided in the storage facility.
5. Ensure appropriate first aid and emergency procedures are in place.
6. E-waste shall be protected from weather, either by a surrounding wall, concrete floor that is protected from the entry of storm water, especially when intended for treatment, re-use so as to prevent contamination or damage of e-waste and also avoid emission that are hazardous to the environment.
7. Special attention shall be given during handling and storage to the following:
  - i. temperature exchange equipment (to avoid damage to the temperature exchange system), as well as unnecessary damage to the insulation material of such equipment). For example: the compressor and cooling circuit of a refrigerator or air conditioner is a temperature exchange system that shall not be destroyed to prevent the discharge of refrigerants;
  - ii. CRT equipment (to avoid implosion and/or emissions of fluorescent coatings);
  - iii. gas discharge lamps (and appliances that contain gas discharge lamps);
  - iv. appliances containing mercury switches (to avoid breakage resulting in the release of mercury);
  - v. smoke detectors (as they may contain radioactive components);
  - vi. appliances containing oil and other fluids within an internal circuit, or capacitors containing mineral or synthetic oil (to avoid spillages and other emissions);
  - vii. appliances containing asbestos or ceramic fibers (to avoid release of asbestos or ceramic fibers);
  - viii. photovoltaic panels (to prevent injury from broken glass and electrocution caused through contact with hazardous voltages generated when the panels are exposed to light);
  - ix. lead-acid batteries or devices containing lead-acid batteries (to prevent emissions of acid and lead particles); and
  - x. lithium-ion batteries (to prevent them from overheating and ignition which can cause fire outbreak).



Box C5. Pictures of E-waste stored appropriately in the right kind of receptacles



### Participants Exercises C

- i. Name five things that should be done to ensure e-waste is handled properly during collection, storage and transportation and why?
- ii. Why should a well-trained/ behaved driver only be engaged to transport e-waste?
- iii. Why should e-waste be stored away from sun and rain and on impervious surface?
- iv. Describe the best approach to transport e-waste.
- v. Why is it important to sort e-waste before storing?
- vi. What will you do if you mistakenly break a screen or lamp? What emergency plan should be put in place to control this?
- vii. What will you do if you receive negative value components?
- viii. What will you do if your vehicle transporting e-waste breaks down or has an accident?
- ix. What will you do if you receive a consignment that is not e-waste?

# Module D

## Substances of Concerns in E-waste Handling

---

This module provides an overview of some e-waste types containing substances of concern and therefore requires specialized handling. It also contains case studies of good and bad practices. This aims to further explain to the collectors activities that are good – which they can follow, and those that are not allowed because they are outside the scope of activities approved for them and also because they expose the operators and the environment to harmful chemicals.



### Facilitators Guide

1. This module shall be taught using PowerPoint presentation indicating a lot of illustrations and pictures on e-waste containing substances of concern
2. Good and bad e-waste management practices shall also be highlighted.
3. Depending on the class size, divide the participants into groups, each group should not be larger than 10 for adequate participation. Give them questions on their respective case studies (10 minutes). The case studies will draw out the salient points such as pollutants, exposure route, effect on workers, effect on the environment and on other members of the society.
4. Ask the groups to report summary of their discussion/recommendations back to plenary (3 minutes each).
5. Conclude with exercise D

**Training Duration: 2 1/2 hours**

## Training Objectives

At the end of this module, participants should be able to:

- Understand that some e-waste components contain harmful chemicals.
- Understand good and bad practices especially for selected e-waste components.
- Understand some bad practices with the potential to cause adverse impacts and how they can be avoided.

## Substances of Concern in E-waste

E-waste generally contains hazardous substances hence the need for specialized management which has been expressly highlighted in previous sections of this manual. However it is important to identify and emphasize these substances of concern in certain e-waste.

### Brominated Flame Retardant (BFR) Containing Plastics

Plastics are a major component of EEE. At present, most non-BFR plastics at end-of life of EEE find many applications. These are easily bought by downstream vendors who recycle them to make other plastic products like chairs, pipes, etc. However, BFR plastics with less value are often abandoned on the premises of: repair shops and dismantling sites or dumpsites and are finally burnt releasing dangerous furans and dioxins to the environment. Figure D1 shows typical dumping of low-quality plastics, usually BFR plastics at backyard and dumpsites, perhaps waiting to be burnt. If you find yourself receiving plastic components in your collection centre perhaps as components from repairers or packaged as e-waste, the following important steps should be taken.

- Plastic fractions readily identified to contain BFRs shall be separated from others and stored separately, plastics with the same chemistry shall be stored together and labelled.
- No plastics shall be exposed to heat, rain and storm water during storage.
- All forms of plastics shall not be pulverized at storage; however, they could be compressed to reduce volume provided there shall be no release of hazardous substances to the environment.



Figure D1. Dumping of low-quality plastics, usually BFR plastics

## Printed Wiring Boards (PWBs) and Capacitors

Printed wiring boards (PWBs) contain lead, tin, antimony, chromium, beryllium oxide, cadmium, etc. They are usually found in electronic products and are one of the most sort after components of e-waste because they contain precious metals. They are graded differently based on the type of products they are recovered from. PWBs recovered from cell phones are rated as the highest grade because they contain the highest amount of precious metals (gold) with high economic value.

PWBs are components of concern because they contain two hazardous components namely BFR containing plastics and capacitors. Plastic parts mounted on PWB contain restricted BFR, therefore, they shall be treated as described in relevant sections of this manual for BFRs. PWBs also contain capacitors which have many uses in electrical and electronic systems. Capacitors contain hazardous chemicals including mercury and radioactive compounds. They also possess the ability to retain charge for quite a longer time after power is removed from a circuit. This has been observed to cause dangerous electrical shocks. Therefore, all appliances with capacitors shall be disconnected from any energy sources for a few days before being stored or transferred for further treatment. The following important steps must be taken to prevent hazards from PWBs if we find them in broken e-waste brought to the collection centre.

- Do not crush PWB or use acids or chemicals to leach valuable metals out of it.
- Do not crush or open capacitors.
- De-soldering of printed wiring board (PWB) to recover gold is vehemently prohibited.
- Acid leaching and precipitation of PWB with cyanide is an unacceptable, highly polluting practice.
- Special boxes and clear labelling are required to store capacitors before and during transport of PWB containing capacitors.

## Cathode Ray Tubes (CRTs) Screens

A CRT screen consists of a plastic case (ABS/ PC), a cathode ray tube (CRT) with an attached magnetic deflector and electron gun, printed wiring board (PWB) and cables. CRTs are one of the most complex and challenging e-waste components to be managed. CRTs are quite old fashioned and have been replaced with flat screens in more recent years. The CRT contains lead (Pb) chemically fused with the different glass layers making the glass layers at end-of-life very difficult to recycle to other product as new CRTs are no longer in vogue. They also contain large quantities of phosphor.

Considering the fact that a vacuum is applied to the interior of all CRT monitors, the lead and the phosphor in it could be released when it breaks in an uncontrolled environment. The monitor could also implode if the outer glass envelope is damaged. If this happens the impact from the implosion will be so high that it could cause fractions to bounce and explode outwards with splints travelling at potentially fatal velocities. In view of the foregoing CRTs need to be handled with care to avoid cracks and breakages that could result in personal injury and exposure to lead chemicals. The following precautions should be taken with CRTs in a collection centre.

- CRTs should be stored in a well packaged manner to prevent breakage during storage and transport.
- Damaged or broken CRT should be handled with care and sealed off with a cling film as hazardous levels of lead could be released.
- Dusk mask and other appropriate PPEs should be worn while handling a broken or cracked CRT monitor.
- On no account should pressure be applied to a CRT screen to deliberately break it open.

The common practice in managing CRTs in developing countries is to force it open and recover the copper coil while the glass layers are abandoned in any available space (Figure D2). This practice is highly polluting and unacceptable. CRT glasses can only be processed in a licensed treatment centre, in that regard, EPRON must be specially notified of consignments with CRT to enable us assign the consignment to appropriate recyclers with the capacity to handle them.



**Figure D2. Improper disposal of CRT glass**

## Lamps

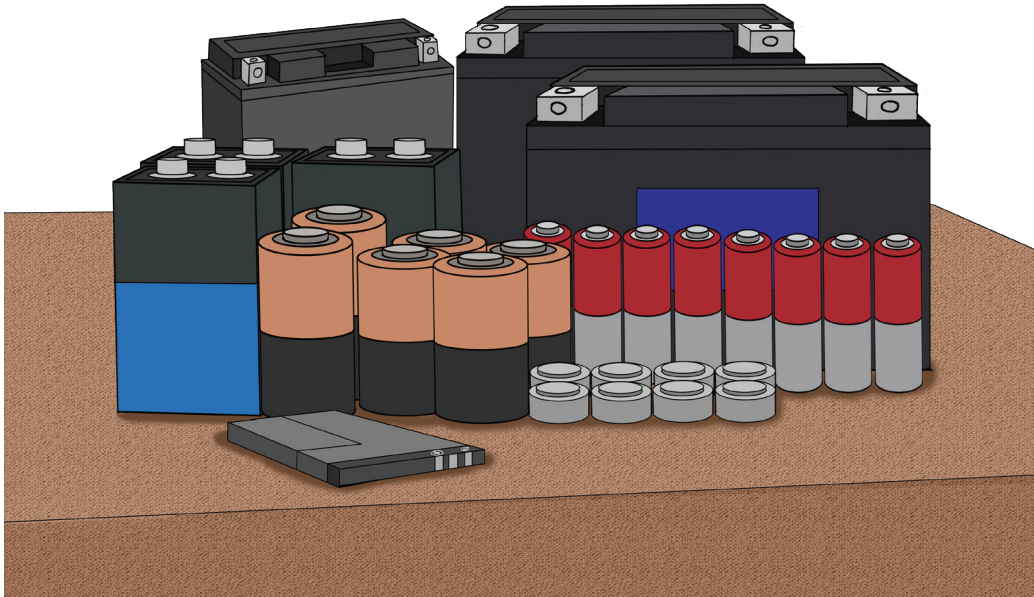
Lamps contain mercury (Hg) and other potentially harmful substances. Special attention shall be given to the collection, transportation and storage of lamps. Lighting wastes can only be processed in specialized lamp treatment facilities. These facilities are technically competent and legally compliant and work with strict technical SOPs. When handling lamps in a collection facility, the important precaution that must be taken are hereby outlined.

- Gas discharge lamps shall not be exposed to direct sunlight.
- All lamps are stored until enough volume is obtained for transportation, it shall be stored in safe and strong containers or boxes on site.
- The storage area shall be inside or under cover with protection from the weather elements and preferably lockable.
- Long term maximum storage for lamps shall not exceed 90 days (SRI, 2019).
- Containers shall be labelled showing that they contain hazardous lighting wastes together with the UN code which shall be provided.
- Lighting wastes shall NOT be manually dismantled prior to the treatment process as it is dangerous.

## Batteries and Accumulators

E-waste contain batteries with different chemistry including lithium ion batteries. For safe keeping of batteries in collection centres, the following important points must be adhered to regularly. These batteries shall be sorted and kept together according to their chemistry.

- All batteries shall be stored away from heat or rain, to avoid explosion.
- Lithium ion batteries and other lithium containing batteries shall be stored in insulating material such as sand to short-circuit the batteries preventing them from explosion.
- Avoid long time storage of batteries. Batteries are subject to corrosion and cell rupture, which could release reactive hazardous substances (heavy metal oxide, organic solvents, and sulphuric acid).
- All batteries shall be stored in acid-resistant barrels.
- They should be stored in a dry and sheltered place with controlled temperature.
- Batteries shall not in any case, be incinerated in an open fire or with municipal waste.
- Never crush or open any battery during storage.



Box C1. pictures of different battery types

## General Bad Practices

Bad/worst practices have been defined as activities that are known or suspected to have severe (typically multiple) negative impacts on the environment, workers/ community health and safety, and quality and quantity of recovered secondary metals, when applied by any economic operator in any of the processes concerning collection, manual and mechanical processing, metallurgical processing and disposal (**Karcher et al. 2018**).



### Facilitors Guide

1. Case studies should be used to teach the adverse effects that different bad e-waste practices could cause. Case study 1 should look at the adverse effect of burning of cables
2. Case Study 2 should look at the adverse effects of thermal extraction or manual dismantling of a CRT box.

Some of the common harmful practices usually experienced in Nigeria are highlighted here. It is important for collection centre operators to be familiar with these practices. Providing them with this knowledge will not only inhibit them from engaging in these practices, they will also be in a better position to inform others (consumers and informal collectors) not to practice such.

1. Putting e-waste in the dustbin alongside other municipal solid waste.
2. Landfilling of e-waste with other waste streams.
3. Burying e-waste fractions especially the hazardous components underground.
4. Open burning as contaminants could easily be released to the atmosphere as well as leach into the soil and pollute both soil and groundwater resources causing considerable environmental pollution.
5. Open burning of cables to stripe the copper wires.
6. Disposal of CRTs into dumpsite, drainage or surface water bodies.
7. Breaking CRT tubes or lamps.
8. Burning PWBs in the open to recover of precious metals.
9. Burning BFR plastics in uncontrolled environment.

10. Crushing and mixing BFR-plastics with other plastics used to manufacture plastic-ware that come in contact with food.
11. Poor housekeeping during collection and handling.
12. Unsound transportation and trading.
13. Poor housekeeping in transportation vehicles.
14. Dangerous manual dismantling practices or Unsafe manual dismantling.
15. Processing of e-waste outside recycling facilities.
16. Inefficient and dangerous metallurgical processing.
17. Low-tech, unsound 'smelting' and 'off-burning.'
18. Amalgamation practices.
19. Other low-tech, unsound chemical leaching.



Box D1. Pictures depicting general bad practices

## Bad Practices Associated with Specific E-waste Components and Collection Centre Activities

While the different bad practices, have been adequately highlighted above, it is especially important to note some of the bad practices associated with certain types of e-waste. It is very important for collectors to refrain from these practices.

### Pre-processing Cooling Appliances

The cooling circuit contains oil that can be contaminated with ozone depleting substances (ODS) refrigerant. Some refrigerators and chest freezers manufactured prior to 2000 have mercury-containing components (i.e., switches and relays). Appliances manufactured prior to 1979 may contain poly-chlorinated bi-phenyls (PCB) capacitors. For this reason, appliances should be recycled by facilities that safely remove these components prior to shredding and recycling (USEPA, 2023). Pictures of some common bad practices of dismantling/dismantled components of cooling systems are depicted in Figure D3. Remember, collectors are not to practice any form of dismantling. Dismantling activities are completely limited to recyclers who are well equipped and trained to do so.



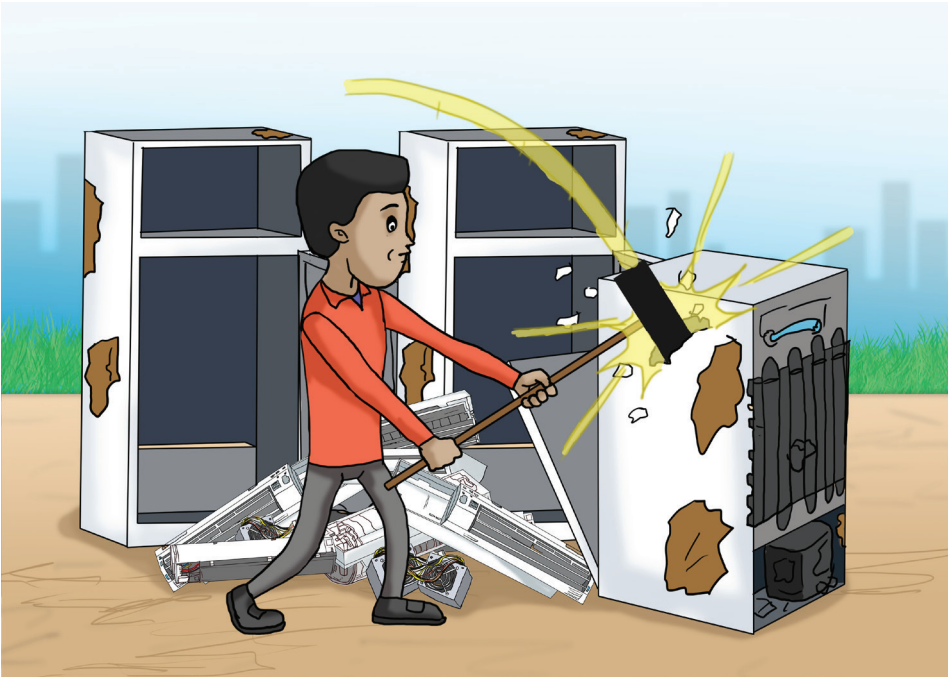


Figure D3. Examples of bad practices of dismantling cooling devices by the informal sector

### *Copper Recovery from Burning Cables*

Worst form of recovering copper involves burning off waste cables in open fires that scald off the outer insulating plastic covering for the recovery of copper residues. Copper is then recovered as the desired product. Insulation makes up an average 38% of cables and is composed of Polyvinyl Chloride or PVC (66.3%) and Polyethylene (31.2%) as well as other materials (2.5%). By burning the insulation, dioxins, furans, as well as other harmful chlorine (Cl) compounds, such as Polychlorinated Biphenyls (PCBs), and about 1.6 kg of CO<sub>2</sub> -eq per kg of recovered copper are released (Safaei et al., 2018). See some typical practices in Figure D4.



Figure D4. Informal collectors burning waste cables to recover copper wires

### Poor Housekeeping Practices in a Collection Facility

Poor house-keeping is considered as one of the worst practices as it encourages inappropriate sorting, including storing of e-waste with dissimilar chemistry together, thereby liable to damaging or breaking of the e-waste with hazardous component, as such releasing dangerous chemicals to the environment, it could also lead to a fire hazard in the facility. Poor house-keeping also harbors rodents and reptiles that usually find their homes into e-waste, at times destroying components that could still be re-used. Furthermore, workers could be endangered from bites by reptiles like snakes that could lead to death. Figure D5 shows poor housekeeping in an informal facility. This is unacceptable in a collection centre.



Figure D5. Poor housekeeping practices in an informal facility

### Improper E-waste Transportation

Proper packaging and use of appropriate transport vehicles to move e-waste, especially those containing substances of concern is very key. E-waste with hazardous components needs to be transported, respectively, in labeled and covered vehicles to alert other road users on the associated danger as well as to prevent direct contact with precipitation and heat. Transporting e-waste in open vehicles could expose the waste to precipitation and heat with capacity to initiate reactions that can cause explosion. Furthermore, there is every possibility of hazardous substances leaching from the waste when in direct contact with precipitation. Figure D6 depicts a typical informal urban miner transporting hazardous materials in an inappropriate vehicle. This is a bad practice that needs to be checked and corrected.



Figure D6. Informal transportation of hazardous e-waste in uncovered vehicles

### Good Practices associated with Specific E-waste Components and Collection Centre Activities

Good practices are generally those conscious efforts made by all stakeholders in the e-waste management chain to ensure the waste is managed in environmentally sound manner without/or with reduced harm to human health and the environment. Good practices are not only those advanced and expensive technologies, but include many other simple, but efficient techniques that meet the minimum standards for sound management of e-waste. **Table D1** adopted from *Karcher et al (2018)* highlight some clusters of worst practices with the corresponding good practices to prevent or reduce the bad ones.

Table D1. Cluster of bad/worst practices and corresponding good practices

Cluster of worst practices	Good Practices
1. Unsound collection practices ( <i>poor house keeping during collection: handling, logistics and facilities</i> )	<ol style="list-style-type: none"> <li>1. Provision and use of PPEs</li> <li>2. Adequate licensed storage facilities with sufficient operational space</li> <li>3. Dedicated safe storage space for batteries and other hazardous waste, fractions or materials</li> <li>4. Proper stockpiling of e-waste during storage, categorization of waste types and clear labelling of material</li> <li>5. Resolution of any non-compliance regulations governing collection</li> <li>6. Prevention of cherry-picking of valuable during collection</li> <li>7. Awareness raising on risks to health and the environment</li> <li>8. Training on Good Practices (e.g., classification and handling of hazardous wastes)</li> </ol>
2. Unsound transportation and trading ( <i>Non-compliant trading and poor house keeping in transportation</i> )	<ol style="list-style-type: none"> <li>1. Resolution of any non-compliance transportation and trade related regulations and international agreements</li> <li>2. Implementation of a traceability scheme such as chain-of-custody</li> </ol>

	<ol style="list-style-type: none"> <li>3. Awareness raising on risks to health and the environment</li> <li>4. Use of appropriate vehicle in good condition with required fire fighting equipment such as fire extinguisher</li> <li>5. Provision of training on Good Practices in house keeping and compliance with regulations and international agreements for transportation and trading</li> </ol>
3. Unsound disposal ( <i>open burning and open dumping</i> )	<ol style="list-style-type: none"> <li>1. Closing of uncontrolled open dumping sites</li> <li>2. Awareness raising on the dangers of uncontrolled open dumping and existing alternatives</li> <li>3. Use of legally authorised facilities that provide sound disposal methods</li> </ol>

### Proper E-waste Transportation

Transportation of e-waste has certain minimum required guidelines. E-waste liable to leaching out some hazardous components when in contact with water or reacting and could explode when in contact with heat are expected to be transported in a closed system to prevent direct contact with rain and heat, respectively. Very importantly, there is currently an advocacy on inclusivity of the informal sector in formal e-waste management along the value chain. The informal sector cooperates when they understand that they have intrinsic human right to be fully insured, fairly paid and to work in appropriate, licensed facilities no matter the position along the value chain and region of the world they come from. This requires that in addition, the environmental, health and safety (EHS) measures, such as appropriate PPEs are promptly provided for any activity to be carried out. Figure D7 shows registered and organized informal collector with uniform and labeled carts. In this way, e-waste would be collected and sorted according to the specifications in the extant regulations.



Figure D7. Organised informal collectors with uniform and labelled carts

### *Proper Housekeeping in Collection Centres*

Housekeeping is a critical area in ESM of e-waste. Apart from the good practices mentioned in Table D1, storage of secondary metal carriers and wastes should be in a closed-off space, protected from the elements by a roof and an impermeable (sealed) floor, with all necessary infrastructure in place for workers to conduct proper arrangements such as the unpacking, repacking and sorting.

In tropical climates with high humidity and temperature levels, the storage of fridges, freezers and other cooling appliances should be temperature controlled since the formation of water pools (e.g. in the defrosting phase) could cause problems of hygiene and disease (mosquitoes breeding grounds). Furthermore, the layout of a facility is also important and should allow for the necessary space and movement for the purposes of storing and handling materials. This would facilitate cleaning the warehouse and the complete removal of any accumulated and potentially health-impacting dust. Collection facilities must be cleaned daily. To avoid the danger of dislocation and accidents due to collapsing piles of materials, the facility needs dedicated and sufficient space within the collector's storage facility to receive materials for preliminary offloading and rearrangement steps and for safe storage prior to dispatch.



#### **Participants Exercises D**

- i. What is the best way to handle cooling devices, CRTs, and lamps?
- ii. Mention any five bad practices and give reasons for classifying them as bad practices.
- iii. Describe the good practices of handling two e-waste containing substances of concern.
- iv. Why is housekeeping important?

# Module E

## Data Protection and Documentation in E-waste Collection

---

This module is intended to guide the collectors on proper record keeping. It also highlights the need for protection of personal/private information/data in e-waste devices handed over to them for ESM.



### Facilitators Guide

1. This module shall be taught using PowerPoint presentation highlighting the importance of record keeping and data protection.
2. Indicate the procedure on how best records are expected to be kept and transferred.
3. Highlight the different techniques for data destruction, highlighting their advantages and disadvantages
4. Show the procedure on how data are destroyed using a named technique and how to confirmed the destruction.
5. Have class exercise at plenary using an arbitrary case study and figures to show how specific records are kept and data destroyed
6. Conclude with exercise E

**Training Duration: 1 hour.**

## Training Objectives

At the end of this module, participants will be able to understand:

- the need for record keeping;
- the need to protect personal data in the e-waste storage devices;
- reporting requirements that must be met; and
- the reporting approach.

## Inventory Keeping and Reporting

Record keeping should be an integral part of the daily routine of a collection centre. They are required to keep up to date record of incoming and outgoing materials as well as the quantities in storage with dates. It is especially important for the data to be accurate, recording should be prompt and the data should be retained over a period of time for correspondence and validation. Due to the likelihood that some collection centres also handle other recyclables (e.g. plastics and paper) it shall be important to separate records for e-waste (collected, stored and transported) from other waste types. Sections should be created within the premises for the different types of wastes.

## Inventory Keeping

Collection centres shall keep accurate day to day inventory of all the e-waste collected. This shall be done electronically as specified in the **Guidance Document for the implementation of the Extended Producer Programme for the Electrical and Electronic Sector in line with Circular Economy**. Collectors shall maintain a good record keeping practice, this is very necessary for the business. It is important to note that inventory keeping is required when e-waste is collected, while it is on site and when it is leaving the collection centre. In view of the following; collectors must take note of the following requirements and conditions.

1. Collectors shall weigh and record every incoming e-waste, inventory keeping should include: the collection date; the source of the e-waste; types/categories of e-waste collected (whole and fractions to be noted specially); the quantity (kg) of e-waste collected



### Facilitators Guide

Collectors form in Appendix should be used to highlight this and to demonstrate what records need to be kept.

Highlight the need for source recording for forensic and other security reasons.

Highlight the value of accurate data

2. Since data will be submitted weekly to EPRON, it may not be out of place for the data collected to also be loaded promptly onto the EPRON data collection software.
3. For e-waste in storage within the collection centre, it is especially important for e-waste collectors to harmonize their inventories regularly, ensuring the following: posted dates in the storage area are consistent with the dates on the material tags; e-wastes shall not be stored longer than one year; and e-waste within the storage area corresponds with the items on the inventory sheet.
4. An inventory of the outgoing e-waste is also important. Outgoing record keeping shall include the following: weight of the e-waste; categories/types of the outgoing e-waste; destinations of the outgoing e-waste (assigned recycler); transporter taking the e-waste/ means of transportation to the destination (transporter /type of vehicle) and the quantities of e-waste transported.
5. A consignment note, shall accompany any e-waste transported.
6. All shipment or consignment notes must be done in multiples of four, and signed by the collector, transporter and the receiving recycler.

7. This information should promptly be made to EPRON as soon as the shipment leaves the collection centres as payments will be made monthly following confirmation of inventory from the recycler.
8. Periodic audits shall be conducted of the inventory to ensure that data collection is maintained and validated.
9. EPRON's financial calendar runs from February 01 to the end of January the following year, in that regard, it is advisable for e-waste collectors to maintain inventory and financial reports that will align with that time frame.

## Why Keep Accurate Inventory?

- Accurate inventory keeping is required for a number of reasons.
- For appropriate planning; target setting etc
- For accurate reporting to the Regulatory Authorities and also globally to each Producer

## Reporting

The following are the reporting requirements of collectors as specified in the **Guidance Doc**.

1. Reporting of e-waste collected shall be done weekly to the PRO(EPRON).
2. Reporting will also be done to any other Regulatory Organization that desires the records.



### Facilitators Guide

Confirm from the State Regulatory Offices, what type of data they will require from the collectors and get them to confirm the format of receipt.

3. Records\ evidence to show e-waste was given to formal recyclers(shipment notes) must be maintained regularly and kept for a minimum of five years before destroying or disposal or deleting from the system.

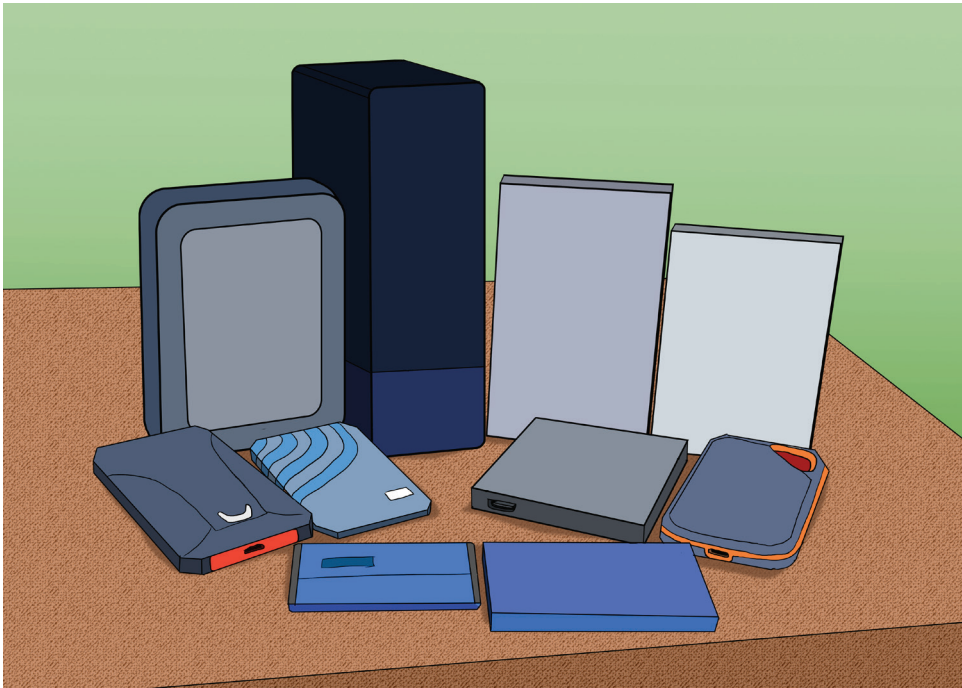
Monitoring is an essential part of programme implementation. It is to ensure that at every stage, the programme is on track and delivering the desired outputs/outcomes. The performance of this EPR Programme is monitored by means of an Automated Monitoring System that is linked to the EPR database in the black box system. The key performance indicators are displayed on the system dashboard that is accessible to only NESREA and EPRON. The monitoring dashboard is also used by NESREA and EPRON to validate the self-reported data from producers.

## Data Protection and Security

Organizations or individuals within organizations have a duty of care to ensure that any confidential data they hold is not released in an unauthorized way. On June 12, 2023, Nigeria Data Protection Act, 2023 was signed into law ("Data Protection Act" or "the Act"). This is a primary legislative framework for the protection of personal information of natural persons residing or doing business in Nigeria. Before this act was signed into law, data protection in Nigeria was ensured through the Nigerian Data Protection Regulation, 2019 ("NDPR"), issued by the National Information Technology Development Agency (NITDA). This subsidiary legislation was the main data protection provision in Nigeria until the Data Protection Law came into place. Therefore collection centres must note the following important points..

1. The Act places a legal obligation on a data controller or data processor to ensure the security, integrity and confidentiality of personal data in its possession or under its control. To this effect, the data controller or data processor is mandated shall implement appropriate technical and organizational measures to ensure this, including protection of the personal data against accidental or unlawful destruction, loss, misuse, alteration, and unauthorized disclosure or access.
2. Consumers should be advised on the data protection obligations so that collectors do not become liable.





### External hard drive

3. Advice on the process for removing private or confidential data must be prominently displayed in collection centres.
4. Data shall neither be removed nor accessed in collection centres.
5. Information shall be made available to persons giving up of EoL EEE with data storage media to make sure they are aware that file deletion does not mean privacy data has been fully removed. This is especially important for corporate Consumers.
6. The collection centres MUST at no time access data on the devices they have collected.
7. It is illegal for an operator of a collection centre to try to access or use the data on any e-waste collected or make the data available for use or be transferred to a third party.
8. Accredited collection centres are considered by the public as a secure place to drop e-waste without data bridges. Any loss of data associated with a collection centre could bring about litigation. It is therefore very important to train Staff not to access or trade any device or information on the devices taken back at any point in time.
9. Collection centres that so desire can provide data destruction services to Consumers, if this is the case, please notify EPRON for a review of the implementation plan for the activities.



#### Facilitors Guide

At this point ask the collection centre if they will be able to maintain this level of trust and confidence reposed in them by the society and EPRON . If they are not, this is the point where they speak up.



#### Participants Exercises E

- i. Mention any three reasons/benefits of accurate record keeping and reporting
- ii. Highlight three data that must be kept during collection of e-waste.
- iii. Who is responsible for the cleanup of data from a non-functional device?
- iv. Why does e-waste shipment to a recycler require a consignment note.
- v. Name three important data that must be in a consignment note
- vi. Identify two components of data protection rights

# Module F

## Health and Safety Management in Collection Centres

---

This module is intended to guide the collectors on the importance of health and safety during e-waste collection, handling, transportation and storage. It emphasizes the need for e-waste collection facilities to have some important elements of an occupational safety and health system such as safety and health policy, risks assessment to include hazard identification and management as well as an Emergency Response Plan (ERP). Like all management system, this should be communicated to the staff and also translated to local languages and should be properly circulated/displayed. There is also need to always put on appropriate PPEs within the facility.



### Facilitators Guide

PowerPoint should be used to:

1. Explain the need to adopt appropriate risk mitigation measures in daily operations
2. Understand the importance of periodic training on HSE on the use of PPE and other HSE related issues;
3. Comprehend the need for an Emergency Response Plan which should contain mitigation measures in case of an emergency etc
4. Group Exercises should be used to elucidate the understanding of this sessions. Participants should be assigned in groups and each group should work on the elements of the occupational safety and health system
5. At plenary, request participants to identify mitigation measures that are necessary in a collection centre and transport system, identify appropriate PPE needed for certain operations.
6. Conclude with exercise F1

**Training Duration: 1 hour.**

## Training Objectives

At the end of this module, participants will be able to:

- Understand the need to adopt appropriate risk mitigation measures in daily activities;
- Identify the risks associated with collection and handling of e-waste
- Understand the importance of periodic training on HSE;
- Understand the need to use PPE, and
- Comprehend the need for an Emergency Response Plan which should contain mitigation measures in case of an emergency.

## Health, Safety and Environment

Studies have shown that crude management of e-waste by especially informal sector releases toxic substances contained in the waste into water, air, soil, dust, and food with concomitant adverse effect on people who interact directly or indirectly with these media. E-waste contains more than 1,000 chemicals, many of which are harmful to man and the environment. Workers engaged in informal e-waste processing can also take some pollutants home in their clothing and fingers/hands. Dioxin-like compounds are released as unintentional byproducts in low-tech e-waste recycling operations including manual disassembly, shredding/comminution, roasting circuit boards, acid-stripping metals, and open burning of e-waste containing chlorinated polymers and/or brominated additives such as polyvinyl chlorides and brominated flame retardants (*Dai et al., 2020*). Studies have shown that such low-tech e-waste recycling facilities have been an important emission source for dioxin like compounds (DLCs), and have contaminated the nearby agricultural environment (*Dai et al., 2020*). The burning of e-waste and breaking of CRT tubes releases harmful substances including heavy metals such as lead, mercury, cadmium and others, halogenated compounds, polybrominated diphenyls ethers (PBDEs), and dioxins. The potential adverse health effects of some toxic components of e-waste on humans are summarized in **Table F1**.

**Table F1. Potential adverse health effects of toxic components of e-waste on humans**

Toxin	Typical source	Effect on humans
Mercury	Fluorescent lamps, LCD monitors, switches, flat panel screens	Impairment of neurological development in fetuses and small children, tremors, changes in emotions, cognition, motor function, insomnia, headache, changes in nervous response, kidney effects, respiratory failure, death
Lead	CRTs of TV, computer monitor, PWBs	Probable human carcinogen, damage to brain and nervous systems, slow growth in children, hearing problems, blindness, diarrhea, cognition, behavioural changes and physical disorder
Chromium	Untreated and galvanised steel plates, decoration of hardener for steel housings	Asthmatic bronchitis, skin irritation, ulceration, respiratory irritation, perforated eardrums, kidney damage, liver damage, pulmonary congestion, oedema, epigastric pain, erosion and discolouration of the teeth, motor function

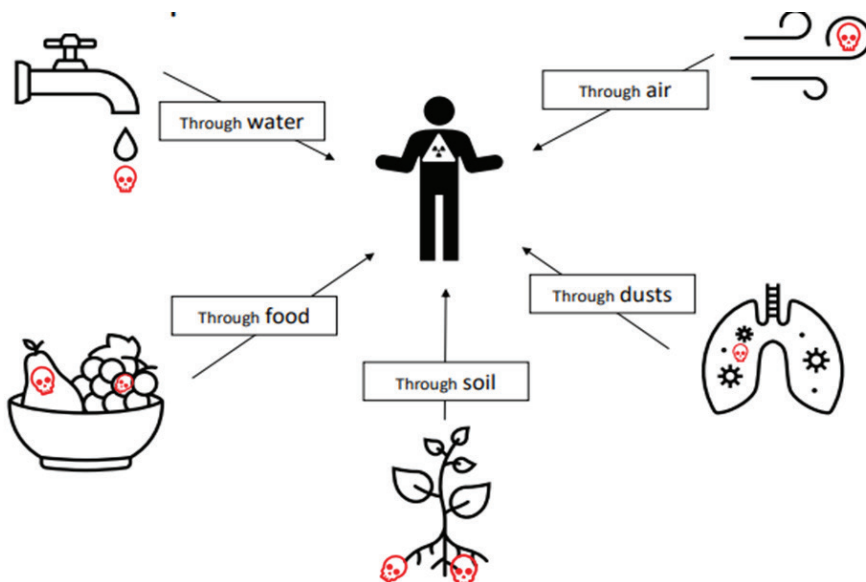
**Table F1. Potential adverse health effects of toxic components of e-waste on humans (CONT'D)**

Toxin	Typical source	Effect on humans
BFR	Plastic casings, circuit boards	May increase cancer risk to digestive and lymph systems, endocrine disorder
Cadmium	Light-sensitive resistors as corrosion retardant, Ni-Cd battery	inhalation due to proximity to hazardous dump can cause severe damage to the lungs, kidney and cognition

Source: UNEP, 2007; Osibanjo et al., 2016.

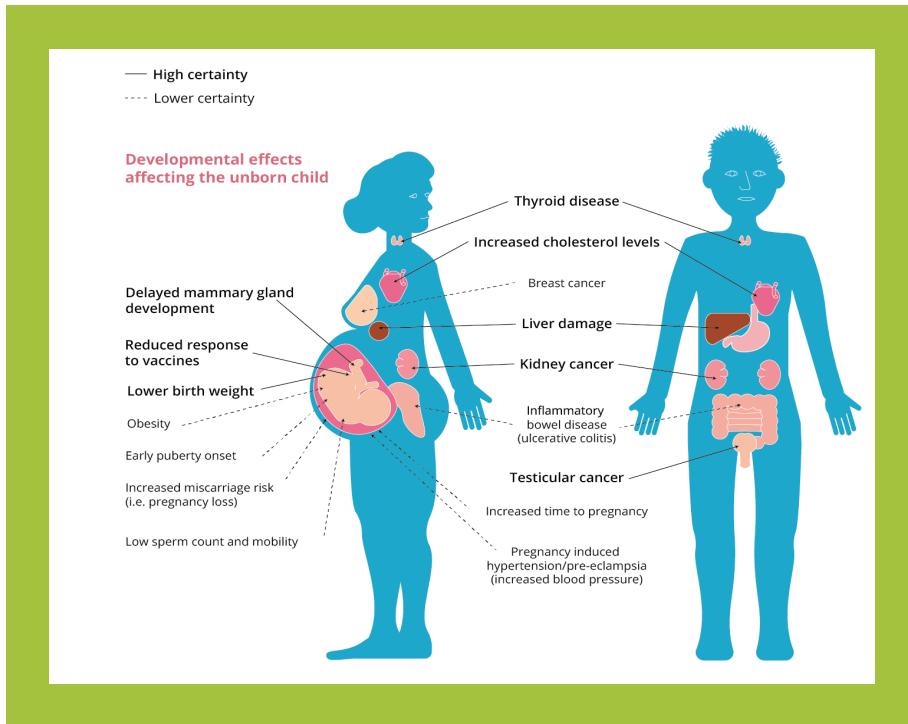
The exposure routes for these pollutants and other chemicals released when inappropriate options are adopted for e-waste management are presented in Figure F1. Workers can be exposed to chemicals contained in e-waste from contaminated food and water, poor house-keeping and hygiene, from inhaling dusts containing chemicals released from e-waste and from absorption through the skin. Thus, there is need to always use PPE.

**Facilitors Guide**  
 Highlight the adverse health effects from toxic components of e-waste using suitable illustrations like those in Figures F1 and F2



**Figure F1. Exposure routes of harmful chemicals contained in e-waste**

People living around such e-waste facilities or passersby can also be exposed through the same routes. It is important to also mention that all parts of the human body can be adversely affected by chemicals from e-waste as shown by the adopted illustration in Figure F2. This once again underscores the reason why improper e-waste management activities are prohibited in collection centres.



**Figure F2: Impact of persistent chemicals on human body, Source: Groups Demand Ban on a Class of Dangerous “Forever Chemicals” (pressenza.com)**

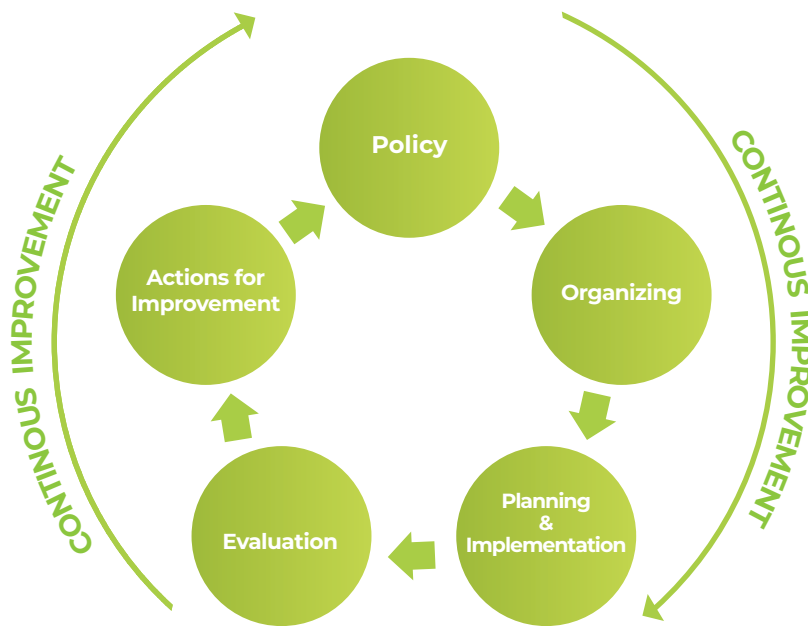
It is important to note that children and pregnant women are more vulnerable to many of these pollutants given the sensitivity of the developing systems, lower immunity and smaller body mass of the children and the unborn foetus. Children engage in hand to mouth activities they are therefore predisposed to the intake of these pollutants. It is important that children are not allowed to play around e-waste processing facilities (**Figure F3**).



**Figure F3. Children playing around e-waste dump/storage sites**

## Key Health and Safety Elements Required in Collection Centres

Beyond all these potential hazards associated with informal practices, a collection centre conducting its activities as specified by the standards, will still need to take appropriate precautions to ensure workers health and the environment is not jeopardized during their operations. As highlighted in the previous sections, different types of e-waste contains hazardous components, it therefore becomes imperative that an occupational safety and health (OSH) management system, commensurate with the activities of the collection centres must be in place (Figure F4). This is the primary responsibility and a duty of care of the owner of the collection centre, EPRON is however willing to provide guidance when required to enable operators of collection centres to carry out their activities safely.



**Figure F4. Main elements of the OSH management system**

The following, basic critical elements of an OSH system, must therefore be in place in the collection centres (ILO, 2001). These elements were adopted from the International Labour Organization Guidelines on occupational safety and health management systems.

### Occupational Safety and Health(OSH) Policy

The business owner in consultation with other staff, should develop an OSH policy, which should be:

1. specific to the collection centre and appropriate to its size and the type of e-waste it collects and stores;
2. it should be concise, clearly written, dated and made effective by the signature of the Chief Executive Officer (CEO) or the most senior accountable person in the organization;
3. it should be communicated and readily accessible to all persons at their place of work;
4. it should be reviewed for continuing suitability and made available to relevant external interested parties, as appropriate.
5. The content of the OSH policy should specify as a minimum, the following key principles and objectives to which the organization is committed:
  - protecting the safety and health of all members of the organization by preventing work-related injuries, exposures, ill health, diseases and incidents;
  - complying with relevant Nigerian OSH laws and regulations, voluntary programmes, collective agreements on OSH and other requirements to which the collection centre subscribes;
  - ensuring that workers and their representatives are consulted and encouraged to participate actively in all elements of the OSH management system; and
  - continually improving the performance of the OSH management system.

If the collection centre has other management systems in place, the OSH management system should be compatible with it or integrated with it.

### **Organizing (Responsibility and Accountability)**

The CEO has overall responsibility for the protection of workers' safety and health, and provide leadership for OSH activities in the organization. He must however ensure that the responsibility, accountability and authority for the development, implementation and performance of the OSH management system and the achievement of the relevant OSH objectives is appropriately allocated to specific employees as an OSH responsibility by ensuring the key actions outlined in this subsection.

1. The structures and processes that will ensure that OSH is a line-management responsibility which is known and accepted at all levels should be established.
2. The CEO or representative should define and communicate to the members of the organization the responsibility, accountability and authority of persons who identify, evaluate or control OSH hazards and risks.
3. Effective supervision, as necessary, to ensure the protection of workers' safety and health must be provided.
4. Cooperation and communication among members of the organization, including workers and their representatives, on how to implement the elements of the organization's OSH management system must be fostered.

### **Competence and Training**

One of the effective ways to mitigate risks in a collection facility is training. Staff of collection centres and especially those designated to handle e-waste must be regularly trained on the hazard identification, recording and safe handling of items and e-waste with substances of concern as well as appropriate response to incidents such as spills and medical emergencies. The OSH competence required in the collection centre should be defined by the employer, and arrangements established and maintained to ensure that all persons are competent to carry out the safety and health aspects of their duties and responsibilities. The Collection centre should have access to, sufficient OSH competence to identify and eliminate or control work-related hazards and risks, and to implement the OSH management system in the collection centre. Owners of collection centre should therefore take appropriate steps to ensure that their employees are trained and this should cover all members of the organization as appropriate. More importantly operators of collection centres must therefore ensure that their staff attend all the OSH trainings provided by EPRON/ NESREA in their geographical area. All visitors/consumers/short term workers/contract staff including third party contractors/ vendors should be briefed on the OSH requirements of the facility. Facilities should be demarcated to determine access restrictions to loading and storage areas.

Depending on their level of involvement in the day to day activities of the collection centre, it is important to train and re-train staff to be acquainted with both the good and bad practices (and the likely health and environmental consequences). Staff should be trained on operational, environmental, safety, health and emergency aspects and on the use of Personal Protective Equipment (PPE).

## Occupational Safety and Health Management System Documentation

Each collection centre shall establish and maintain OSH management system documentation commensurate with the size and type of e-waste collected by the centre. This will include:

1. the OSH policy (this should be visibly displayed at facility) and objectives (communicated to all staff) of the organization;
2. the allocated key OSH management roles and responsibilities for the implementation of the OSH management system;
3. the significant OSH hazards/risks arising from the organization's activities, and the arrangements for their prevention and control with clear instructions provided to all staff in the most understandable way and where necessary should be translated to local languages. Other important documentation includes:
  - records arising from the implementation of the OSH management system;
  - records of work-related injuries, ill health, diseases and incidents;
  - records arising from national laws or regulations dealing with e-waste and or OSH in work place;
  - records of workers' exposures, surveillance of the working environment and workers' health including medical records; and
  - the results of both active and reactive monitoring.

## Communication

Arrangements and procedures should be established and maintained for:

1. receiving, documenting and responding appropriately to internal and external communications related to OSH such as incidents in the workplace, this should be displayed;
2. ensuring the internal communication of OSH information between relevant levels and functions of the organization; a good way of achieving this is through the use of pictorial illustration of dos and don'ts which should be presented to remind workers of both the good and bad practices.

It is also important to ensure that the concerns, ideas and inputs of workers and their representatives on OSH matters are received, considered and responded to promptly. This can be achieved , through the incident report boxes placed in strategic positions within facilities or note books. All persons should have access to incident reporting.



Box F1. Appropriate PPEs



## Planning and implementation

For every collection facility, an initial review of the OSH system and the outcome will serve as a basis for establishing an OSH management system. Appropriate considerations should be made for all the current applicable national laws and regulations, national guidelines, tailored guidelines, voluntary programmes and other requirements to which the organization subscribes to. This review will also include a risk assessment of all the hazards associated with the collection centre.

### Risk Assessments

The centre must establish effective arrangements to identify and eliminate or control work-related hazards and risks, and promote health at work.

Risk assessments should be conducted to examine risk that may arise from all points of the activities of the collection centre.

The main stages of a risk assessment include:

- identifying risks and how they may arise with the involvement of all employees; and
- assessing likelihood and impact of the risk.

### Mitigation Measures

- Following the risk assessments, risks mitigation measures should be put in place. In developing the mitigation plans, the business owner should note the following important points.
- Mitigation measures should be appropriate and commensurate with the hazard level. For example, the risk of being injured by falling e-waste components from high piles can be reduced by sufficient storage space, as well as structures (e.g. shelves, walls) to prevent such hazards. For lamps contain mercury, it is recommended that appropriate mask should be put on while handling lamps.
- Every personnel shall be required to wear PPEs while at work. The PPEs used will depend on the types of e-waste collected within the facility (based on hazard identification and mitigation including risk assessment workshops conducted with all employees) for example, hand gloves will be required for all e-waste types, also safety boots, eye goggles, dusk mask, safety boots and apron.
- Hazards and risks to safety and health arising from the existing or proposed work environment and work organization must frequently be identified, anticipated and assessed to determine whether planned or existing controls are adequate to eliminate hazards or control risks.
- Analyses of the data provided from workers' health surveillance must be done annually to determine exposure and impact of exposure if any.

The result of the initial review should: (a) be documented; (b) become the basis for making decisions regarding the implementation of the OSH management system; and (c) provide a baseline from which continual improvement of the organization's OSH management system can be measured.

### System Planning, Development and Implementation

Planning would facilitate the creation of an OSH management system that supports at the very minimum, compliance with national laws and regulations; the elements of the organization's OSH management system; and continual improvement in OSH performance in the facility.

Arrangements should be made for adequate and appropriate OSH planning, based on the results of the initial review, subsequent reviews or other available data.

These planning arrangements should contribute to the protection of safety and health at work, and should include:

1. a clear definition, priority setting and quantification, where appropriate, of the organization's OSH objectives;
2. the preparation of a plan for achieving each objective, with defined responsibility and clear performance criteria indicating what is to be done by whom and when;
3. the selection of measurement criteria for confirming that the objectives are achieved; and;
4. the provision of adequate resources, including human and financial resources and technical support, as appropriate.

The OSH planning arrangements of the organization should cover the development and implementation of all the elements of the OSH management system.

### **Emergency Prevention, Preparedness and Response**

Every collector shall have an Emergency Response Plan for the potential hazards in their facility. Such plan shall have mitigation measures in case of an emergency including medical emergencies and this shall conspicuously be displayed within the facility. Emergency prevention, preparedness and response arrangements should be established and maintained and should be commensurate to the size, nature and activities of the collection centres. These arrangements should identify the potential for accidents, medical and other emergency situations, and address the prevention of OSH risks associated with them. In light of the foregoing, the following points below must be adhered to:

1. Typical emergencies associated with the collection centres such as fires, injuries, workers health etc should be identified and arrangements should be put in place to ensure that the necessary information, internal communication and coordination are provided to protect all people in the event of any emergency at the worksite; for example a muster point should be determined and communicated, fire extinguishers should be on site, first aid boxes with assigned trained first aider etc.
2. Also important are information to, and communication with, the relevant competent authorities, and the neighborhood and emergency response services. All of these should be in place;
3. Relevant information and training shall be provided to all members of the organization, at all levels, including regular exercises in emergency prevention, preparedness and response procedures.
4. Emergency prevention, preparedness and response arrangements should be established in cooperation with external emergency services and other bodies where applicable.

### **Performance Monitoring and Measurement**

To ensure continuous improvement of the system, it is necessary to monitor, measure and record OSH performance on a regular basis. The arrangement for the monitoring should be developed, established and periodically reviewed. Responsibility, accountability and authority for monitoring at different levels and on different activities shall be allocated to assigned persons within the facility.

The performance indicators will also be set based on the size and nature of activity of the organization and the OSH objectives of the collection centre. These will be based on the organization's identified hazards and risks, the commitments in the OSH policy and the OSH objectives in line with international best practices.



## Participants Exercises F

- i. Why must underage be restricted from your facility
- ii. Why should operators use PPE?
- iii. How will you go about a risk assessment?
- iv. Why must you apply precaution in all activities at the facility?
- v. Give any three reasons for regular training.

## REFERENCES/FURTHER READING

1. BAN/SVTC (2000). Exporting Harm: The High-Tech Trashing of Asia. (Basel Action Network and Silicon Valley Toxics Coalition). [www.ban.org](http://www.ban.org) and [www.svtc.org](http://www.svtc.org)
2. Dai, Q; Xu, X; Eskenazi, B; Asante, K; Chen, A; Fobil, J; Bergman, A; Brennan, L; Sly, P; Nnorom I.C; Pascale, A; Wang, Q; Zeng, E.Y; Zeng, Z; Landrigan, P.J; Drisse, MN, B Huo, X (2020) Severe dioxin-like compound (DLC) contamination in e-waste recycling areas: An under-recognized threat to local health. *Environment International* 139 (2020) 105731. <https://doi.org/10.1016/j.envint.2020.105731>
3. EU (2003). European Union WEEE Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE); European Commission. Official Journal of the European Union: Luxembourg, 2003; pp 24–38.
4. GIZ/BMZ (2019) E-Waste Training Manual. 2nd Revised Edition. Document elaborated under the programme Environmentally Sound Disposal & Recycling of E-Waste (E-Waste Programme). Supporting Ghana to introduce a sustainable e-waste management system. Published by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. Vienna, Austria, 2019. [giz2019-e-waste-management.pdf](http://giz2019-e-waste-management.pdf) and <https://www.giz.de/de/downloads/giz2019-e-waste-management.pdf>
5. ILO(2001). Guidelines on occupational safety and health management systems, ILO-OSH Geneva, International Labour Office, 2001; pp 5-17
6. Karcher, S. Y.; Valdivia, S., Schlupe, M. (2018). From Worst to Good Practices in Secondary Metals Recovery: FACT SHEETS. Developed to support the implementation of the Guidance Principles for Sustainable Management of Secondary Metals ISO IWA 19: 2017€
7. Laws in Nigeria (2022). Data protection laws of the world - Nigeria, DLP Piper, <https://www.dlapiperdataprotection.com/?t=law&c=NG> Dec 2022
8. Nnorom, I.C. and Osibanjo, O. (2008a). Overview of electronic waste (e-waste) management practices and legislations, and their poor applications in the developing countries, *Resources, Conservation and Recycling*, 52(6): 843 - 858.
9. Odeyingbo, O; Nnorom, I.C; Deubzer, O (2017) Assessing import of used electrical and electronic equipment in Nigeria. Person-in-the-Port Project. November, 2017. UNU-ViE SCYCLE and BCCC Africa (Funded by BMZ/GIZ and US-EPA). [http://collections.unu.edu/eserv/UNU:6349/PiP\\_Report.pdf](http://collections.unu.edu/eserv/UNU:6349/PiP_Report.pdf)
10. OECD (2001) Extended Producer Responsibility: A Guidance Manual for Governments. Paris OECD (Organisation for Economic Cooperation and Development; 2001. Available at [http://www.oecd-ilibrary.org/environment/extended-producer-responsibility\\_9789264189867-en](http://www.oecd-ilibrary.org/environment/extended-producer-responsibility_9789264189867-en)
11. Osibanjo, O. (2009) E-Waste Control along the Supply Chain: Challenges and Prospects. Paper presented at National Environmental Standard Regulation and Enforcement Agency (NESREA) International Conference on E-Waste Control, Abuja-Nigeria, July 20–21, 2009.
12. Osibanjo, O; Nnorom, I.C; Adie GU; Ogundiran, M.B and Oketola-Adeyi, B (2016) Global Management of Electronic Wastes: Challenges Facing Developing Economies in Transition Countries in the Management of Electronic Waste. In: *Metal Sustainability: Global Challenges, Consequences, and Prospects*. Edited by Reed M. Izatt. Wiley Interscience Publishers (Book Chapter). Chapter 3. Pp. 52-84.
13. Osiko, A. (2022). Tackling the fastest growing waste stream: E-waste, GSMA publication. <https://www.gsma.com/mobilefordevelopment/blog/tackling-the-fastest-growing-waste-stream-e-waste/>
14. OTDG (One Trust Data Guidance) (2022). Nigeria - Data Protection Overview | Guidance Note | DataGuidance, <https://www.dataguidance.com/notes/nigeria-data-protection-overview>
15. Safaei, A., Symeonidis, A., Valdivia, S., Ottiger, F. (2018). Life Cycle Assessments of Selected Worst Practices in Secondary Metals Recovery and Recommendations to Move Towards Good Practices, available at [https://www.sustainable-recycling.org/wp-content/uploads/2018/09/LCI-Worst-Practices\\_180831\\_.pdf](https://www.sustainable-recycling.org/wp-content/uploads/2018/09/LCI-Worst-Practices_180831_.pdf)

16. Singh, R., Khan, S.A. and Siddiqui, S. (2020). Fastest Growing Waste: E-waste, *Asian Journal of Advanced Research and Reports* 11(1): 20-24. [https://www.researchgate.net/publication/342133251\\_Fastest\\_Growing\\_Waste\\_E-waste](https://www.researchgate.net/publication/342133251_Fastest_Growing_Waste_E-waste).
17. SRI (2019) Technical Guidelines on Environmentally Sound E-Waste Management for Collectors, Collection Centers, Transporters, Treatment Facilities and Final Disposal in Ghana. Environmental Protection Agency (EPA) with the support of the project "Sustainable Recycling Industries" (SRI). [https://www.sustainable-recycling.org/wp-content/uploads/2018/03/eWaste-GuidelinesGhana\\_2018\\_EPA-SRI.pdf](https://www.sustainable-recycling.org/wp-content/uploads/2018/03/eWaste-GuidelinesGhana_2018_EPA-SRI.pdf)
18. StEP (2012) What is E-waste? StEP — Solving the E-Waste Problem. Accessed July 7, 2013, [http://www.step-initiative.org/index.php/Initiative\\_WhatIsEwaste.html](http://www.step-initiative.org/index.php/Initiative_WhatIsEwaste.html)
19. The Global E-waste Statistics Partnership (GESP). <https://globalewaste.org/statistics/country/nigeria/2019/>
20. UNEP (2007) E-waste Volume I: Inventory Assessment Manual. United Nations Environmental Programme Division of Technology, Industry and Economics, International Environmental Technology Centre Osaka/Shiga. [http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/EWasteManual\\_Vol1.pdf](http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/EWasteManual_Vol1.pdf).
21. UNEP (2007) Inventory assessment manual, E-waste volume 1, UNEP Division of Technology, Industry and Economics (DTIE), Osaka, Shiga, [www.uneo.org](http://www.uneo.org).
22. UNEP (2023) Nigeria acts to fight growing e-waste epidemic, <https://www.unep.org/gef/index.php/news-and-stories/press-release/nigeria-acts-fight-growing-e-waste-epidemic>
23. USEPA (2023) Frequently Asked Questions about Safe Disposal of Refrigerated Household Appliances, <https://www.epa.gov/section608/frequently-asked-questions-about-safe-disposal-refrigerated-household-appliances>
24. Widmer, R., Oswald-Krapf, H., Sinha-Khetriwal, D., Schnellmann, M; Boni, H. (2005) Global perspective on e-waste; *Environmental Impact Assessment Review* 25, 436 - 458.
25. Nnorom, I.C; Osibanjo, O. (2008b) Sound management of brominated flame retarded plastics from electronic wastes: state of the art and options in Nigeria. *Resources Conservation and Recycling* 52: 1362–1372,

# ANNEX 1. COLLECTORS REPORTING TEMPLATE

Name of Collector	
Facility	
Contact E-mail	
Date	
Period Covered	

DATE OF RECEPTION	SHIPMENT NUMBER	ORIGIN, TYPE OF SOURCE	ID NUMBER OF BRINGING THE WASTE	CATEGORY	PRODUCT TYPES	NUMBER PER PRODUCT (UNIT) IN THE BATCH	MISSING PARTS			WEIGHT OF COLLECTOR	WEIGHT (KG) COLLECTOR	AMOUNT PAID PER KG IN NAIRA	RECYCLING CENTER WHERE THE WAST WAS TRANSPORTED	ID OF THE BATCH DELIVERED TO THE RECYCLING CENTER	DATE OF DELIVERY TO RECYCLING CENTER	WAS THE DELIVERY REJECTED?	PROVIDE REASON OF REJECTION	PROVIDE CURRENT DESTINATION OF THE LOAD
	Assign a number to each batch of ex-waste received	Select from the list, type "Other" if not on the list.	Assign one ID number to each collector bringing the waste. Use "0" for citizens.	Select "Note select "not e-waste" for impurities	Select from the list, if the item is not on the list, use "Other" type "other"		Please indicate if the equipment was missing any parts	Number of units missing	Please explain what parts were missing. Eg compressor etc.					Assign one batch number and complete the rows of the waste sent in the batch				

# GLOSSARY AND DEFINITIONS

**Environmentally sound disposal** - means disposal in a manner which will protect human health and the environment against the adverse effects of the hazardous wastes and other wastes.

**Environmentally sound management** - means taking practicable steps to ensure that hazardous wastes or other wastes are managed in a manner which will protect human health and the environment against the adverse effects which may result from the wastes; "environmentally sound manner" means in a manner which will protect human health and the environment against the adverse effects which may result from hazardous wastes and other wastes.

**CFC Chlorofluorocarbons** - a family of organic chemicals composed of chlorine, fluorine and carbon atoms, usually characterised by high stability contributing to a high ODP. These fully halogenated substances are commonly used in refrigeration, foam blowing, aerosols, sterilants, solvent cleaning, and a variety of other applications. CFCs have the potential to destroy ozone in the atmosphere.

**HCFC Hydrochlorofluorocarbons** - a family of chemicals related to CFCs, which contains hydrogen, chlorine, fluorine, and carbon atoms. HCFCs are partly halogenated and have much lower ODP than the CFCs. Examples of HCFC refrigerants HCFC-22 (CHClF<sub>2</sub>) and HCFC-123 (CHCl<sub>2</sub>F<sub>3</sub>).

**HFC Hydrofluorocarbons** - a family of chemicals related to CFCs, which contains one or more carbon atoms surrounded by fluorine and hydrogen atoms. Since no chlorine or bromine is present, HFCs do not deplete the ozone layer. HFCs are widely used as refrigerants. Examples of HFC refrigerants are HFC-134a (CF<sub>3</sub>CH<sub>2</sub>F) and HFC-152a (CHF<sub>2</sub>CH<sub>3</sub>).

**ODP Ozone depletion potential** - a relative index indicating to which extent a chemical product may cause ozone depletion. The reference level of 1 is the potential of CFC-11 and CFC-12 to cause ozone depletion. If a product has an ozone depletion potential of 0.5, a given weight of the product in the atmosphere would, in time, deplete half the ozone that the same weight of CFC-11 would deplete. The ozone depletion potentials are calculated from mathematical models, which take into account factors such as the stability of the product, the rate of diffusion, the quantity of depleting atoms per molecule, and the effect of ultraviolet light and other radiation on the molecules. The substances implicated generally contain chlorine or bromine.

**ODS Ozone depleting substances** - any substance with an ODP greater than 0 that can deplete the stratospheric ozone layer. Most of ODS are controlled under the Montreal Protocol and its amendments, and they include CFCs, HCFCs, halons, methyl bromide and carbon tetra chloride.

**Carrier:** A natural or legal person who transports hazardous wastes and other wastes by means of conveyance such as trucks, taxi, auto bus, aircraft, train, or ship.

**Collector:** A natural or legal person or organization that picks up or accepts discarded electrical and electronic equipment (EEE) from a consumer.

**Collection:** Includes the mixing, bulking and sorting of wastes and interim storage at an approved site or facility for hazardous wastes and other wastes as well as waste generated in small quantities. Consumer: Any natural or legal person who acquires and is using EEE individually or in bulk.

**Exporter:** Any person under the jurisdiction of the State of export who arranges for hazardous wastes or other wastes to be exported.

**Producer responsibility organisation:** An organisation authorised or financed collectively or individually by producers, which can take responsibility for the collection and channelisation of e-waste generated from producers' products to ensure the environmentally sound management of such e-waste.

**Informal sector:** Any worker or economic unit carrying out economic activities along the e-waste value chain – in law or in practice – not covered or insufficiently covered by formal arrangements.

**Producer:** Any natural or legal person, established in a state, who manufactures or markets or resells electrical and electronic equipment (EEE) under his own name or trademark; places on the market of that state, on a professional basis, EEE from a third country or from another state; or sells EEE by means of distance communication directly to private households or to users other than private households in a state, and is established in another state or in a third country.

**Registered recycler:** A registered/licensed person or entity who processes e-waste to recover useful materials. Processing of e-waste may include appropriate depollution steps aiming at the removal of hazardous substances and components present in e-waste and its subsequent proper treatment and/or disposal.

**Retailer:** A person or organization that sells EEE to the public for use or consumption rather than for resale.

EEE and E-waste: EEE includes a wide range of products with circuitry or electrical components with a power or battery supply. EEE becomes e-waste once it has been discarded by its owner as waste without the intent of reuse.





