GOVERNMENT OF SOMALILAND

MINISTRY OF INFORMATION COMMUNICATION AND TECHNOLOGY (MICT)

E- WASTE MANAGEMENT PLAN

EASTERN AFRICA REGIONAL DIGITAL INTEGRATION PROJECT (EA-RDIP) SERIES OF PROJECTS (SOP) PHASE I

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TERMS AND DEFINATION

The following key terminologies will apply to E-waste management;

Term	Definition
Collection Centre	Established individually or jointly or a registered society or a designated agency or a company or an association to undertake collection operations of E-waste;
Consumer'	User of electrical and electronic equipment or generator of E-waste;
Deposit bond	Advance recycling fee from the end user.
Electrical and electronic equipment'	Equipment which is dependent on electric currents or electromagnetic fields in order to work properly and equipment for the generation, transfer and measurement of such currents and fields
Electrical and electronic equipment registry	means a unit housed by the Authority for the purposes of effecting registration of all electrical and electronic equipment producers and recyclers;
Entity	Agency, organization, establishment, business, partnership, body corporate with capacity to sue or to be sued;
Environmentally sound management'	Taking all steps required to ensure that E-waste are managed in a manner which shall protect health and environment against any adverse effects, which may result from hazardous substance contained in such waste;
E-waste	Also referred to as waste electrical and electronic equipment means waste resulting from electrical and electronic equipment including components and sub- assemblies thereof;
Generator	Any person whose activities or activities under his or her direction produces E-waste or if that person is not known, the person who is in possession or control of that E-waste;
Market	means an environment that facilitates trading in Electrical and electronic equipment and E-waste;
Manufacturer	An entity involved in the making or production of electrical and electronic equipment either locally or internationally; minimum collection incentive' means the minimum collection price paid by recyclers to the collection network to ensure collection of problematic fractions;
Problematic fractions	Components or parts of E-waste where the collection and treatment cost far outweighs the material recovery value;
Producer	Any person or entity who introduces or causes to be introduced new or used electrical and electronic equipment into the market by sale, donation, gifts, inheritance or by any such related methods and can either be a manufacturer, importer, distributor or assembler;

Recovery	Any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfill a particular function;
Recycling	Any operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes;
Recycler	Any person or entity engaged in recycling or reprocessing used electrical and electronic equipment or assemblies or their component;
Refurbisher	Any person who repairs, dismantles or re-assembles electrical and electronic equipment to extend the working life of the product;
Refurbishing	The action of repair, dismantling, improvement of E-waste for the purposes of extending the working life of the product;
Take-back	The process of returning or repossessing used products from the market to the producer or their representative;
Transporter	A person or entity that is in the conduct of carrying or conveying E-waste from one point to another;
Treatment	Processing E-waste through modern and eco-friendly technologies to ensure compliance with environmental protection; and
Treatment facility	A licensed plant, premise, and establishment for processing E-waste

LIST OF ABBREVIATIONS

E-Waste	Electronic Waste
EEE	electrical and electronic equipment
WEEE	Waste Electrical and Electronic Equipment
ICT	Information Communication and Technology
EARDIP	Eastern Africa Regional Digital Integration Project
Hg	Mercury
BFRs	Brominated Flame Retardants
Pb	Lead
Cd	Cadmium
As	Arsenic

PCBs	Polychlorinated Biphenyls
PAHs	Polycyclic Aromatic Hydrocarbons
PFAS	Per- and Polyfluoroalkyl Substances
PM	Particulate Matter
WB	World Bank
ESHG	Environmental, Social, and Health Guidelines
GIIP	Good International Industry Practice
ITU	International Telecommunication Union
ODS	ozone depleting substances
CFCs	Chlorofluorocarbons
HCFCs	hydro chlorofluorocarbon
GHG	Greenhouse gases

1 INTRODUCTION

1.1 Project Information

Somaliland, with a total population of about 5.7 million in 2021 and one of the highest rates of urbanization in Africa, has long sought to make advances in digital economy. Somaliland's population is young and has become more urbanised over time due to several factors, including repeated droughts. The different population groups stand at 53 percent urban dwellers, 11 percent residents in rural settlements, and 34 percent nomadic and agro-pastoral communities. . According to NDP III Somaliland's gross domestic product (GDP) per capita increased from US$557 to US$775. ranking among the five lowest in the world throughout the last decade: in 2020 it was the second lowest in the world (only Burundi had a lower GDP per capita in 2020). The World Bank estimated GDP per capita for 2021 was 446 US dollars. This translates into well below the international poverty line of 1.90 US dollar a day and the target for SDG1: eradicate extreme poverty. Through East Africa Regional Digital Integration Project (EA-RDIP), the Government of Somaliland will benefit from USD 13.5 million to support series of projects towards regional connectivity market, regional data market, and regional online and digital market. The Project Components are summarized in **Table 1.1** below.

Table 1-1 Project Components

Component	Sub-component	Description
Component 1: Connectivity market development and integration	Sub-component 1.1: Cross-border and backbone network connectivity	This subcomponent will support the deployment of key missing cross-border and backbone fiber links to improve the resilience, coverage, and integration of regional and national connectivity networks. It will support the deployment of up to 1,287 km of new fiber along prioritized backbone network routes, including connecting Berbera main cable landing station to major population centers, as well as establishing new cross-border links to Somalia, Kenya and Ethiopia. The fiber is likely to be deployed in phases, starting in the north, where the security context is more permissible, and adapting to the evolving security context. Gap financing will be provided for the deployment of related routes, using a range of modalities to crowd in private sector financing. Commercial providers are expected to co-finance, design, build, and operate network infrastructure deployed on an open access basis and at reasonable rates to support affordable service expansion and competition.
	Sub-component 1.2: Last mile connectivity including in borderland areas	This sub-component will providing catalytic funding to unlock further infrastructure deployment in unserved or underserved areas, which are highly correlated with higher poverty levels and climate vulnerability (including in refugee/IDP camps and their host communities, located in

		rural and borderland areas) and to connect public institutions along fiber route. Infrastructure financed will be deployed using a range of modalities, including reverse auctions, bulk purchase of capacity81 and/or licensing arrangements, that aim to maximize private sector financing.
	Sub-component 1.3: Enabling legal, regulatory and institutional ICT environment	This subcomponent will strengthen existing ICT frameworks and boost regulatory maturity to effectively spearhead the connectivity agenda and universal services targets through the development of new strategic, policy and regulatory instruments.
Component 2: Data market development and integration	Sub-component 2.1: Cybersecurity frameworks, infrastructure and capacity	This sub-component will strengthen local capacity to effectively detect, respond to and mitigate evolving cyber threats and cybercrimes as well as support implementation of forthcoming cybersecurity legal and strategic frameworks.
	Sub-component 2.2: Data exchange, governance and protection	This subcomponent will support investments in enabling data infrastructure and governance frameworks that facilitate cost-effective and secure data storage, processing and sharing.
Component 3: E-service market development and integration	Sub-component 3.1: Digital cross-border trade, payment and service enablers.	This subcomponent aims to enhance readiness to expand digitally enabled cross-border trade and service delivery, by introducing key enablers.
	Sub-component 3.2: Regional research and education networks (RENs), and training for digital skills.	This subcomponent will support the development of the digital skills base through support for SomaliREN, and new digital skills training programs.
Component 4: Project Management and Implementation Support	n/a	This component will finance key project management functions, including procurement, FM, M&E, communications as well as ESF compliance, with a particular emphasis on addressing the high security- and GBV-related risks associated with the deployment of infrastructure and civil works, including. It will finance the establishment and operations of (i)the main Project implementation Unit (PIU) at MICT,; and (iii) coordination with the regional PIU at IGAD level.

1.2 Understanding E- Wastes

In order to define e-waste, it is necessary to first define electrical and electronic equipment (EEE). EEE is defined as "any household or business item with circuitry or electrical components with power or battery supply(Step Initiative, 2014). EEE and its parts turn into Waste Electrical and Electronic Equipment (WEEE), or e-waste, after the items and their parts "have been discarded by the owner as waste without the intention of reuse" (Step Initiative, 2014)

E-waste is the fastest growing waste stream around the globe at a rate of 3-5% due to demand and as such has been defined as a "tsunami" by the UN (Forti et al., 2020). In 2019, the world generated 53.6 Mt of e-waste, a number projected to grow to 65.3 and 74.7Mt by 2025 and 2030 respectively, (UNITAR, 2024), and (Forti et al., 2020). Globally, only 20% of e-waste is handled formally, meaning it is documented, collected, and recycled (PACE & E-waste Coalition, 2019). The remaining 80% is disposed of as household waste, dumped in landfills, traded, or recycled by the informal sector in poor and hazardous working conditions (PACE & E-waste Coalition, 2019).

Holistically, the increased number of E-waste volumes results from the increasing market penetration of electronic use in developing countries, and the increase in replacement market due to technology advancement in the developed countries. The East African region has also suffered from the importation of used or obsolete Electrical and Electronic Equipment (EEE) under the name of donations, as well as the prohibitive prices for acquisition of new EEE. There is therefore a high demand for used products that have a short life span and easily find their way to the E-waste streams in the short-term.

EEE are composed of various components, i.e. hazardous and non-hazardous materials. The hazardous materials include; Lead, Barium, Mercury, Nickel, Cadmium, Lithium etc. Components such as Lead and Mercury contaminate the soil and water when disposed of in the landfills with other waste. These hazardous components are also listed as human carcinogens.

The valuable materials in electronic products include the precious metals- (Gold, Tantalum, Silver etc.), while the non-hazardous components are; plastics, Copper etc. Recycling of the precious metals conserves these valuable materials as they are rare earth minerals. Recycling also prevents air and water pollution likely to result from the extraction of new mineral from the earth as well as reduction on greenhouse gas (GHG) emissions. Recovery of these precious metals may pose a positive impact to both the environment as well as socio -economic development issues.

1.3 Types of E- Waste Streams

EA-RDIP components 1, 2 and 3 will involve digital gadgets might result into e-wastes when they are worn out or when they malfunction.

As highlighted above, the main source of e-wastes under the Project will be from components 1,2 and 3, that deals with Cybersecurity frameworks, infrastructure and capacity, the infrastructure under this component could result to emission of localized greenhouse gas emissions from digital infrastructure and e-waste and OSH risks during construction of the masts. The main component of adverse risks will be from IT apparatus which generate e-wastes upon malfunctioning, e- wastes have been known to affect people's health due to lead and mercury poisoning and other heavy metals, halogenated Compounds and Radio Active Substances. **Table 1-1** below present an indicative list of e- wastes from IT and telecommunication equipment's that apply to the Project.

Table 1-2 Types E- Waste Streams

Category	Examples
IT and telecommunication equipment's	i. Centralized data processing: ✓ Mainframes ✓ Minicomputers ✓ Servers ✓ Printer units ✓ Personal computing: ii. Personal computers (CPU, mouse, screen and keyboard included) iii. Laptop computers (CPU, mouse, screen and keyboard included) ✓ Notebook computers ✓ Notepad computers iv. Copying equipment v. Electrical and electronic typewriters vi. Pocket and desk calculators and other products and equipment for the vii. collection, storage, processing, presentation or communication of information by electronic means viii. User terminals and systems ix. Facsimile x. Telex xi. Telephones xii. Photocopying equipment xiii. Electrical and electronic typewriters xiv. Pocket and desk calculators xv. Facsimile and Telephones xvi. Pay telephones xvii. Cordless telephones xviii. Cellular telephones xix. Answering systems and other products xx. Broadcasting equipment for transmitting sound, images or other xxi. information by telecommunications

Category	Examples
Batteries	i. Alkaline ii. Lithium ion

1.4 Toxicity and radioactive nature of E-waste

E-waste includes many substances that are dangerous to the health of humans and the environment if released in an unsound manner. E-waste recorded in 2019 contained as much as 50 tons of mercury and 71 kt of brominated flame retardants[1]. The improper dumping and recycling of e-waste in several African countries serves as a major source for the release of harmful substances. These harmful substances can pollute soil, water, air, dust, and food sources[2]. Numerous studies have reported contamination of e-waste workers and local residents with toxic metals, dioxins and furans, brominated flame retardants (BFRs), PCBs, polyaromatic hydrocarbons (PAHs), per- and polyfluoroalkyl substances (PFAS), particulate matter and other air pollutants, phthalates and other chemicals in plastics, and the chemical mixtures at these sites. There are other chemicals present in e-waste for which little information is available. Growing research has found associations between e-waste recycling and a range of adverse health effects, including negative birth outcomes, impaired neurological and behavioral development, impaired thyroid function, and increased risk of chronic diseases later in life[3]. Table 1-3 below depicts the most common toxic substances found in E-waste.

Table 1-3 Shows the most common toxic substances in E-waste

Toxic Substance	Occurrence in E-Waste
Mercury (Hg)	Found in lighting devices (e.g., LCD backlights), switches, and batteries; 50 tons reported in 2019 e-waste.
Brominated Flame Retardants (BFRs)	Present in plastic casings, circuit boards, and cables; 71 kilotons reported in 2019 e-waste.
Lead (Pb)	Found in CRTs (cathode ray tubes), circuit boards, batteries, and solder.
Cadmium (Cd)	Present in rechargeable batteries (Ni-Cd), semiconductors, and plastics.
Arsenic (As)	Used in semiconductors and older circuit boards.
Polychlorinated Biphenyls (PCBs)	Previously used in capacitors and transformers; still found in older e-waste.
Polycyclic Aromatic Hydrocarbons (PAHs)	Formed during the open burning of plastics and cables.

[1] .Forti V., Balde C.P., Kuehr R., Bel G. The Global E-Waste Monitor 2020. [(accessed on 11 September 2020)];2020 Available online: https://www.iswa.org/home/news/news-detail/article/-21c8325490/109/

[2] Deng W.J., Louie P.K.K., Liu W.K., Bid X.H., Fu J.M., Wong M.H. Atmospheric levels and cytotoxicity of PAHs and heavy metal in TSP and PM2.5 at an electronic waste recycling site in southeast China. Atmos. Environ. 2006;

[3] Grant K., Goldizen F., Sly P., Bruné M., Neira M., Berg M.V., Norman R. Health consequences of exposure to e-waste: A systematic review. Lancet Glob. Health. 2013;1:e350–e361. doi: 10.1016/S2214-109X(13)70101-3

Per- and Polyfluoroalkyl Substances (PFAS)	Found in non-stick coatings, electronics, and fire-resistant materials.
Dioxins and Furans	Byproducts of the open burning of halogenated plastics.
Phthalates	Present in soft plastics used in cables and casings.
Particulate Matter (PM)	Released during informal dismantling and burning processes, contributing to air pollution.
Other Hazardous Chemicals in Plastics	Includes chemical additives such as plasticizers, stabilizers, and pigments; many are poorly studied but suspected to have endocrine or developmental effects.
Chemical Mixtures	Complex mixtures from multiple sources during informal recycling processes, often with synergistic toxic effects.

1.5 Sustainable E-Waste Management Practices Benefits

Electronic waste (e-waste) is one of the fastest-growing waste streams globally, driven by rapid technological advancement and increased consumption of electronic devices. As discarded electronics accumulate, so do the environmental, health, and security risks associated with their improper disposal. Sustainable management of e-waste—through practices such as recycling, refurbishing, and responsible disposal—offers significant benefits that go beyond simply reducing waste volumes. These benefits span environmental protection, natural resource conservation, energy and water savings, and even data security. A comprehensive overview of these benefits is discussed in detail in the following subsection

1.5.1 Benefits of Sustainable Management of E-Waste

Sustainable e-waste management offers a wide range of environmental, social, and economic benefits. Key advantages include:

1. Reduction of Landfill Use

Recycling e-waste significantly reduces the volume of waste destined for landfills. This helps preserve land for more productive and socially beneficial purposes such as low-income housing projects, agriculture and urban farming, and renewable energy installations (e.g., solar farms).

2. Prevention of Soil, Water, and Air Pollution

Many electronic devices contain hazardous substances such as lead, mercury, cadmium, beryllium, polyvinyl chloride (PVC), and chromium. If improperly disposed of in landfills, these substances can leach into the soil, contaminate groundwater, and release toxins into the air through burning. This leads to widespread environmental degradation and poses serious health risks, particularly to vulnerable and less-advantaged communities that are often disproportionately affected.

3. Conservation of Natural Resources

Electronic devices are composed of valuable raw materials like gold, silver, copper, and rare earth elements. Sustainable recycling practices enable the recovery and reuse of these materials, reducing

the demand for virgin mining—which is not only energy-intensive and environmentally damaging but also frequently associated with social and ethical concerns. By reusing these finite resources, sustainable e-waste management helps preserve fragile ecosystems, reduces greenhouse gas emissions from mining operations, and ensures the availability of critical materials for future generations.

4. Energy and Water Savings

The use of recycled materials in manufacturing requires significantly less water and energy than extracting and processing raw materials. This reduces overall production costs and lowers the environmental footprint of new electronic products. Additionally, the reduced energy demand helps combat climate change by lowering associated greenhouse gas emissions.

5. Improved Data Security

E-waste often contains sensitive personal, corporate, or governmental data stored in devices such as hard drives, smartphones, and tablets. Recycling facilities that are certified for secure destruction can shred, wipe, or otherwise destroy data-bearing components, preventing sensitive information from falling into the wrong hands. Responsible disposal not only protects individual privacy but also ensures compliance with data protection regulations and helps prevent cybercrime.

6. Support for Circular Economy and Job Creation

Sustainable e-waste practices support the transition to a circular economy by keeping valuable materials in circulation for longer. This fosters innovation in green technologies, supports businesses engaged in electronics repair, refurbishment, and recycling, and creates employment opportunities. It also encourages the development of new skills in areas such as eco-design, resource recovery, and environmental management.

7. Health Protection for Vulnerable Communities

Informal e-waste processing—often conducted in unregulated settings—exposes workers and nearby residents to toxic substances without adequate protective measures. Sustainable management reduces harmful emissions, improves air and water quality, and promotes environmental justice by protecting disadvantaged populations from the health hazards of uncontrolled e-waste handling.

1.6 Purpose of E- Waste Management Plan

E-waste Management Plan (E-WMP) is a standalone plan which forms part of the Environment and Social Management Framework (ESMF) prepared for the project. Therefore, this E-waste Management Plan shall serve as a guidance document for Ministry of Information Communication and Technology MICT and PIU to respond to e- waste related challenges that might arise during implementation of the project. The goal of the E-waste Management Plan is to protect human health

and the environment while complying with applicable local, regional and international regulatory requirements.

This plan involves the tracking of E-waste resulting or associated with the activities of the EA-RDIP, all IP and stakeholders shall avoid generation of e-waste where possible and adopt the **(4 Rs) principle; Reduce, Reuse, Recycle and Recover**. Where e-waste generation cannot be avoided, the project shall minimize the generation of waste, and reuse, recycle and recover waste in a manner that is safe for human health and the environment. Where waste cannot be reused, recycled, or recovered, e-waste shall be treated, destroyed, or disposed of in an environmentally sound and safe manner that includes the appropriate control of emissions and residues resulting from the handling and processing of the waste material.

E- Waste Management Practices at operation stage will involve, (i) Segregation of Waste at source, this will involve waste segregation at source and handed over to the service providers, the ideal situation will to have collection centers are established individually or jointly or as registered society. (ii) Transportation, Once general waste is collected at designated places, the contracted service providers collect and take it to dumping sites and recycling facilities for processing. (iii) Recycling, here exist both formal and informal recycling activities in the Somaliland market with scanty information on the volumes collected and processed. (iv) Refurbishments, there is a growing number of licensed entrepreneurs and organized groups which are refurbishing E-waste in the Horn of Africa with the intent of increasing product lifespan. (v) E-waste takes back, there are efforts by a few manufactures who have introduced take-back programmes in the Horn of Africa.

1.7 Objective of E- Waste Management Plan

The aim of the E-Waste Management Plan is to achieve and maintain an integrated e-waste management plan that is effective and efficient to ensure the generated e-waste is not indiscriminately disposed to the detriment of human health and the environment.

The overall objectives of the e-waste management plan are summarized (i) to assess the activities involved for the proposed project and determine the type, nature, and estimated volumes of waste to be generated; (ii) to identify any potential environmental and health impacts from the generation of waste at the project sites; (iii) to recommend appropriate waste handling, storage, transport, treatment, and disposal measures in accordance with the current legislative requirements, WB ESHG, and GIIP; (iv) to strengthen capacity building and raise awareness to communities and waste handling companies on e-waste management risks and impacts.

2 E- WASTE MANAGEMENT SITUATION

2.1 Somaliland Context

Waste is mainly collected in dumping holes dug outside the towns and cities. The local Berbera Municipality organizes and collects the waste and has two big dumping sites outside the town. Hargeisa has two companies named DHIS Waste Management and Sabawanag Waste Management who collect the waste from the city and their temporary dumping sites located within the town. Hargeisa Municipality has four dumping sites for burning garbage, which are about seven kilometers outside the city. In general Somaliland does not have a recycling programme in place therefore two commonly used materials like plastic bags and bottles are dumped or sometimes burned.

In Somaliland, Urban Waste Management and Sanitation Laws No 83 of 2018: This law applies to the solid, liquid, and sanitary waste management in the cities of the Republic of Somaliland and consisting of 64 articles, mainly aims to (i) have clean cities that are safe for public health, and improve their beauty, hygiene, and sanitation; (ii) promote all the social services related to environmental sanitation to strengthen and enhance the availability of a clean environment in which to live; (iii) have a law to strengthen the capacity of the Urban Sanitation and Waste Management; (iv) enable the development of the National Plan for Solid Waste, Liquid, and Sanitation and translate it into national plans; (v) establish a collaborative framework for collaboration between all stakeholders in the development of waste management and sanitation; (vi) encourage the Public-Private Partnership (PPP) system in the sector. The services related to hygiene and sanitation are the responsibility of the local Governments whose duties are detailed in article 5. While the role of the Ministry of Health, mainly of support, training, and guidance, is dealt with in article 6. Other concerned ministries, whose tasks are indicated in the following articles, are the Ministry of Environment and Rural Development, the Ministry of Water Resources Development, the Ministry of Trade, Industry and Tourism, and the Ministry of Livestock and Fisheries Development.

The Law deals with the companies responsible for the services related to the waste management and in particular, with (i) waste companies (art.11); (ii) slaughterhouse companies (art.12); (iii) waste development and recycling companies (art.13). As for the sub-sectors, the Law considers the following (i) household waste (art.17); (ii) commercial waste (art.18); (iii) industrial waste (art.19); (iv) hazardous waste produced by health facilities (art.20); (v) waste produced in public areas, such as road, schools, markets, fishery-related fields, building. Waste management includes storage and separation, collection, and disposal which are the object of articles 28 - 31. Regarding the garbage dumps, article 33 establishes that they have to be placed where the local government and the relevant government agencies have checked that it is appropriate. The waste management business is organized through a license and contracts system (art. 34) and with the payment of fees, as provided in article 35.

Part IV regards the liquid waste management and it is organized according to the following subsectors (i) business areas (art.39); (ii) housing sites (art.40); (iii) industrial areas (art.41); (iv) Health Centers (art.42); (v) liquid waste in dairy products (art.43); (vi) liquid waste for dyeing clothing (art.44); (vii) liquid waste from vehicles and industry (art.45); (viii) from abattoirs (art.46); (ix) in reservoirs and sewers (art.47). Section V regards the hygiene rules in the following (i) household and personal; (ii) food places; (iii) hotels; (iv) animal slaughterhouses; (v) food products. Article 61 is dedicated to sanitation and the prevention of threats at ports, airports, and borders.

According to Somaliland Regional and District Administration Law (Law/No23/2002) article (36), Local governments are responsible for providing social services including hygiene and sanitation. The main provisions are the following:

i. The local government will develop a comprehensive plan for the implementation of waste and sanitation management strategies.
ii. Household solid waste will be collected once or twice weekly, while collection from other areas such as business centers, healthcare facilities, schools, and public spaces will occur one to two times daily.
iii. Efforts will be made to encourage the adoption of reuse and recycling technologies for solid waste, aiming to reduce unemployment.
iv. Service providers will operate as public-private partnership companies, selected and contracted through a transparent process. Contracts will clearly define the roles and responsibilities of each party and ensure a clean and hygienic environment.
v. Local governments will oversee the preparation and monitoring of waste disposal and dumping sites.
vi. Regular monitoring will be conducted for waste collection, segregation, transportation, and disposal processes.
vii. Research projects focusing on recycling and reusing waste will be actively promoted.

There are no specific laws and regulation on e- wastes, however Somaliland has enacted Somaliland Waste Management and Sanitation Act Law No. 83/2018 and signed both Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1989) and the 1991 Bamako Convention on the Ban of Import into Africa and Control of Transboundary Movement and Management of Hazardous Wastes within Africa.

2.2 International Conventions

2.2.1 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1989):

The Basel Convention aims to protect human health and the environment against the adverse effects resulting from the generation, management, transboundary movements and disposal of hazardous and other wastes. Among key provisions of the Basel Convention are the environmentally sound

management, transboundary movement, waste minimization and waste disposal practices aimed at mitigating adverse effects on human health and the environment. E-waste is included in Annex VIII, added to the convention in 1998 by the 4th meeting of the conference of the parties (Decision IV/9).

2.2.2 Montreal Protocol on Ozone Depleting Substances (1989)

The Montreal Protocol is an international treaty which aims to protect the ozone layer by phasing out the production and use of ozone depleting substances (ODS). ODS, chlorofluorocarbons (CFCs) and hydro chlorofluorocarbon (HCFCs) as refrigerants which are still used in some refrigerators and air conditioners. Waste refrigerators and air conditioners will also likely contain CFCs or HCFCs. Many waste refrigerators, freezers, and air conditioners—especially older models—still contain CFCs or HCFCs. If these appliances are dismantled or disposed of improperly ODS can be released into the atmosphere, this contributes to **ozone layer depletion**, increasing UV radiation exposure and its harmful effects on human health and the environment. Sustainable e-waste management supports the aims of the Montreal Protocol by ensuring, safe recovery, containment, and disposal of ODS from e-waste, use of certified facilities that prevent the release of these substances during dismantling and recycling processes. Also, the protocol promotes the shift toward non-ozone-depleting technologies. Proper e-waste recycling helps remove obsolete appliances that use CFCs/HCFCs and encourages adoption of, eco-friendly refrigerants and energy-efficient and ozone-safe technologies.

2.2.3 International Convention for the Prevention of Pollution from Ships (MARPOL) (73/78/97)

Together with its 6 annexes, MARPOL addresses oil pollution from ships, from noxious liquid substances carried in bulk, from harmful substances carried by sea in packaged form, from sewage and garbage and the prevention of air pollution from ships. MARPOL has greatly contributed to a significant decrease in pollution from international shipping and applies to 99% of the world's merchant tonnage. In particular, MARPOL Annex V generally prohibits the discharge of all waste into the sea, unless explicitly permitted under the Annex. Among other wastes, MARPOL includes E-waste generated during the normal operation of ships and its liability of being disposed of continuously or periodically

2.2.4 Rotterdam Convention on the Prior Informed Consent Procedure for Certain

Hazardous Chemicals and Pesticides in International Trade (1998), the Rotterdam Convention promotes shared responsibilities in relation to the international trade of certain hazardous chemicals in order to protect human health and the environment from potential harm. The convention promotes open exchange of information about their characteristics, by providing for a national

decision-making process on their import and export and by disseminating these decisions to parties. It also calls on exporters of hazardous chemicals to use proper labelling, to include directions on safe handling, and to inform purchasers of any known restrictions or bans.
The convention plays a vital role in safeguarding human health and the environment from the risks posed by hazardous chemicals, many of which are commonly found in electronic waste (e-waste).

In the context of e-waste management, the Convention gives a way to control the Hazardous substances in E-waste which contains a wide range of hazardous chemicals such as Lead, mercury, cadmium, brominated flame retardants (BFRs), Polychlorinated biphenyl (PCBs), and Per-and polyfluoroalkyl substances (PFAS). These substances fall under the scope of chemicals regulated by the Convention, due to their toxic effects on human health and the environment.

2.2.5 Stockholm Convention on Persistent Organic Pollutants (2001)

The Stockholm Convention is a global treaty designed to protect human health and the environment from chemicals that remain intact in the environment for long periods of time, that become widely distributed geographically, that accumulate in the fatty tissues of humans and wildlife, and that have harmful impacts on human health or on the environment. There are several persistent organic pollutants present in E-waste, and the listing of E-waste requires parties of the Stockholm Convention to take appropriate measures to eliminate the release of these pollutants from stockpiles and wastes.

2.2.6 The Basel Convention Ban Amendment 1994

The "Ban Amendment" provides for the prohibition by each Party included in the proposed new Annex VII (Parties and other States which are members of the OECD, EC, Liechtenstein) of all trans boundary movements to States not included in Annex VII of hazardous wastes covered by the Convention that are intended for final disposal, and of all trans boundary movements to States not included in Annex VII of hazardous wastes covered by paragraph 1 (a) of Article 1 of the Convention that are destined for reuse, recycling or recovery operations.

The Ban Amendment was originally adopted as a decision of the second meeting of the Conference of the Parties in March 1994. The Secretariat provides assistance to parties that are facing difficulties in ratifying the Ban Amendment, on request and within available resources. Only Kenya and Tanzania have ratified the Ban Amendment

2.2.7 Paris Climate Agreement under the United Nations Framework Convention on Climate Change

The Paris Agreement's central aim is to strengthen the global response to the threat of climate change by keeping the global temperature rise this century below a "2-degree Celsius above pre-industrial levels", and to pursue efforts to limit the temperature increase even further to "1.5 degrees

Celsius". Additionally, the agreement aims to strengthen the ability of countries to deal with the impacts of climate change. It recognizes that sustainable lifestyles and sustainable patterns of consumption and production, with developed country parties taking the lead, play an important role in addressing climate change. The convention promotes sustainable consumption and production of E-Waste and emphasis the promotion of E-Waste recycling programs to reduce the Green House Gases (GHGs).

2.2.8 Connect 2020 Agenda for Global Telecommunication/ICT Development

This global agenda sets out the shared vision, goals and targets that Member States of the International Telecommunication Union (ITU) have committed to achieve by 2030. These targets will be achieved in collaboration with stakeholders within the ICT ecosystem. With the adoption of the Connect 2030 Agenda, ITU Member States have committed to transitioning to an information society, empowered by the interconnected world, where telecommunication/ICT enables and accelerates socially, economically and environmentally sustainable growth and development for everyone. One of the key goals of the Connect 2030 Agenda is sustainability, where by 2023, increase the global e-waste recycling rate to 30% and ensure at least 50% of countries have adopted e-waste legislation.

2.3 Regional Conventions

2.3.1 Bamako Convention

The Bamako Convention is an African expression of Africa's unity to prevent Africa from becoming the final destination of hazardous waste produced elsewhere. The Convention requires Parties to ban the import of hazardous and radioactive wastes as well as all forms of ocean and inland water dumping or incineration of hazardous waste. It also requires Parties to minimize the trans-boundary movement of wastes among themselves and only conduct it with consent of the importing and transit States. The Convention also requires Parties to minimize the production of hazardous wastes and cooperate to ensure that wastes are treated and disposed of in an environmentally sound manner. The Bamako convention establishes the precautionary principle and provides for the sound management of these wastes within the continent.

2.3.2 Maputo protocol

The protocol to the African charter on human and people's rights guarantees the right of women to live in a healthy and sustainable environment. This includes ensuring that parties take all appropriate measures to regulate the management, processing, storage and disposal of domestic waste and ensure that proper standards are followed for the storage, transportation and disposal of toxic waste including e-wastes.

2.3.3 Agenda 2063: The Africa We Want (2013)

This is a 50-year strategic socio-economic transformation framework for the African continent. The agenda 2063 implementation plan (2014-2023) outlines specific goals to be achieved during the first ten years, including reference to the expected transformation of waste management. Goal 1 aspires a high standard of living, quality life and wellbeing for all citizens. Priority 4 aspires modern, affordable and livable habitats and basic quality services, hence cities will be recycling at least 50% of the waste they generate by 2023. The East Africa Member States have also been concerned about the E-waste problem in the region. To address these challenges, the EACO Regional E-waste Management Strategy 2017 was developed. Further, the EAC Member states were encouraged to develop national E-waste Management Strategies.

2.3.4 The Durban Declaration, Africa (2008)

The declaration called for an African regional platform/forum on E-waste alongside international bodies. The requirements of the declaration require countries to review existing legislation, improve their compliance with legislation and amend existing legislation regarding E-waste management.

2.3.5 The Libreville Declaration, Africa (2008)

As an outcome of the first inter-ministerial conference on health and the environment in Africa, the declaration recognized that there is a need to further research the vulnerability of humans to environmental risk factors, and to establish policies to increase this understanding. These include risk factors for poor health which can arise from E-waste.

2.4 World Bank Environment and Social Standards and Guidelines

2.4.1 ESS1: Assessment and Management of Environmental and Social Risks and Impacts

Client's responsibilities for assessing, managing and monitoring environmental and social risks and impacts associated with each stage of a project supported by the Bank through Investment Project Financing, in order to achieve environmental and social outcomes consistent with the Environmental and Social Standards (ESSs).

In order to meet this requirement, the borrower will: (a) Conduct an environmental and social assessment of the proposed project, including stakeholder engagement; (b) Undertake stakeholder engagement and disclose appropriate information in accordance with ESS10; (c) Develop an ESCP, and implement all measures and actions set out in the legal agreement including the ESCP; and (d) Conduct monitoring and reporting on the environmental and social performance of the project against the ESSs

The project ESCP has committed the government to prepare safeguard instruments with specific measures and actions over a specified timeframe to avoid, minimize, reduce or mitigate specific risks and impacts of the project, hazardous wastes are classified amongst the risks. The government

will not carry out any activities in relation to the project that may cause material adverse environmental or social risks or impacts until the relevant plans, measures or actions have been completed in accordance with the ESCP.

2.4.2 World Bank ESS3: Resource Efficiency and Pollution Prevention and Management

ESS3 contains provisions on the management of hazardous and non-hazardous wastes under section B. It sets the borrowers' requirements under World Bank funded projects to minimize the generation of waste, reuse, recycling, and recovery of waste in a safe manner. If the aforementioned is not possible at all or in part, ESS3 requires borrowers to dispose of the waste in an appropriate manner that include control of emissions and residues resulting from the handling and disposal process of the waste material. ESS3 requires that if the generated waste is considered hazardous, the borrower shall comply with the existing requirements for management in line with national requirements, international conventions and (Good International Industry Practices (GIIP).

2.4.3 World Bank Environmental, Health, and Safety (EHS) Guidelines – General EHS Guidelines[4]

The EHS guidelines define hazardous waste as one sharing the properties of hazardous material (e.g. ignitability, corrosively, reactivity, etc) among other physical, chemical, or biological characteristics that may pose potential health risks. Hazardous waste in terms of this document are ones that are also classified as "hazardous" by local regulations. The EHS guidelines define the practices required from facilities that generate and store waste which include avoidance and minimization, and where waste generation cannot be avoided but has been minimized, recovering and reusing waste, and where this cannot be implemented, reusing, treating, destroying and disposing of it in an environmentally sound manner. The EHS guidelines contain specific measures for the management of hazardous waste that include compliance with local and international regulations, ensuring contracting reputable and legitimate enterprises for the management of hazardous waste. In addition to general waste management measures on waste prevention, reuse, recycling, treatment, disposal, storage, transportation, and monitoring.

2.4.4 World Bank Environmental, Health, and Safety (EHS) Guidelines – Environmental Waste Management[5]

These guidelines apply to projects that generate, store, or handle any quantity of waste across a range of industry sectors. It is not intended to apply to projects or facilities where the primary business is the collection, transportation, treatment, or disposal of waste. Specific guidance for these

[4] https://documents1.worldbank.org/curated/en/157871484635724258/pdf/112110-WP-Final-General-EHS- Guidelines.pdf
[5] https://www.ifc.org/wps/wcm/connect/456bbb17-b961-45b3-b0a7-c1bd1c7163e0/1

types of facilities is presented in the Environmental Health and Safety (EHS) Guidelines for Waste Management Facilities.

The guidelines provide that hazardous waste shares the properties of a hazardous material (e.g. ignitability, corrosively, reactivity, or toxicity), or other physical, chemical, or biological characteristics that may pose a potential risk to human health or the environment if improperly managed. Therefore, in that perspective e-waste poses characteristic of hazardous waste.

The guidelines provide that hazardous waste should always be segregated from nonhazardous waste. If generation of hazardous waste cannot be prevented through the implementation of the above general waste management practices, its management should focus on the prevention of harm to health, safety, and the environment, according to the following additional principles:

- Understanding potential impacts and risks associated with the management of any generated hazardous waste during its complete life cycle ·
- Ensuring that contractors handling, treating, and disposing of hazardous waste are reputable and legitimate enterprises, licensed by the relevant regulatory agencies and following good international industry practice for the waste being handled ·
- Ensuring compliance with applicable local and international regulations

3 E-WASTES ENVIRONMENTAL, SOCIAL AND HEALTH IMPACTS

3.1 Environmental Impacts

Hazardous materials are released when E-waste is dismantled, plastic parts are burnt, metals are recovered through chemical processes and discarded parts are disposed of on land and water under unsafe manner. Owing to unsafe recycling practices, the health of the workers involved in the E-waste recycling operations and communities living in the vicinity of E-waste recycling operations are at risk. The following are the potential environmental risks that could arise from the generation of e- waste.

- Generation of leachate and the release of pollutants and heavy metals to the environment due to unsafe and improper disposal of generated e-waste, posing health and safety risks to the public.
- Contamination and acidification of agricultural soil, affecting soil fertility and agricultural yield.
- -Water, air, and soil pollution due to the release of environmental pollutants such as Persistent, Bio-accumulative Pollutants and Toxic (PBT), and Persistent Organic Pollutants (POPs), furans, lead, mercury, poly-brominated flame retardants, lithium, dioxins, and Polycyclic Aromatic Hydrocarbons (PAHs) among others.
- Improper recycling of e-waste as such practices are done for scavenging resalable components and parts, therefore causing environmental pollution due to the burning of cables, random disposal of wastewater from the recycling processes, and random dumping of irretrievable e-waste.

3.2 Social Impacts

In addition, improper collection, management, and disposal of e-waste could pose the following social risks.

- Nuisance to communities due to aesthetical and visual pollution
- Contamination of drinking water, underground water resources with heavy metals, and other POPs.
- Child labor and Gender Based Violence Impacts associated with employing children and women in collection and primitive recycling of e-waste.

3.3 Health Impacts

Health risk associated with e-waste contamination is as detailed below.

- Various health impacts due to heavy metals in water, air, and soil due to the carcinogenic nature of these pollutants and their bioaccumulation in the food chain and water resources.
- Lead may cause neurotoxicity, high blood pressure, and muscle pains, and learning disabilities among children. Barium oxide can cause severe skin irritation and ingestion is harmful, and chronic exposure may lead to damage of Central Nervous System (CNS), spleen, liver, kidney or bone marrow.
- Gold is extracted from E-waste either by burning the gold containing components at high temperatures, or using leaching chemicals like cyanide solution. Burning releases toxic gases and disposal of cyanide solution or other leaching chemicals into the drain or on land pollutes water and soil.
- Mostly the above mentioned hazardous chemicals and toxic metals are persistent toxic substances (PTSs), which are released in the environment and can enter the food webs. Several PTSs are known to be endocrine disrupters, posing adverse health effects such as reproductive disorders, developmental deformities, and cancer in both humans and wildlife.
- Dioxins, released from burning of E-waste are known carcinogens, which accumulate in the human body and may cause changes in the immune system, glucose metabolism and reproductive problems.
- Inhalation of cadmium fumes or particles can be life threatening. Cadmium exposure may cause kidney damage. The International Agency for Research on Cancer (IARC) has classified cadmium as a human carcinogen (group I) on the basis of sufficient evidence in both humans and experimental animals.
- Acute mercury exposure may give rise to lung damage. Chronic poisoning is characterized by neurological and psychological symptoms, such as tremor, changes in personality, restlessness, anxiety, sleep disturbance and depression.
- High mercury exposure results in permanent nervous system and kidney damage. It has also been possible to detect proteinuria at relatively low levels of occupational exposure. Metallic mercury is an allergen, which may cause contact eczema.
- The symptoms of acute lead poisoning are headache, irritability, abdominal pain and various symptoms related to the nervous system. People who have been exposed to lead for a long time may suffer from memory deterioration, prolonged reaction time and reduced ability to understand. Acute exposure to lead is known to cause proximal renal tubular damage. Long-term lead exposure may also give rise to kidney damage.
- Inorganic arsenic is acutely toxic and intake of large quantities leads to gastro intestinal symptoms, severe disturbances of the cardiovascular and central nervous systems, and eventually death. Populations exposed to arsenic via drinking water show excess risk of mortality from lung, bladder and kidney cancer, the risk increasing with increasing exposure. There is also an increased risk of skin cancer. Studies on various populations exposed to arsenic by inhalation, such as smelter workers, pesticide manufacturers and miners in many different countries consistently demonstrate an excess lung cancer.
- Beryllium can cause sensitization, lung and skin disease in a significant percentage of exposed workers. Calcium chromate, chromium trioxide, lead chromate, strontium

chromate, and zinc chromate are known human carcinogens. An increase in the incidence of lung cancer has been observed among workers in industries that produce chromate and manufacture pigments containing chromate.

- Exposure to relatively high concentrations of antimony (9 mg/m^3 of air) for a longer period of time can cause irritation of the eyes, skin and lungs. As the exposure continues, more serious health effects may occur, such as lung diseases, heart problems, diarrhea, severe vomiting and stomach ulcers.
- Exposure to Lithium can cause loss of appetite, nausea, vomiting, diarrhea and abdominal pain, headache, muscle weakness, twitching, blurred vision, loss of coordination, tremors, confusion, seizures and coma.
- Zinc can cause eminent health problems, such as stomach cramps, skin irritations, vomiting, nausea and anemia. Very high levels of zinc can damage the pancreas and disturb the protein metabolism, and cause arteriosclerosis.
- Cobalt dust may cause an asthma like disease with symptoms ranging from cough, shortness of breath and dyspnea to decreased pulmonary function, nodular fibrosis, permanent disability, and death. Exposure to cobalt may cause weight loss, dermatitis, and respiratory hypersensitivity..

4 MITIGATION MEASURES AND E-WASTE MANAGEMENT

4.1 Waste minimization and prevention

In accordance with ESS3 and World Bank EHS Guidelines the following are the general requirements for E-waste management. E-waste segregation must take into account the hazardous nature of the waste or its content (e.g. heavy metals, POPs) shall always be segregated from other e-waste that does not contain environmental, carcinogenic, or other pollutants. The segregation shall be done based on content, and correct labelling and quantification must be applied. Annex II presents the e-waste management and monitoring matrix expected to be implemented in relation to the project by MICT and the contractors engaged in the replacement or retrofitting of ICT equipment. Below listed provisions will be complied with.

- Selection of technologies and equipment based on international standards to maximize their lifetime and minimize associated risks at their end-of-life stage
- Coordination with the relevant authorities and stakeholders
- Identification, labelling, and segregation of e-waste at source
- E-waste quantification, and qualitative record keeping
- Temporary storage on site
- Collection and transport
- Central storage at MICT designated location
- Reuse, recycling, and recovery of suitable waste
- Treatment and disposal
- Incident reporting of e-waste related accidents

4.2 E-waste Minimization and Prevention

The following set of measures aim to prevent and/or minimize the quantities of e-waste generated and the hazards associated with e-waste:

- Procure electronic devices from credible manufactures to avoid purchasing second hand, refurbished, or obsolete devices with a short shelf life or already categorized as e-Waste. In order to achieve this, project related Information and Communication Technologies (ICT) procurement shall be done according to the World Bank procurement procedures and GIIP in the ICT sector.
- Instituting good housekeeping and operating practices, including inventory control to reduce the amount of e-waste resulting from materials that are out-of-date, off specification, contaminated, damaged, or excess to operational needs; and
- Minimizing hazardous e-waste generation by implementing stringent waste segregation to prevent the commingling of non-hazardous and hazardous e-waste to be managed.
- Instituting procurement measures that recognize opportunities to return usable materials.

- Awareness and sensitization of community on E- Waste Management Practices

4.3 E-waste Segregation and Quantification

The contractors and suppliers associated with the EA-RDIP Project shall be assigned the responsibility of sound e-waste segregation, quantification, and labelling in accordance with this plan, national laws and GIIPs. This in turn will be reinforced in their contracts and their responsibilities towards the e-waste segregation, quantification, and labelling will be clearly stated in the bidding documents.

As such, characterization, segregation, sorting, labelling, quantification, temporary storage and transport to final storage location, this shall be conducted according to composition, source, type of e-waste produced, pollutants content (POP/heavy metals/PAHs/ and others) in accordance with local and GIIP practices.

4.4 E-waste Recycling, Reuse, and Recovery

Operational assessment of end-of-life equipment shall be conducted by running appropriate tests to assess the functionality when replacing or retrofitting project related equipment. A sample of a functionality test that shall be conducted as using the template presented in the annex.

In addition to the implementation of e-waste prevention strategies, the total amount of e-waste may be significantly reduced through the implementation of reuse and recycling plans, which should consider the following elements: i) Identification and reuse/recycling of products that can be reintroduced into the operational processes ii) Investigation of external markets for recycling by other industrial processing operations located in the neighborhood or region of the facility (e.g., e-waste exchange); iii) Establishing reuse/recycling objectives and formal tracking of e-waste generation and recycling rates; and iv) Providing training and incentives to employees in order to meet objectives.

4.5 E-waste Storage

MICT staff and involved contractors shall ensure that the storage of project related e-waste is being conducted in accordance with the ESS3 and World Bank EHS Guidelines containing measures on Hazardous Waste. E-waste shall be stored in a way that prevents and controls accidental release to natural resources (air, soil, and water). The following measures are to be followed in the storage of e-waste.

- Temporary storage containers shall be available on site until transported into their final storage location.
- E-waste shall be stored in closed containers, each depending on type and composition away from direct sunlight, rain, wind, electrical fixtures, and water systems and in an area where ventilation system is not circulated to other rooms or facilities.

- E-waste shall be stored in an appropriate manner preventing the mixing or contact between different sorts of e-waste and in a separate location from solid waste.
- The storage arrangement shall allow for inspection between containers to monitor leaks or spills. Examples could include insufficient space between incompatible e-waste.
- The Contractor, employees involved in the e-waste management, and the disposal or recycling enterprises shall provide their personnel with training and induction on the proper handling of e-waste.
- Employees involved with e-waste management shall be provided with the appropriate Personal Protective Equipment (PPEs), vaccinations in accordance with the Health Law and the bylaw on hazardous waste, and a medical record shall be kept.
- Containers with different types of e-waste shall be correctly labelled, with a datasheet attached and specified for each type including but not limited to number of containers, number of units within each container, type, weight, hazardous material content (Lead, mercury, etc, date of collection, e-waste management personnel name, receiver, and final disposal method.
- Conduct periodic inspection of e-waste storage area and document the findings.

4.6 E-waste Transportation

All e-waste containers designated for off-site transport shall be secured in the designated storage location and shall be labelled with the contents, associated hazards, receiver, destination, and other information. E-waste shall then be properly loaded onto the transport vehicles in accordance with OHS guidelines on loading and unloading, specified in the World Bank EHS Guidelines, ILO guidelines, and other GIIP.

The e-waste containers shall be accompanied by an e-waste transfer note, in the form of a transport manifest that describes the load and its associated hazards, in suitable and well-suited vehicles in accordance with GIIPs. The handler and transporter shall be registered and certified. When preparing for shipment the following should be implemented:

- Name and identification number of the material(s) composing the e-waste
- Physical state (i.e., solid, liquid, gaseous or a combination of one, or more, of these)
- Quantity (e.g., kilograms or liters, number of containers)
- Waste shipment tracking documentation to include, quantity and type, date dispatched, date transported, and date received, record of the originator, the receiver, and the transporter
- Method and date of storing, repacking, treating, or disposing at the facility, cross-referenced to specific manifest document numbers applicable to the e-waste.
- Location of each e-waste within the facility, and the quantity at each location.

4.7 E-waste Treatment and Disposal

In cases when e-waste is still generated after the implementation of feasible e-waste prevention, reduction, reuse, recovery and recycling measures, e-waste materials should be treated and disposed of, and all measures should be taken to avoid potential impacts to human health and the environment. Selected management approaches include timely removal, treatment and/or disposal at permitted/ approved facilities specially designed to receive the e-waste in accordance with national laws and GIIP. The approached may include but not limited to ones listed below

- On-site or off-site chemical, or physical treatment of the e-waste material to render it non-hazardous prior to final disposal;
- Treatment or disposal at permitted facilities specially designed to receive the e-waste;
- Permitted and operated landfills or disposal facilities designed for the respective type of e-waste or other methods known to be effective in the safe, final disposal of e-waste materials

4.8 Monitoring

When significant quantities of hazardous e- wastes are generated and stored on site, monitoring activities shall include:

- Weekly visual inspection of all e-waste storage collection and storage areas for evidence of accidental releases and to verify that e-waste is properly labelled and stored.
- Weekly visual inspection of labelling, quantities, and containers conditions.
- Weekly inspection of loss or identification of cracks, corrosion, or damage to protective equipment, or floors.
- Verification of locks, and other safety devices for easy operation (lubricating if required and employing the practice of keeping locks and safety equipment in standby position when the area is not occupied).
- Documenting any changes to the storage facility, and any significant changes in the quantity of materials in storage.
- Regular audits of e-waste segregation and collection practices.
- Tracking of e-waste generation trends by type and amount, preferably by facility departments.
- Regular visual inspection of all e-waste storage, collection and storage areas for evidence of accidental releases and to verify that e-waste is properly labelled, and stored;
- Inspection of loss or identification of cracks, corrosion, or damage to protective equipment, or floors;
- Checking the operability of emergency systems;
- Documenting results of testing for integrity, emissions;
- Documenting any changes to the storage facility, and any significant changes in the quantity of materials in storage;
- Regular audits of e-waste segregation and collection practices,

- Tracking of e-waste generation trends by type and amount of e-waste generated, preferably by facility departments,
- Characterizing e-waste at the beginning of generation of a new e-waste stream, and periodically documenting the characteristics and proper management of the e-waste, especially hazardous e-wastes;
- Keeping manifests or other records that document the amount of e-waste generated and its destination;
- Periodic auditing of third-party treatment, and disposal services including re-use and recycling facilities when significant quantities of hazardous e-wastes are managed by third parties. Whenever possible, audits should include site visits to the treatment storage and disposal location. In the event that e-waste (on-site storage and/or pre-treatment and disposal) is in direct contact with soil, additional procedures must be performed to ensure regular monitoring of soil quality

Additionally, record keeping of collected e-waste needs to be monitored. E-waste collected, stored, or transported shall include;

- Name and identification number of the material(s) composing the hazardous e-waste or Physical state.
- Quantity (i.e., kilograms, number of containers)
- Content (i.e., devices, screens, servers)
- Schedule (date of collection, date of transportation, etc…)
- Hazardous and pollutant contents (i.e., existence of mercury, lead, PAHs)
- E-waste transport tracking documentation shall include, quantity and type, date dispatched, date transported, and date received, record of the originator, the receiver, and the transporter.
- Method and date of storing, repacking, treating, or disposing at the facility, cross- referenced
- to specific manifest document (e-waste transfer notes) numbers applicable to the hazardous e-waste, or the Location of each hazardous e-waste within the facility, and the quantity at each location.

5 BUDGET AND RESOURCES REQUIREMENTS

The budget estimates provided are on an annual basis and are intended as a preliminary projection to guide planning and resource allocation. However, it is important to note that the budget remains an estimate and is subject to change, especially as more accurate and project-specific financial information becomes available. Since this document is a living document, adjustments will be made accordingly once the actual budget is confirmed.

The **Table 5-1** below provides an indicative outline of the cost and resources requirements needed for the implementation of this plan;

Table 5-1: Budget and Resources Required Per Sub Project in annual basis

Activity	Timeline	Estimated annual Cost (USD)[6]
Training to Workers on the identification and handling of E-waste, segregation, filling data sheets, and storage.	Prior to commencement of works	5000
Providing containers for E-waste collection	Prior to commencement of works	10,000
collection, sorting, dismantling, and disposal of the e-waste.	During works execution	20,000
Temporary storage & Transport to final storage location	After finishing each site	150$ (avg.100$/ site)
Audits (if needed)	On completion	2000$
Tracking and monitoring	Continuous	No additional cost
Contigencies .		10,000
Total		**62,000**

[6] Budget is subject to change and to be reviewed with accurate costs at project implementation stage

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6 STAKEHOLDER CONSULTATIONS

6.1 Stakeholder Engagement process

Stakeholder engagement is an inclusive process conducted throughout the project life cycle. Where properly designed and implemented, it supports the development of strong, constructive and responsive relationships that are important for successful management of a project's environmental and social risks. For this reason, stakeholders' engagement must be started early in the project cycle because it guarantees the 'social license to operate' by signaling to communities and other local stakeholders that their views and well-being are considered important.

In this section, consultations with key stakeholders with regards EA-RDIP – Somaliland, and the implementation of project components is documented as presented the SEP. A Stakeholder Engagement Process was developed in order to achieve proper stakeholder identification and mapping. The process is further detailed in the stand-alone SEP. The objectives focused on obtaining the views of relevant stakeholders on subject matter relating to proposed activities

6.2 Stakeholder Engagements and Outcomes

The design and key activities of the project have been deliberated and refined through a series of engagements between the World Bank and GoSL representatives, and other parties involved in Phase 1 of the project. Further, other stakeholder consultations held during the project preparation phase include consultations with:

- Key MDAs at GoSL level – directly affected by the project
- Private sector – telecoms operators
- Education sector – Higher education institutions and SomaliREN
- Vulnerable people, Women and Youth

The resolutions and summary is presented below while detailed information on regarding the meetings is presented in SEP report prepared as a separate document to this plan. Further meetings will continue to take place to inform the engagement process through project implementation stage. The MICT, through the new PIU, will continue engaging in inclusive consultations with all relevant stakeholders including other MDAs, local municipalities in project areas, community leaders, entities representing disadvantaged groups and small business. Information gathered through the consultations will be used to update the SEP, as necessary.

7 E-WASTE MANAGEMENT PLAN

This section describes the proposed E-waste management plan in a matrix indicating the impacts associated with handling and mishandling of E-waste against the mitigation measures, monitoring and the relevant responsible parties in the proposed project. It can be adopted to avoid hazardous impacts associated with the dismantling and recycling of the E-waste.

Table 7-1: E-Waste Management Plan Matrix

Environmental Impacts			
Impact	Mitigation Measure	Monitoring Tools	Responsibility
Air Pollution	• Procure Electronic devices from credible manufactures to avoid purchasing second hand, refurbished or obsolete devices with a short shelf life or already categorized as e-Waste. Apply WBG Procurement procedures and GIIP. • Instituting good housekeeping and operating practices, including inventory control to reduce the amount of e-waste resulting from materials that are out-of-date, off specification, contaminated, damaged, or excess to operational needs • Implement stringent e-waste segregation to prevent the commingling of non-hazardous and hazardous e-waste to be managed. • Identify and recycle some of the ICT products that can be reintroduced into the operational processes.	• Review of procurement evaluation report for the manufacturers suppling the electronic devices. • Records of good housekeeping and visual inspection. • Review of procurement evaluation report for the manufacturers suppling the electronic devices. • Availability of E-waste receptacles for collecting e- waste. • Inclusion of e-waste management provisions in contracts. • Inclusion of E&S measures that cover labor, E&S mitigation measures into contracts. • Records of good housekeeping and visual inspection. • Certificate of disposal of E-wastes given by a licensed E-waste firm, stating that E-waste from the project has been successfully disposed of. • Awareness campaigns and publications for users of electronic devices on E- waste management. • Assess the contracts and staffing of e-waste contractors to ensure no child labor is employed.	Project implementers & Contractors
Increased amount of waste	• Establish E-waste collection centers, including collection bins, receptacles. • Regular audits of e-waste segregation and collection practices. • Tracking of e-waste generation trends by type and amount, preferably by facility departments	• Certificate of disposal of E-wastes given by a licensed E-waste firm, stating that E-waste from the project has been successfully disposed of. • Audit reports present. • Records of duly filled tracking forms.	

	• Documenting any changes to a storage facility, and any significant changes in the quantity of materials in storage.		
Water pollution	• Instituting good housekeeping and operating practices, including inventory control to reduce the amount of e-waste resulting from materials that are out-of-date, off specification, contaminated, damaged, or excess to operational needs	• Records of good housekeeping and visual inspection.	
Economic Impacts			
Increased healthcare expenditure	• Remitting all statutory deductions as per the laws of the Government of Somaliland.	• Checking of medical records for the workers	
Informal trade and e-waste management centre	• Contract a licensed E-waste firm/ or liaise with appropriate authorities for the timely removal of E-waste for treatment and disposal at permitted facilities. • Ensure that receiving entities or firms are contractually committed to providing their workers with all necessary requirements and provisions. • Workers need to be aware of the existence of the Workers' GM and are to be provided with orientation.	• Availability of E-waste receptacles for collecting e- waste. • Availability of licenses and permits for the facilities. •	Project implementers & Contractors
Loss of useful resources/materials	• Identify and recycle some of the E-waste products that can be reintroduced into other operational processes. • Identification, labelling, and segregation of e-waste at source • E-waste quantification, and qualitative record keeping	• Availability of E-waste receptacles for collecting e- waste	
Social Impacts			

Health and Safety of the Public	• Contract a licensed E-waste firm/ or liaise with appropriate authorities for the timely removal of E-waste for treatment and disposal at permitted facilities. • Ensure that receiving entities or firms are contractually committed to providing their workers with all necessary requirements and provisions. • Raising awareness campaigns to the public. Engaging in stakeholder participation.	• Awareness campaigns and publications for users of electronic devices on E- waste management. • Availability of licenses and permits for the facilities	Project implementers & Contractors
Loss of appreciation to ICT	• Raising awareness for the users of electronic devices to ensure that they engage in best practices for E-waste management.	• Awareness campaigns and publications for users of electronic devices on E- waste management.	
Aesthetic value of land	• Establish E-waste collection centers, including collection bins, receptacles. • Create banners and posters and distribute them in strategic places.	• Availability of E-waste receptacles for collecting e- waste. • Availability of posters and banners on best E-waste practices.	
Child Labor and GBV impacts	• Inclusion of E&S measures that cover labor, E&S mitigation measures into contracts. • Preparing a detailed LMP for the contractors to adhere to.	• Assess the contracts and staffing of e-waste contractors to ensure no child labor is employed.	

8 REFERENCES

1. African Clean Energy Technical Assistance Facility E-Waste Policy Handbook, July 2019.
2. Best Practices for E-Waste Management in Developing Nations. Rachna Arora, GTZ-ASEM April, 2008
3. GSMA E-waste Legislative Framework Map (GSMA,2021).
4. Guidelines for E-Waste Management in Kenya, 2010
5. Hai-Yong Kang, Julie M. Schoenung (2005). Electronic waste recycling: A review of U.S. infrastructure and technology options, Resources Conservation & Recycling 45 368- 400, Elsevier.
6. Waste Management (Waste Electrical and Electronic Equipment) Regulations 2005. Statutory Instruments (S.I.) No. 340 of 2005. Dublin, Ireland.

9 Appendices

9.1 Sample Functionality Test for Used Computing Equipment

This sample functionality test has been adapted from ITU end-of-life management for ICT equipment[7] and the Basel Convention PACE revised guidelines on environmentally sound material recovery and recycling of end-of-life computing equipment[8].

Computing equipment	Functionality tests	Test results
Central processing units (CPUs), including desk top PCs, routers, and other equipment	**Power on self-test (POST)** Switching on the computer and successfully completing the boot up process. This will confirm that the principal hardware is working, including power supply and hard drive. • A working monitor will need to be used if none present • Ensure that cooling fans are functioning • Remove dust as much as possible (e.g., delicately using a vacuum cleaner is possible), in order to ensure better cooling and stable operation	**Computer** should boot up successfully **Computer** should respond to keyboard and mouse input. **Cooling fans** should operate normally. No strong mechanical sound denoting end-of life of fans.
Cables and power cords	Assess cable insulation and inspect plugs	Cabling and plugs should be complete and free of damage, e.g., has no cracked insulation. Any detachable cable with damage should be replaced by a new one to avoid electric shocks or premature failures.
Components (removed from equipment) including mother boards, other circuit boards, sound cards, graphics cards, hard drives, power supplies and cords/ cables)	Components should be gently wiped from dust to improve thermal exchange and allow better cooling. Components should be tested for functionality either before removal from the host computer or laptop, or by insertion in a test bench computer using diagnostic software, or a known working device as applicable	Components should be fully functional Power supplies and cords / cables should be complete and free of damage, e.g., has no cracked insulation. Any detachable cable with damage should be replaced by a new

[7] https://www.itu.int/dms_pub/itu-t/oth/4B/04/T4B0400000B0013PDFE.pdf

[8] [8]http://www.basel.int/Implementation/TechnicalAssistance/Partnerships/PACE/PACEGuidelines,ManualandReports/tabid/3247/Default.asp

		one to avoid electric shocks or premature failures.

9.2 Inspection Form Template

E-waste Type Generated	Hazardous Content? (Pb, Hg, PAH, ...)	Segregated		Stored		Recycled/ Reused/ Recovered		Disposed		Satisfactory	
		Y	N	Y	N	Y	N	Y	N	Y	N

9.3 Sound Management of Used batteries

Definitions of Terms

Battery Any device that stores energy for later use; common use of the word, "battery however, is limited to an electrochemical device that converts chemical energy into electricity, by use of a galvanic cell.

Galvanic cell - a device consisting of two electrodes (an anode and a cathode) and an electrolyte solution; batteries may consist of one or more galvanic cells.

Lead battery - the electrical accumulator in which the active material of the positive plates is made up of lead compounds and that of the negative plates is essentially lead, the electrolyte being a dilute sulphuric acid solution.

Used lead battery - the battery which is no longer capable to be recharged or cannot retain its charge properly, its lifetime reaches its end and it becomes a waste.

Management of used lead batteries - the overall process of collection, transport, recovery and or disposal of used lead batteries, including the supervision of such operations.

Separate collection - the gathering of used lead batteries, including the preliminary sorting and preliminary storage of used lead batteries for the purposes of transport to a treatment facility.

Storage - placing of used lead batteries in the room of waste management or treatment facilities in sites with impermeable surfaces and suitable weatherproof covering or in suitable containers.

Treatment of used lead batteries - means recovery or disposal operations with used lead batteries, including preparation prior to recovery or disposal

Recovery - means any operation the principal result of which used lead batteries serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy

Recycling - means any recovery operation by which used lead batteries materials are reprocessed into products, materials or substances whether for the original or other purposes

Fractions of used lead batteries – material parts and pieces produced from treatment of used lead batteries and relevant by- processes of used lead batteries

Disposal - means any operation which is not recovery even where the operation has as a secondary consequence the reclamation of substances or energy

Environmental and Health Effects of Used Batteries

Used batteries pose a threat to our environment and should be managed properly. The toxic materials present in the battery can cause harm to the environment and to human beings also. This is the reason why waste battery recycling should be done properly. The incorrect management of waste lead batteries cause danger to waters soil and air, as well as to human health.

Batteries are safe, but precaution applies when touching damaged cells and when handling lead acid systems that have access to lead and sulphuric acid. Lead batteries are labelled as hazardous material.

Lead is a toxic metal that can enter the body by inhalation of lead dust or ingestion when touching the mouth with lead-contaminated hands. If leaked onto the ground, the acid and lead particulates contaminate the soil and become airborne when dry.
Exposure to lead causes a variety of health effects, and affects children in particular. Lead is a metal with no known biological benefit to humans. Too much lead can damage various systems of the body including the nervous and reproductive systems and the kidneys, and it can cause high blood pressure and anaemia. There is no known safe blood lead concentration. But it is known that, as lead exposure increases, the range and severity of symptoms and effects also increases.

The sulphuric acid in a lead acid battery is highly corrosive and is potentially more harmful than acids used in other battery systems. Eye contact can cause permanent blindness; swallowing damages internal organs that can lead to death.

Collection, transport and storage of used Batteries
The used lead batteries are an important source of environmental hazard and it is necessary to operate the effective system of management of used lead batteries. The result of the system is the environmentally safe handling and disposal of lead wastes as well as the production of valuable secondary raw materials.

The life cycle of lead batteries consists of these steps:

- Production
- Consumption
- Collection and sorting
- Transport
- Storage
- Recovery (recycling)
- Disposal

General occupational health and safety recommendations for workers during the waste management and treatment of used lead batteries

The actions and certain recommended measures in connection with occupational health and safety should be taken to improve waste management and treatment of used lead batteries of each treatment plant, and to achieve good environmental control practices. From the health point of view, the proposed preventive measures are activities that should be observed in the occupational environment in order to prevent the workers exposed to lead from suffering adverse effects of lead contamination.

First aid treatment that is necessary part of each facility in case of contact with sulphur acid calls for flushing the skin for 10 to 15 minutes with large amounts of water to cool the affected tissues and to prevent secondary damage. Immediately remove contaminated clothing, thoroughly wash the underlying skin and call for the doctor.

The most important proposed measures are to 1: (a) consider every material containing lead as a possible source of environmental and human contamination;

- Keep the work environment in compliance with the national regulations for industrial safety;
- Segregate the work and eating areas i.e. prohibit eating and smoking inside the working areas;
- Prohibit children and pregnant women from working in lead recycling facilities;
- Undertake the development of educational and informative programs;
- Ensure the use of personal protection equipment in working places containing at least:

  - ✓ Effectively protective cloth;
  - ✓ Hard hats and safety footwear;
  - ✓ Daily clean-up of the used cloths;
  - ✓ Check and clean respirators daily;
  - ✓ Protective masks which may vary in accordance of the average lead concentration in air;

- Control the lead concentrations in the working environment;
- Demand periodic medical checks of lead exposed workers;
- Enforce showering at the end of work.

Collection and sorting of used lead batteries

As used batteries are a valuable source of Lead it is important to provide separate collection under controlled conditions to get the material for recovery as clean as possible. The second reason for controlled collection is environmental protection to prevent unprofessional dismantling with release of electrolyte to waters or soil.

The aim of separate collection is to get the used lead batteries from waste producers to authorised treatment facilities to prevent environmental and health hazards.

The outcome of the project proposed the extended producer responsibility where the producers (importers) are obliged to provide (prepare, organise and finance) the system of waste collection, treatment and disposal. The producers will provide one or several systems of separate collection of waste batteries in order to meet collection limits given by legislation.

Transport of used lead batteries

Used lead-acid batteries must be considered as hazardous wastes when transport is needed. Again, the main problem associated with battery transport is the electrolyte, which may leak from used batteries, requiring control measures in order to minimize the risk of spillage and define the specific actions to be taken in event of an accident:

(a) used batteries must be transported inside containers: no matter which mode of transport is being used, i.e. boat, train, etc., used lead-acid batteries must be transported inside sealed containers due to the risk of leakage, which may be high even if the batteries are appropriately transported in upright

position. The transport may displace the batteries from their original positions, including eventual box breakages or turning them upside down, which will certainly leak the electrolyte content, thus making it necessary to provide a shock resistant and acid resistant sealed container;
(b) Containers must be well packed to the transport vehicle: containers should not be allowed to move while being transported. Therefore, they must be bound, shrink wrapped or stacked properly to avoid this problem;
(c) The transport vehicle should be identified with symbols: the vehicle, whether it is a ship a truck or a van must be correctly identified, following international conventions, symbols and colours identifying the fact that corrosive and hazardous products are being transported;
(d) Specific equipment: a minimum set of equipment necessary to combat any simple spillage or leakage problems should be provided and the transport team trained on how to use it;
(e) Drivers and auxiliaries should be trained: people dealing with hazardous wastes should always be trained in emergency procedures, including fire, spilling, etc. and how to contact emergency response teams. Besides this, they should be aware of the specific kind of hazardous material is being transported and how to deal with it;
(f) Personal protection equipment: PPE should be provided for the transport team and they should be trained in the use of the equipment, in case of any accident
(g) Transport schedule and map: if possible, hazardous waste transport should always choose routes that minimize the risk of possible accidents or other specific problems. This is made possible if they follow a certain predefined path and restrict themselves to a known schedule1. Every transport should be controlled by state authorities by the means of permits. It is recommended the permit should contain the following minimum information: Name and identification of sender receiver (address, ID number, statutory or other responsible person. The vehicle must be furnished with first- aid set, set for elimination of accident consequences and the driver must be instructed on techniques in the case of accident

Storage of used lead batteries

Storage, including temporary storage, of waste batteries at treatment facilities shall take place in sites with impermeable surfaces and suitable weatherproof covering or in suitable containers. Table 8 shows recommendations on breaking down these requirements to a more detailed specification15.

These specifications are valid for storage at treatment facilities including sorting facilities and storage facilities.
Storage buildings are used for storing all kinds of substances, from drums with flammable liquids, cylinders with pressurised gas, to packaged products such as chemicals and pesticides or chemical wastes awaiting disposal. They can be a standalone building or be part of another building.

Good design and construction of storage buildings containing dangerous materials focuses on events such as fire, explosion and releases of dangerous substances, in particular to prevent or control them as much as possible. Also good management practices and operational procedures are important.

Mostly, but not always, storage buildings are constructed from non-combustible materials. The degree of fire-resistance offered by the building itself determines the minimum distance to other buildings and to the boundaries of the danger zone. With a sufficient degree of fire resistance the storage building can be part of another establishment.

The storage space can be separated into different compartments for storing different types of hazardous material each by partition walls or by leaving a storage-free zone empty between the compartments. Some warehouses have an inbuilt store within the main warehouse. This interior store can be used to store particularly hazardous materials, such as highly flammable liquids or gases as well as peroxides.
The floors of the building are usually made of non-combustible material, are liquid-tight and are resistant to the stored substances.
The roof of the building is resistant to wind- blown fires, with the roof structure being of a fire resistant construction to prevent fire entering the store. The degree of fire- resistance depends on different factors such as, how close the store is to the border of the site or other buildings and the type of substances stored.
A storage building is normally equipped with adequate ventilation to prevent the formation of an explosive gas mixture from leakages and to extract any harmful or unpleasant fumes.

The use of electrical equipment can generate sparks that might ignite a fire in the storage building. Therefore, it is important to use explosion-protected in the storage building. Therefore, it is important to use explosion-protected electrical equipment. However, proper earthling of the steel structure also may be sufficient.
If a fire breaks out in a storage facility, part of the stored substances may be released. The storage facility should be constructed in such a way that the released substance cannot cause any harm. In particular provisions are to be taken to prevent polluted extinguish ant from entering the soil, the sewage systems or surface water.

In principle, measures and provisions for storing dangerous (packaged) materials outside do not differ from those for storage inside a building. The amount and type of substances stored determines the minimum distances from boundaries and buildings to be observed. To protect the storage from direct sunlight and rain, the storage area may be covered by a roof.

The provisions for collecting of spilled substances and possibly released extinguish ant are the same as those applied in storage buildings as described above. When the storage is not covered with a roof, provisions for the cleaning of possibly polluted rainwater and its controlled discharge should be in place.

The level of fire prevention and fire-fighting measures depend on many factors, such as the flammability of the stored substances, the flammability of the packaging and the quantity of material stored