Overview of e-waste in Kenya

Manufacturing Africa

June 2022

This programme is funded by UK aid from the UK Government; however, the views expressed do not necessarily reflect the UK government's official policies

We have engaged various stakeholders to generate our assessment on implementing EPR for e-waste in Kenya

5+

Electronics importers, retailers and distributors

5+

Industry associations focused on manufacturing and waste management

2+

Government officials in environment and electronics equipment sector

5+

Waste management operators including collectors, recyclers, and repair/reuse players

5+

Global experts involved in waste management

5+

Development partners focused on the environment and waste management

Agenda

What are the categories of e-waste in Kenya?

How much e-waste is generated in priority sub-sectors?

How can EPR support the scale up of collection, recycling, reuse/repair of electronics in Kenya?

Electronic waste (e-waste) comprises of end-of-life electrical and electronic equipment products

PRELIMINARY

Focus of this document

E-waste is one of the 5 waste streams that is in scope of the EPR regulations in Kenya

E-waste refers to any electrical or electronic equipment (EEE), which is waste, including all components, subassemblies and consumables, which are part of the equipment at the time the equipment becomes waste.

E-waste has also been defined as any **appliance using an electric power supply that has reached its end-of-life**

According to the EPR regulations, E-waste has been categorized as follows:

i. Electrical and electronic equipment
ii. Mercury auto switches
iii. Thermostats
iv. Battery and accumulators

E-waste in Kenya has been categorized as follows as per the e-waste guidelines

IT and telecommunication equipment

laptops, PCs, telephones, cellphones

Large household appliances

such as refrigerators, washing machines, dryers etc.

Small household appliances

including vacuum cleaners, irons, blenders, fryers etc.

Consumer equipment

video and audio equipment, musical instruments, accumulators, solar equipment

Lighting equipment

such as incandescent light bulbs, fluorescent tubes, gas-discharge lamps

Batteries

Alkaline, Lithium ion

Electrical and electronic tools

including drills, saws and gardening devices

Toys, leisure and sports

electronic toys, models, sports equipment

Medical devices

all medical equipment except for implants

Monitoring and control devices

including detectors, thermostats, laboratory equipment etc

Vending machines/ automatic dispensers

for hot drinks, hot or cold bottles, solid products, money, and all appliances that automatically deliver various products.

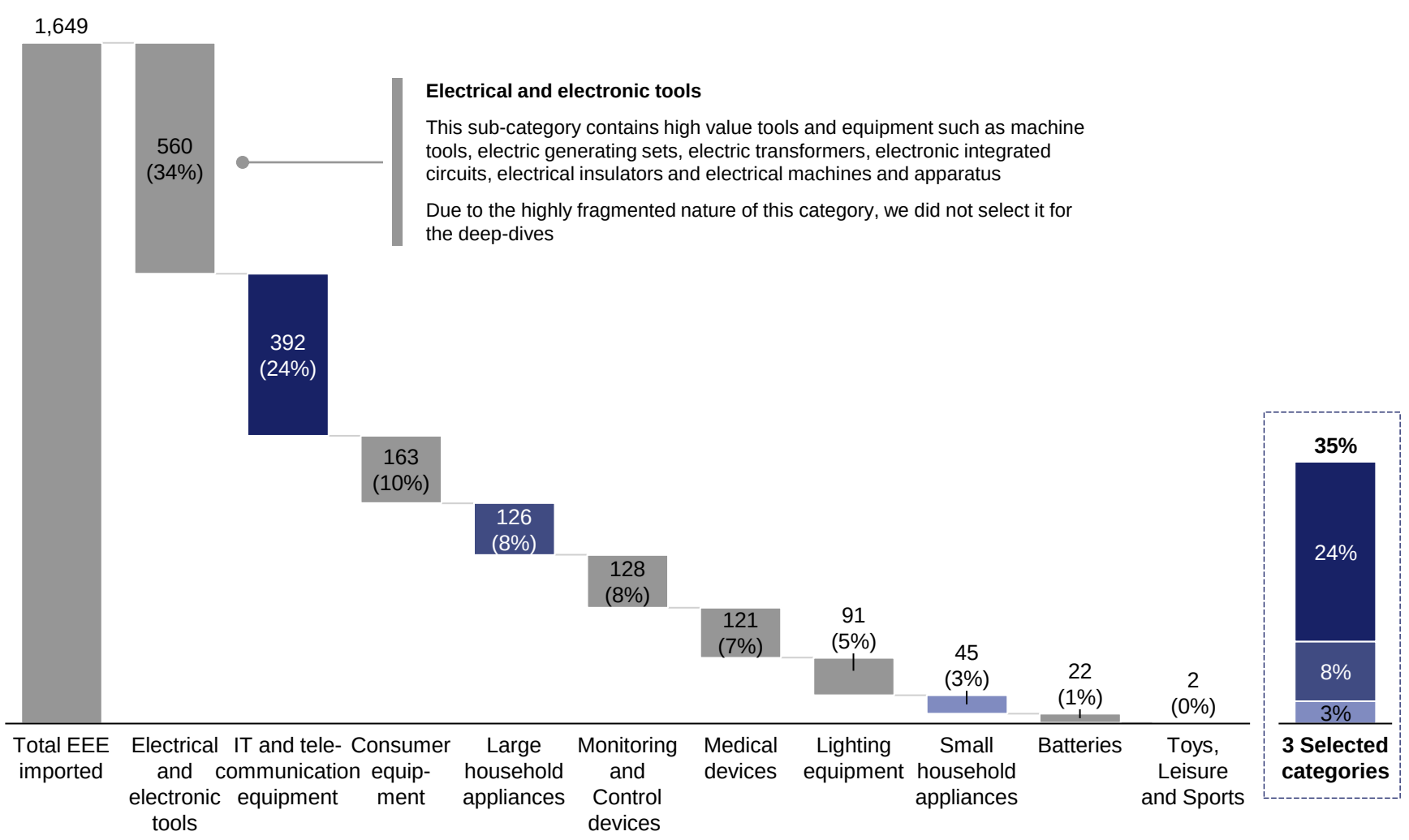
Security and military equipment

drones

Source: Ministry of Environment and Forestry, National e-waste management strategy, 2019; K4D, Drivers, barriers and opportunities of e-waste management in Africa, 2021; WHO, Children and digital dumpsites, 2021; ILO, The global impact of e-waste, 2012; Environmental Management and Co-ordination of Extended Producer Responsibility, 2020; press search

There is USD ~1.6 billion of electronic and electric equipment imported annually; we focus on categories that represent 35% of imports

Value of electronic and electric equipment (EEE) imports to Kenya in 2018, (USD Mn)



Deepdive categories

Rationale for selection of the deep dive categories includes:

- **Value of imports**
- The **three selected categories also make up ~1/3 of the total EEE imported:**
  - IT and telecommunication equipment at 25%
  - Large household appliances at 8%
  - Small household appliances at 3%
- **Depth of expertise by MA team (i.e., consumer electronics)**

This selection **allows broad representation and analysis across varied electronic equipment volumes and values**

Source: UN Comtrade

Agenda

What are the categories of e-waste in Kenya?

How much e-waste is generated in priority sub-sectors?

- Cell phones
- Refrigerators
- Irons

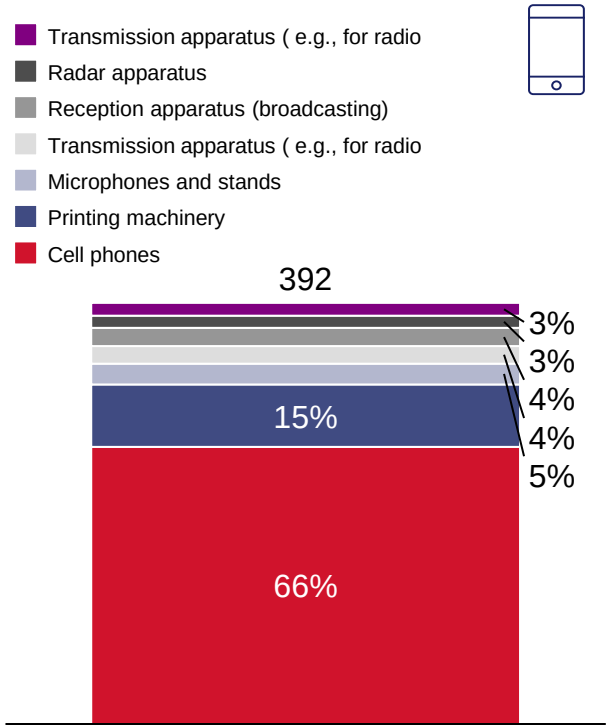
How can EPR support the scale up of collection, recycling, reuse/repair of electronics in Kenya?

Within each prioritized category, we focus on one major good for deeper analysis on collection, reuse, and recycling

PRELIMINARY

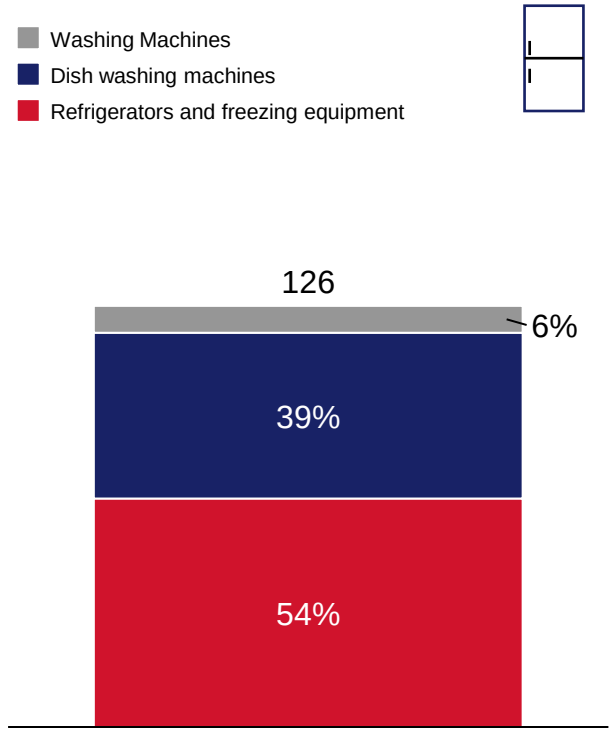
Prioritized products

Cell phones constitute 66% of IT and telecommunication equipment, import values, USD millions



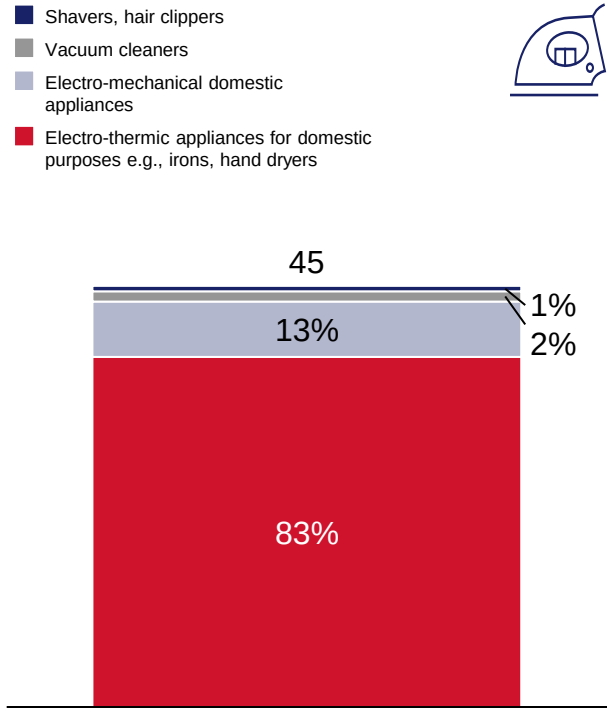
Total IT and telecommunication equipment imports

Refrigerators constitute 54% of large household appliances, import values, USD millions[1]



Total large household appliances

Electro-thermic appliances constitute 83% of small household appliances, import values, USD millions



Total small household appliances imports

The prioritized goods selected from each of the selected categories each **are greater than 50% of the total value of the imports** for the respective categories.

The small household appliances category is highly fragmented. **The selected product, irons, has been grouped along with other electric household appliances such as hand dryers but still makes up ~ 83%** of the total import value of this category

1. Subcategory also includes: electric water, space, soil heaters; electro-thermic hair-dressing apparatus; hand dryers, irons; electro-thermic appliances for domestic purposes

Source: UN Comtrade

Agenda

What are the categories of e-waste in Kenya?

How much e-waste is generated in priority sub-sectors?

- **Cell phones**
- Refrigerators
- Irons

How can EPR support the scale up of collection, recycling, reuse/repair of electronics in Kenya?

End-of-life phones in Kenya are dismantled to recover functional components or disposed in landfills

PRELIMINARY

Market entry

Cell phones are introduced into the market via import by:

Distributors: Include players such as Salute iworld, Elite Digital, PC world etc

Retail traders : Import and sell cell phones including players such as Safaricom, Carrefour and Jumia

Private/ commercial users

Households: hoard old cell phones due to sentimental attachment and lack of awareness on processing options

Business: Stockpile e-waste mainly due to lack of awareness on waste processing options

Governments: Largest e-waste holders in Kenya due to large volumes purchased

Waste collection

Waste pickers: Collect cell phones dumped with other waste mainly at Dandora dumpsite

Drop-off locations: WEEE centre, Safaricom, Carrefour

Garbage service operators: Collect any cell phones that may be disposed along with household waste

Repairer and processor

Processing of end-of-life phone

End of life

- Recovery of components
- Energy recovery of plastics
- Disposable waste

Dismantling of end-of-life phone

The cell phone components are broken up into:

Batteries | Plastics | Circuits | Accessories

Recoverable and valuable materials are extracted

Plastics | Gold | Cu Copper | Li Lithium | Co Cobalt

Examples of items made from the recovered resources include:

Stainless steel | Plastic fence posts | Batteries

Final user

Retailer
- Sell the products which could be reused or refurbished to secondhand users
- Sell components received from dismantled waste to be used in other products

Manufacturer
- Reintegrate/reintroduce scrap into new components

Disposal

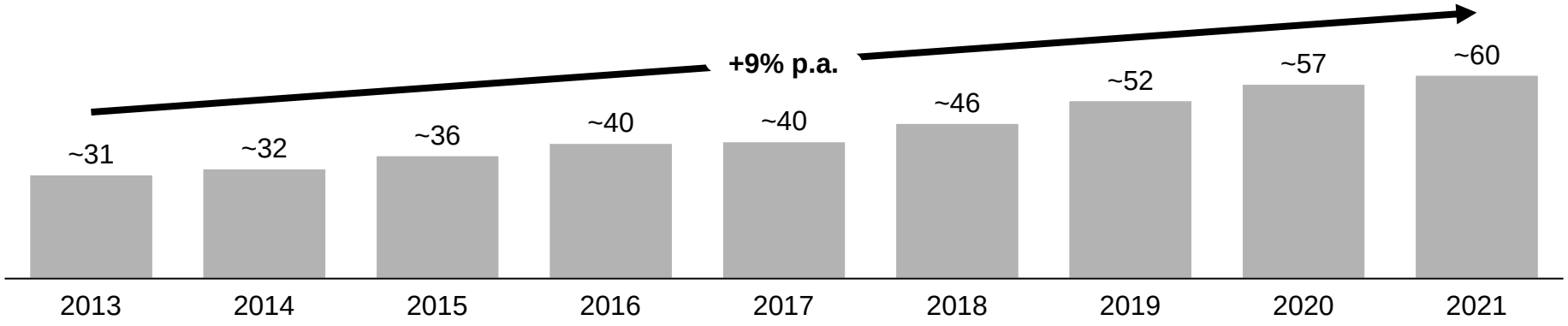
Possible treatment includes:
- Residual waste
- Landfill

Source: Communications Authority of Kenya; Expert interviews; Press search

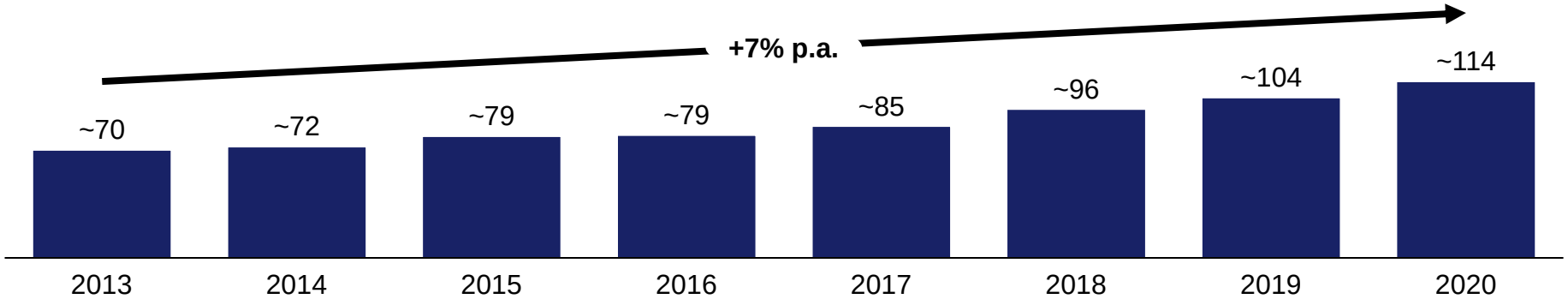
The number of cell phone devices in Kenya has been increasing at ~9% per annum in the last decade

PRELIMINARY

Number of cell phone devices in Kenya, in Millions



Number of mobile cellular subscriptions (per 100 people), in Millions



The **number of cell phone devices** and **mobile subscriptions** have been increasing at 9% and 7% annually in the last decade

Average life span of cell phones is 4 years signifying annual growth in the volumes of e-waste generated by disposal of old phones generating

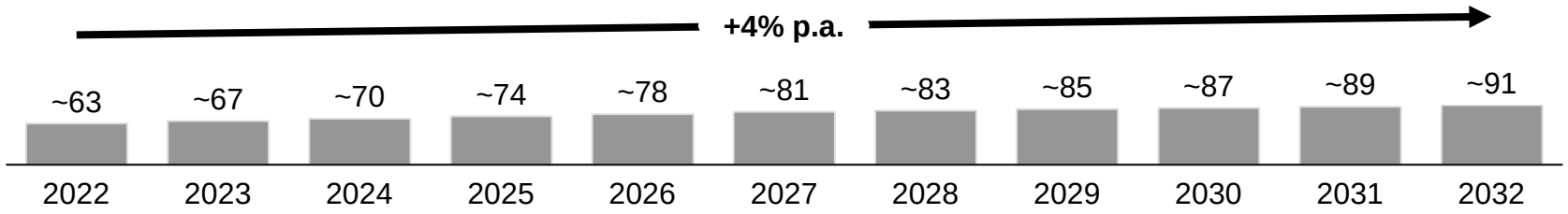
Source: Communications Authority of Kenya; World Bank

The volume of waste generated by cell phones could grow at 4% p.a. over the next decade

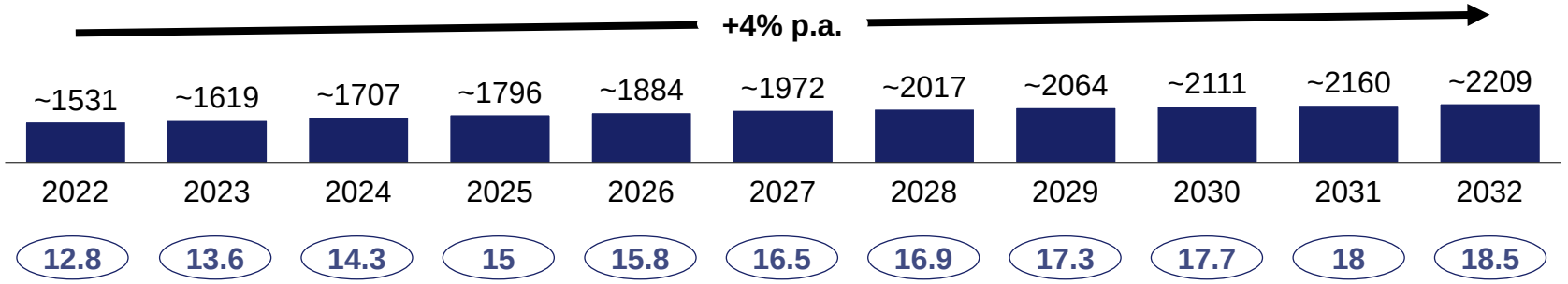
PRELIMINARY

X Millions of mobile phones disposed annually

Estimated number of cell phones in Kenya between 2022 and 2032, *millions*



Estimated volume of waste generated by cell phones disposed in Kenya between 2022 and 2032, '*tonnes*[1]



1. The volumes of waste generated by cell phones is based on the publicly available data on the number of cell phone devices in Kenya and the historical growth rate. Assumptions are as follows:

a.) The average lifespan of a cell phone is 4.7 years
b.) 90% of cell phones are disposed when they reach their end of useful life
c.) Average weight of a cell phone is 0.125 kilograms
d.) Growth rate of waste generated by cell phones is 1:1 positively correlated with the growth rate in number of cell phone devices

2. The number of cell phones is estimated to increase at ~3.5 million units annually between 2022 and 2027 and at the population growth rate of ~2% between 2027 and 2032

Source: UN Comtrade, E-Waste Initiative of Kenya

By 2032, there may be an estimated **~2,200 tonnes of e-waste generated annually by end-of-life mobile phones**

In the coming decade, **the volume of waste generated by cell phones could grow at ~4% p.a.**[2] which is **lower than the historical growth rate in number of mobile device** recorded in the last decade at ~9% p.a. This was driven by the **increasing percentage of the population with cell phones**

The estimated lifespan of mobile phones is less than 5 years

Agenda

What are the categories of e-waste in Kenya?

How much e-waste is generated in priority sub-sectors?

- Cell phones
- **Refrigerators**
- Irons

How can EPR support the scale up of collection, recycling, reuse/repair of electronics in Kenya?

The processing of cooling and freezing waste is a capital- and labour-intensive process but with a high volume of recoverable components

PRELIMINARY

Market entry

Refrigeration equipment is introduced into the market via import by:

- **Distributors:** Sell large quantities of products to commercial customers.
- **Retail traders** : Import and sell refrigerators including players such as Hotpoint

Private/ commercial users

- **Households**: Retain old refrigerators mainly due to lack of awareness on processing and disposal options

Waste collection

- **E-waste processors:** Organize household collection of end-of-life refrigerators
- **Drop-off locations:** Organized by WEEE centre, Safaricom, Carrefour e.g., through take-back schemes
- **Garbage service operators:** N//A currently

Repairer and processor

Processing of end-of-life refrigerator

Pre-processing
- Extraction of refrigerants and used oils in the compressor
- Extraction of potentially hazardous parts e.g., switches electronics containing mercury and ozone depleting substances
- Extraction of other parts (cables, compressor, shelves, doors, glass)

Size reduction

Manual and mechanical size reduction of the refrigerator through cutting

Shredding

Progressive destruction and size reduction of the waste

Blowing agents (to incineration)

Mechanical sorting
- Magnetic separators
- Eddy currents
- Density/ optical separators

Final user

Retailer
- Sell the products which could be reused or refurbished to secondhand users
- Sell components received from dismantled waste to be used in other products

Manufacturer
- Reintegrate/reintroduce scrap into new components

Disposal

Possible treatment includes:
- Residual waste
- Landfill

Processing of an end-of-life refrigerator

Breaking it down

A. Oils can be recycled for use in other industrial equipment

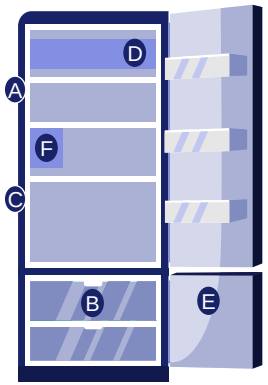
B. Hazardous capacitors are shipped to an approved waste incinerator

C. Metal, plastic and foam is separated & shipped to nearby waste-to-energy incinerators

D. Mercy-containing switches and thermostats are sent to a qualified handler

E. Metal and plastic are sent to appropriate recyclers

F. Glass is crushed and could be used as an aggregate in concrete



What's made from a recycled refrigerator

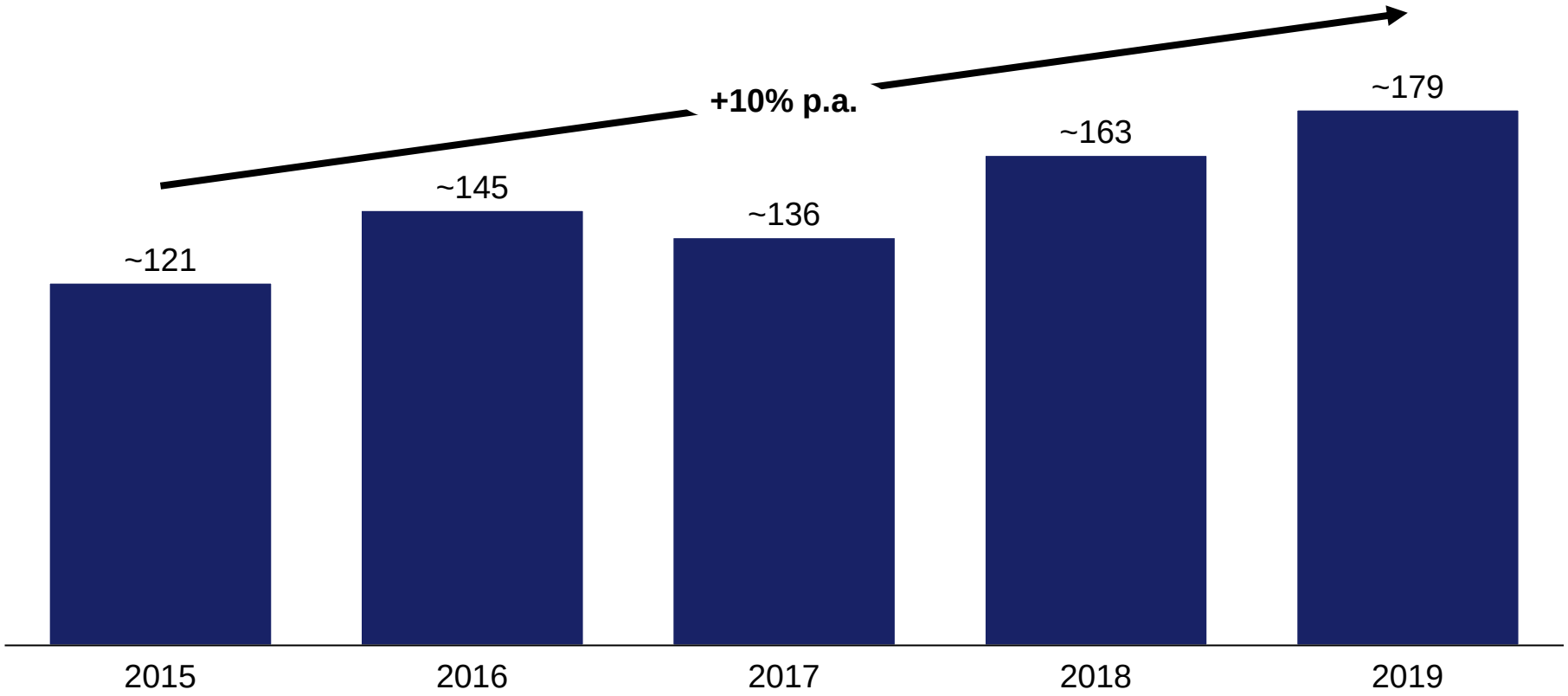
Plastic		Metal			Glass
Mobile phones	Computers	Nails	Rebar	Beverage cans	Cement mixture

Source: Expert interviews; WEEE Centre; EWIK

The number of refrigerators imported increased at ~10% per annum between 2015 and 2019

PRELIMINARY

Number of refrigerators in Kenya, thousands



The **number of refrigerators** increased at 10% p.a. between 2015 and 2019

This could be an indicator of **increased penetration in the number of households with refrigerators**

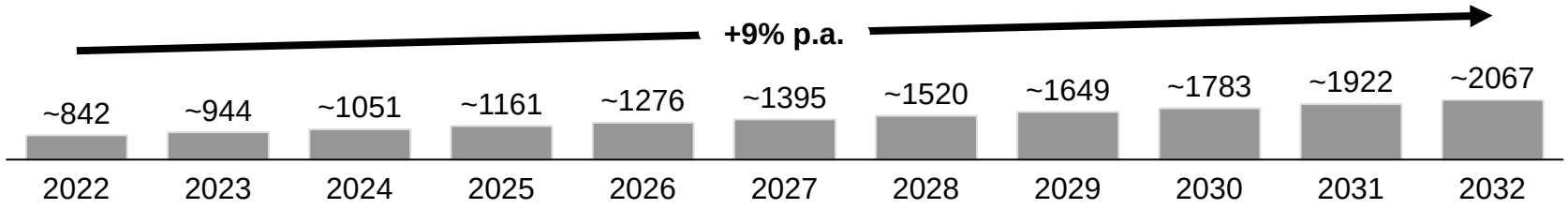
Source: UN Comtrade; World Bank

The volume of waste generated by refrigerators could grow at ~9% over the next decade

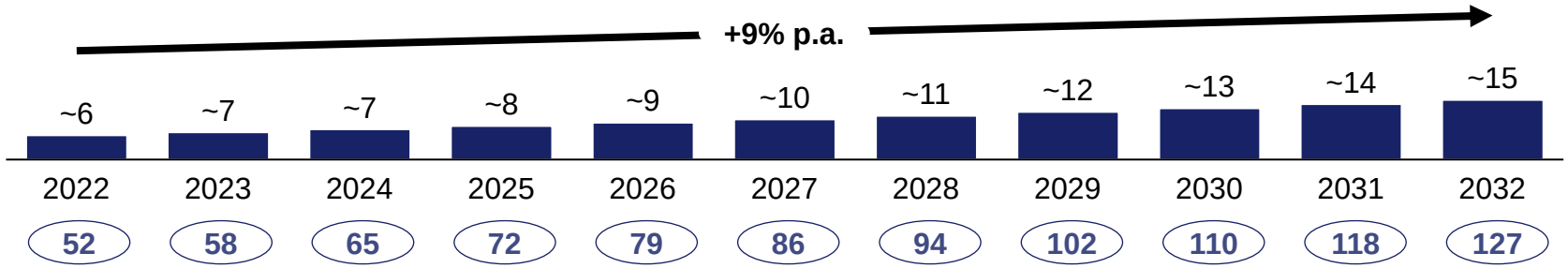
PRELIMINARY

X Thousands of refrigerators

Estimated number of refrigerators in Kenya between 2022 and 2032, *thousands*



Estimated volume of waste generated by refrigerators disposed in Kenya between 2022 and 2032, '*tonnes*[1]



1. The volumes of waste generated by refrigeration equipment are based on the publicly available data on the Kenyan population and percentage of households with refrigerators. Other assumptions are as follows:

a.) The average lifespan of a refrigerator is 12 years
b.) 25% of refrigerators are disposed when they reach their end of useful life while 75% are repaired which extends their lifespan by another 6 years
c.) Average weight of a refrigerator is ~115 kilograms
d.) Imported refrigerators replace those that have come to their end of useful life
e.) The number of households with a refrigerator grows by ~0.5% annually in the next decade

Source: UN Comtrade, E-Waste Initiative of Kenya; Global Data Lab

The **volumes of waste generated by refrigeration equipment** is expected **to grow at ~9% p.a.** between 2022 and 2032

This growth is driven by the estimated increase in **import value and volumes of refrigeration equipment** potentially due to growth in purchasing power resulting in:

i. Purchase of **higher value** equipment

ii. Higher volumes of refrigeration and freezing equipment purchased

The estimated volumes are also driven by the **increase in number of households with a refrigerator.** The expected lifespan of a refrigerator is ~12 years

Agenda

What are the categories of e-waste in Kenya?

How much e-waste is generated in priority sub-sectors?

- Cell phones
- Refrigerators
- **Irons**

How can EPR support the scale up of collection, recycling, reuse/repair of electronics in Kenya?

95% of the components of an end-of-life iron can be recycled to be used in making other products

PRELIMINARY – WORK IN PROGRESS

Market entry

Irons are introduced into the market via import by:

- **Distributors:** Sell large quantities of products to commercial customers
- **Retail traders** : Import and sell irons

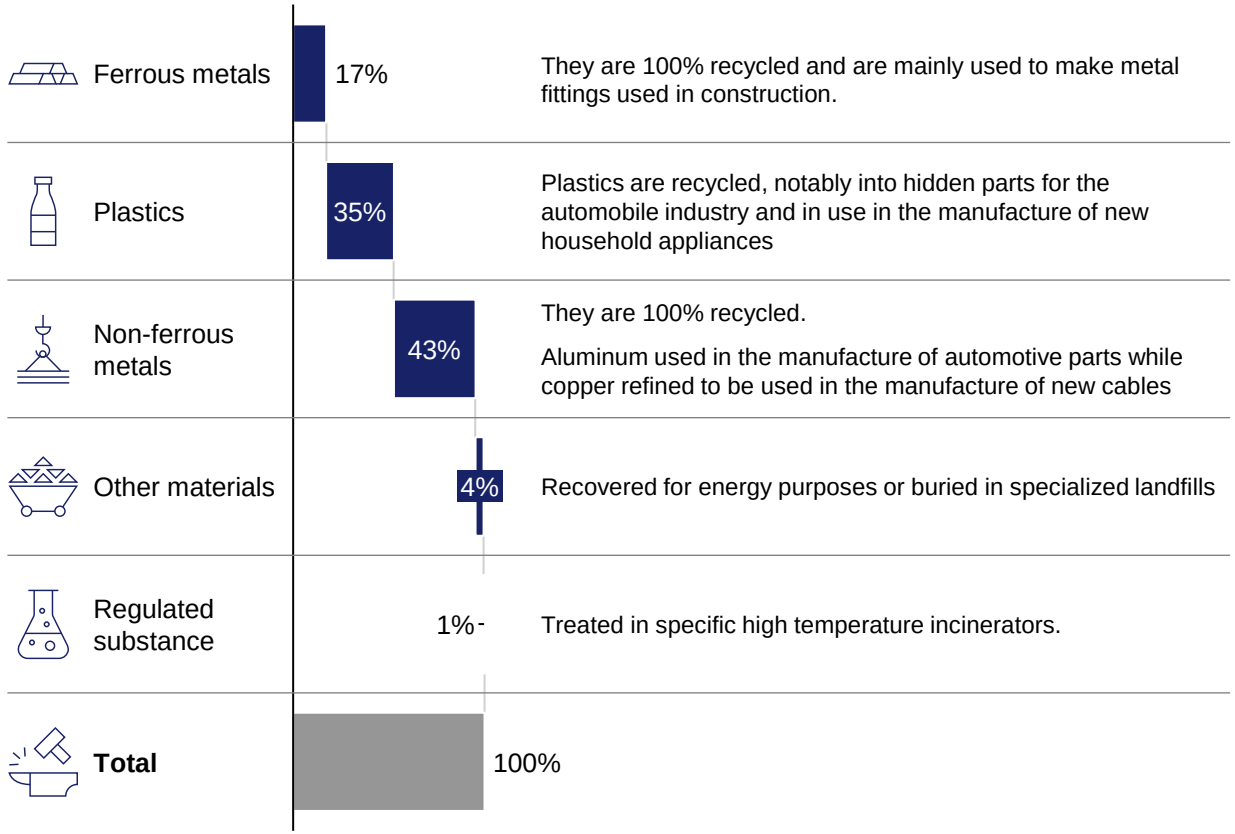
Private/ commercial users

- **Households**: Generate waste by disposal of end-of-life irons

Waste collection

- **E-waste processors:** Organize household collection of end-of-life refrigerators
- **Drop-off locations:** Organized by WEEE centre and Carrefour
- **Garbage service operators:** Collect the e-waste materials dumped along with other household waste

Repairer and processor



Final user

Retailer

- Sell the products which could be reused or refurbished to secondhand users
- Sell components received from dismantled waste to be used in other products

Manufacturer

- Reintegrate/reintroduce scrap into new components

Disposal

Possible treatment includes:

- Residual waste
- Landfill

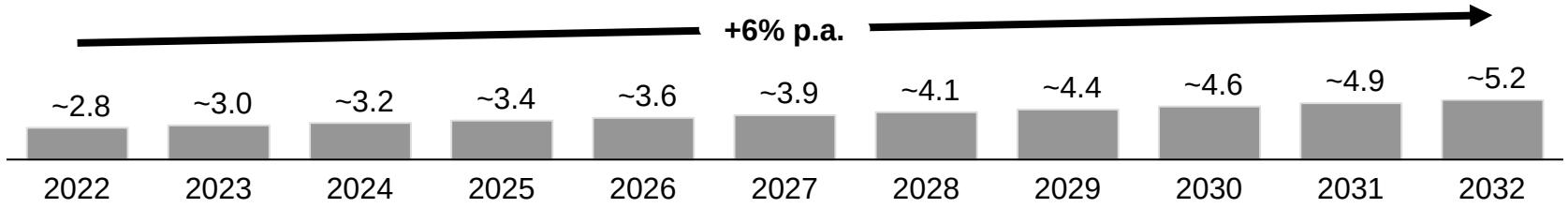
Source: Eco-Systèmes SAS, Expert interviews

The volume of waste generated by irons is estimated to grow at ~6% in the coming decade

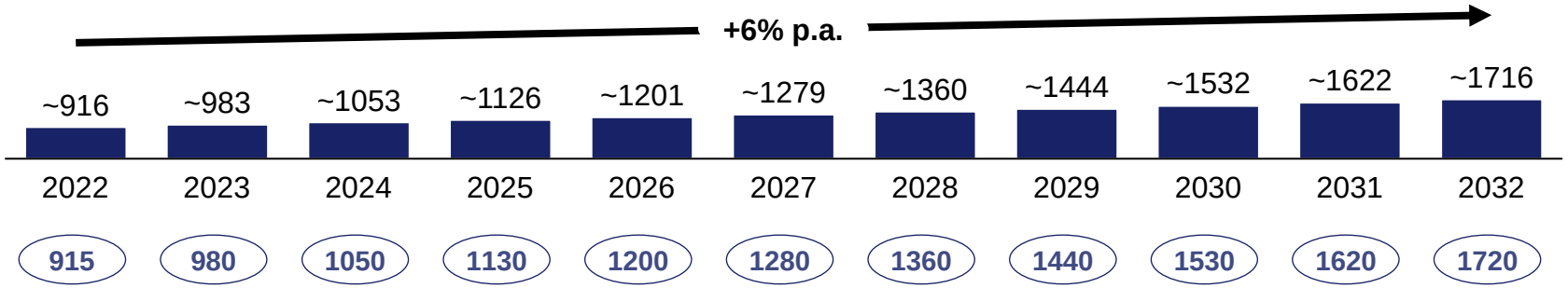
PRELIMINARY

X Volumes in thousands of iron waste generated

Estimated number of irons in Kenya between 2022 and 2032, *millions*



Projected volume of waste generated by irons in Kenya between 2022 and 2032, *tonnes*[1]



1. The volumes of waste generated by irons is based on the publicly available data on the Kenyan population and percentage of households with irons. Other assumptions are as follows:

a.) The average lifespan of an iron is 4 years
b.) 75% of irons are disposed when they reach their end of useful life while 25% are repaired which extends their lifespan by another 2 years
c.) Average weight of an iron is ~1.5 kilograms
d.) Imported irons replace those that have come to their end of useful life but there is also a ~1% p.a. growth rate on the number of households with irons

Source: UN Comtrade, E-Waste Initiative of Kenya; Global Data Lab

The **volumes of waste generated by irons** is expected **to grow at ~6% p.a.** between 2022 and 2032 with an average lifespan of 4 years

This growth is driven by the increase in **import value and volumes of irons** potentially due to growth in purchasing power resulting in:

i. **Higher volumes** of irons equipment purchased
ii. Purchase of **higher value** equipment

The volumes are also driven by the **increase in number of households with an iron estimated to grow at ~1% annually in the coming decade**

Agenda

What are the categories of e-waste in Kenya?

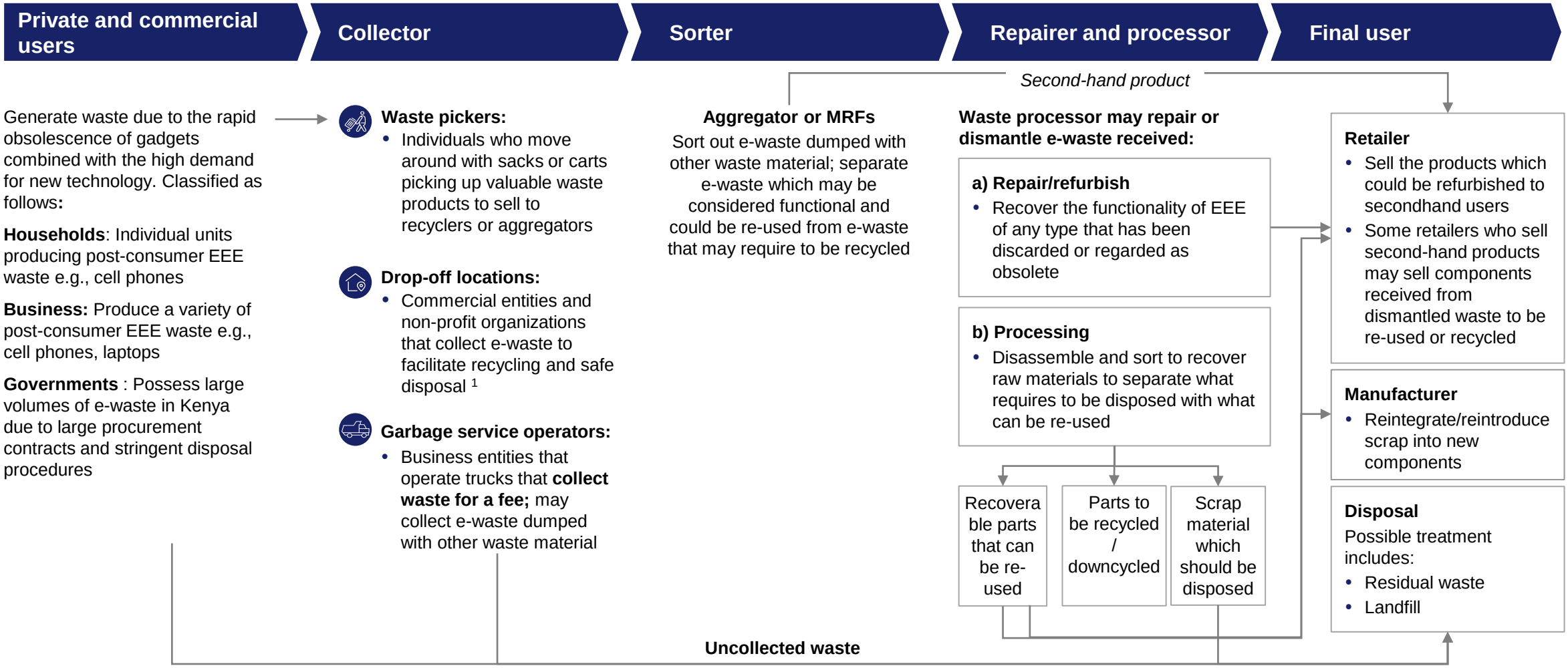
How much e-waste is generated in priority sub-sectors?

How can EPR support the scale up of collection, recycling, reuse/repair of electronics in Kenya?

- Collection
- Repair
- Processing

The e-waste value chain is complex with processing including recycling and re-use of product

PRELIMINARY



1. Drop-off locations in Kenya include WEEE Centre, Safaricom Limited and Carrefour Supermarkets, among others

Source: ILO, The Global Impact of e-waste, 2012; Ministry of Environment and Forestry, National E-waste Management Strategy, 2019 ; Expert interviews; internal analysis; press search

Limited consumer awareness and technological capacity are some of the hindrances to scaling up collection, repair and processing of used and waste EEE

Key challenges facing e-waste value chain in Kenya

PRELIMINARY

Waste holder

- **Limited awareness** at consumer level on:
  - channels available for repair/reuse, or disposal of e-waste
  - health implications of incorrect management of e-waste
- **Sentimental attachment** to electronics results in waste being hoarded and not collected
- **Stock piling** e.g., by government agencies as a result of purchasing large volumes and stringent disposal requirements

Waste management operators

- **Collection**
  - Limited collection infrastructure e.g., low number of drop off points and absence of take-back schemes
- **Repair/refurbish**
  - Service providers have limited access to authentic spare parts, training opportunities and repair standards
  - Consumers lack access to drop off points and take-back schemes for used EEE which could be repaired for secondary use
- **Processing**
  - Inadequate technology to process and safely dispose of e-waste: large capital requirements for e-waste processing technologies e.g., dust extraction equipment.
  - Limited technical expertise on treatment of e-waste
  - Occupational exposure to health hazards especially by the informal sector when collecting and treating e-waste due to lack of proper protective gear

Manufacturers

- **Lack of confidence in the quality of repaired/reused products** hinders the growth of e-waste processing industry

Consumer awareness is required on the disposal and treatment options available in Kenya to facilitate increased collection and processing of e-waste

Investment in technical capacity building and **acquisition of e-waste processing equipment** may enable scale-up of e-waste processing in Kenya

Source: Expert interviews; Coffey International, E-waste Policy Handbook, 2019; Ministry of Environment and Forestry, National E-waste Management Strategy, 2019; ILO, The Global Impact of e-waste, 2012

EPR could facilitate roll-out of potential enablers to scale up collection, repair & reuse as well as processing of e-waste generated in Kenya

Potential enablers to scale up e-waste management in Kenya

PRELIMINARY

Category		Potential initiatives
Collection	Creation of awareness	Increase consumer awareness on disposal options for used and waste EEE
	Roll out additional take-back schemes	Roll out take-back schemes and trade-in services for EEE products
	Investment in collection facilities	Facilitate the set up of collection centres/drop off points
		Introduce of collection days for used and waste EEE
Repair	Access to spare parts	Scale up partnerships between manufacturers and distributors to increase availability and access of authentic spare parts
	Repair standards	Develop repair guidelines in collaboration with tertiary and vocational training institutes to be shared with OEM repair service franchises
	Training capabilities	Develop partnerships between service centres and training institutes to facilitate development of training programs appropriate for electronic repair services
	Take-back schemes	Roll out take-back schemes to facilitate trade in and return for used EEE that could have secondary use
	Mandates	Outline collection targets and mandates for e-waste PRO to achieve through producers and waste management operators
Processing	Regional pooling	Regional pooling of e-waste with neighbouring countries to make it economically viable for export
	Subsidy distribution	Distribute EPR subsidies to waste processors to encourage local recycling of certain components
	Fee modulation	Charge higher EPR fees on components that are harder to repair, reuse or recycle to disincentivize use of such materials
	Capacity buidlng	Capacity building of waste processers which is a critical element of scaling up e-waste processing as seen in India

Source: Expert Interviews with electronics industry retailers, distributors and waste management operators

Agenda

What are the categories of e-waste in Kenya?

How much e-waste is generated in priority sub-sectors?

How can EPR support the scale up of collection, recycling, reuse/repair of electronics in Kenya?

- **Collection**
- Repair
- Processing

Compared to global best practice, Kenya collects e-waste more via the informal sector than via formalized collection agencies and take-back schemes (1/2)

Case studies of the e-waste collection schemes across various countries

PRELIMINARY

✓ Common occurrence in Kenya ✓ Seldom occurrence in Kenya ✗ Does not take place in Kenya Example follows

Practice	Description	Countries	Kenyan experience
1 **Collection agencies and PROs**	Collection of e-waste is organized by the PRO or other formal collection agencies approved by original electronic manufacturers and/or EEE PROs	PROs have collection points e.g., at train stations Belgium has a single WEEE PRO which manages the collection of e-waste. There are 543 e-waste collection and sorting parks at municipal level where individuals dispose WEEE free of charge. In 2019, there were a total of 8,663 collection points, Offer “Efficiency Rewards” i.e., financial bonuses paid by PROs to collection points following collection, provided that the amount of WEEE collected reaches or exceeds certain volume thresholds In Malaysia ~ 350 bins in place for collection of cell phone batteries placed at strategic positions including government offices, shopping complexes and telecommunications companies to collect batteries, end-of-life cell phones and their accessories.	✓ Privately organized collection points e.g., program ran by WEEE Centre in partnership with Safaricom and Carrefour for collection at the Safaricom shops and Carrefour supermarkets
2 **Retailers through take-back and buy back schemes and exchange**	Schemes where individuals can take-back to the retailer used EEE as they purchase new products	Retailers offer free drop-off and take-back of like-for-like products Home Appliance Recycling Law imposes an “old for new” requirement on retailers. For every product sale, retailer must take-back from the consumer either a similar used product or another product sold in the past. Retailers (including online and mail order in the case of Germany) obliged to offer 1:1 take-back schemes Retailers, which are obliged by EU law to take-back old, comparable appliances whenever a new appliance is bought on a 1-to-1 basis, can also register as a collection point.	✓ Privately organized take-back schemes e.g., Safaricom’s e-waste management program for cell phones and other electronics not sold by Safaricom e.g., laptops and radios
3 **Informal sector**	Take electronic waste products from households and/or from landfills and dumpsite but often goes undocumented	Indian e-waste PROs such as Karo Sambhav have engaged informal workers to increase e-waste collection and aggregation. This has been achieved by offering incentives such as digital financial transactions which facilitate immediate payment upon delivery for waste pickers. Furthermore. collaboration with NGOs aiming to improve livelihoods has enabled the organization of waste pickers into collectives and self-help groups. Karo Sambhav has so far managed to engage over 5.000 aggregators and collectors and collect over 3.000 tons of e-waste. The National Incentive Payment System for Electronic Waste (NIPSEW) promotes collection and recycling by offering scrap dealers a price for eligible types of e-waste and subsidizes the collection and additional costs associated with recycling.	✓ Electronic waste is largely collected by informal collectors through door-to-door operations or scavenging at dumpsites

Source: SRI, International E-waste Management Practices, 2021; ITU, Policy Practices for E-waste Management 2021; Adelphi, Analysis of Extended Producer Responsibility Schemes, 2021 ; expert interviews

Compared to global best practice, Kenya collects e-waste more via the informal sector than via formalized collection agencies and take-back schemes (2/2)

PRELIMINARY

✓ Common occurrence in Kenya ✓ Seldom occurrence in Kenya ✗ Does not take place in Kenya

Practice	Description	Countries	Kenyan experience
4 Private vendors	Private entities organize the collection of e-waste at individual capacity without involvement from the PRO or municipal authorities. The collection does not mandate take-back of used products	Commercial consumers can request for paid pick-up Final user of the product can pay to send WEEE products to the company's appointed recycler Manufacturers can contract other organizations, such as the Association for Electric Home Appliances (AEHA), to provide collection services on their behalf Distributers' collection sites where waste from a 1:1 and 1:0 take-back schemes is accepted. Orange partnered with Emmaus International and Ateliersdu bocage to host mobile waste collection workshops which have enabled collection and recycling of more than two million cell phones from 5 African countries	✓ Privately organized collection points e.g., at Safaricom shops and Carrefour supermarkets
6 Municipal waste services	Public facilities provided by government/local authorities to cater for e-waste collection	Municipal collection points offer free drop-off and take-back of like-for-like. Civic amenity sites for collection are run by local authorities, Largely collected via Designated Collection Facilities (DCF) set up and managed by either the local authorities/municipalities or authorised WEEE management companies. Citizens can dispose WEEE at a DCF free of charge. Some DCFs also offer collection services and accept WEEE from distributors. There is a total of 4,367 DCFs in Italy	✗ There are no existing municipal provided facilities for collection of e-waste products

Source: SRI, International E-waste Management Pracitces, 2021; ITU, Policy Practices for E-waste Management 2021; Adelphi, Analysis of Extended Producer Responsibility Schemes, 2021

Rolling out take-back schemes is one way corporates are managing e-waste put on the market

Case study of Safaricom's E-waste Management Initiative

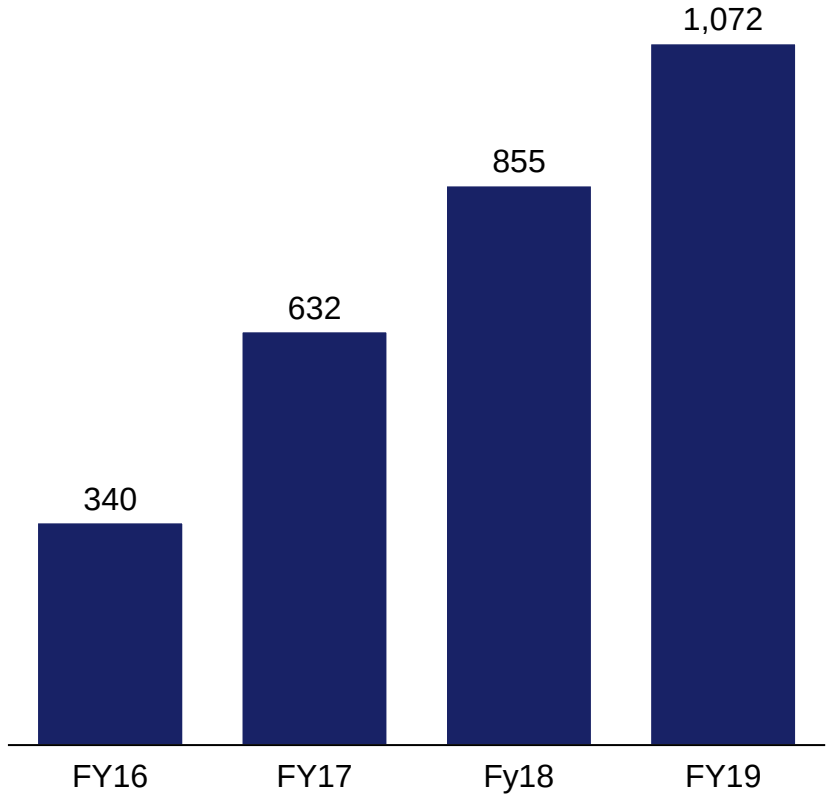
Safaricom introduces ~1.2 million handsets into the market every year

The **Safaricom E-waste Management Programme was launched in 2012 to collect all types of old electronics** for waste processing

The program has 4 main components:

- **Public awareness:** Flier distribution, awareness sessions, communication to government ministries and other public institutions etc.
- **E-waste collection** through Safaricom retail centres and offices and partner institutions such as WEEE centre
- **Customer service** through the company's Customer Care and the Environment and Sustainability teams to answer all queries related to e-waste recycling.
- **Transport & recycling** by the WEEE centre who handle the transportation of e-waste from collection centres to their processing workspace

Cumulative e-waste collected through Safaricom's E-waste management programme (tonnes)



1. According to the Waste Electrical and Electronic Equipment (WEEE) forum

Source: GSMA, Safaricom, WEEE forum

Take-back programmes are rolled out to:

i. **Create awareness** about proper disposal of e-waste

ii. **Minimize the potential environmental impact** associated with the disposal of decommissioned EEE

This is achieved by enabling producers to collect products that have reached their end of life from for refurbishment or proper disposal

Globally, only **17.4 per cent of 2019's e-waste was collected and recycled**[1]

Investment in awareness programs, take-back schemes and collection centres could scale up the volumes of e-waste collected in Kenya

Priority enablers to scale collection of electronic waste in Kenya

PRELIMINARY **FOR DISCUSSION**

Industry stakeholder assessment on relative benefit: High Medium

Category	Potential initiatives	Potential role of EPR	Impact	Potential stakeholders
Creation of awareness	**Increase consumer awareness on disposal options for used and waste EEE**	The lead e-waste **PRO could initiate awareness programs on available opportunities to dispose** used and end-of-life EEE products e.g., providing information to consumers at point of purchase, advertising campaigns through mainstream and social media platforms		Producers; PRO
Roll out additional take-back schemes	**Roll out take-back schemes and trade-in services for EEE products**	**Producers could incentivize consumers to deliver used and end-of-life products by offering take-back schemes and trade-in services** e.g., by providing redeemable points, cash discounts, deposit refund systems etc.		Producers; PRO; Consumers
Investment in collection facilities	**Facilitate the set up of collection centres/drop off points**	**Through EPR, private sector players can facilitate the set-up and operations of e-waste collection facilities** e.g., at community centres and retail centres. Such facilities could scale up the volumes of used and end-of-life EEE products collected for processing		Producers; PRO; Waste management operators; Consumers
	Introduction of collection days for used and waste EEE	**The e-waste PRO could introduce collection days** where it facilitates the collection of used and end-of-life electronics from households, corporates and government offices e.g., quarterly through collaboration with waste management operators and producers		Producers; PRO; Waste Management Operators; Consumers

Source: Interviews with electronics industry retailers, distributors and waste management operators

Agenda

What are the categories of e-waste in Kenya?

How much e-waste is generated in priority sub-sectors?

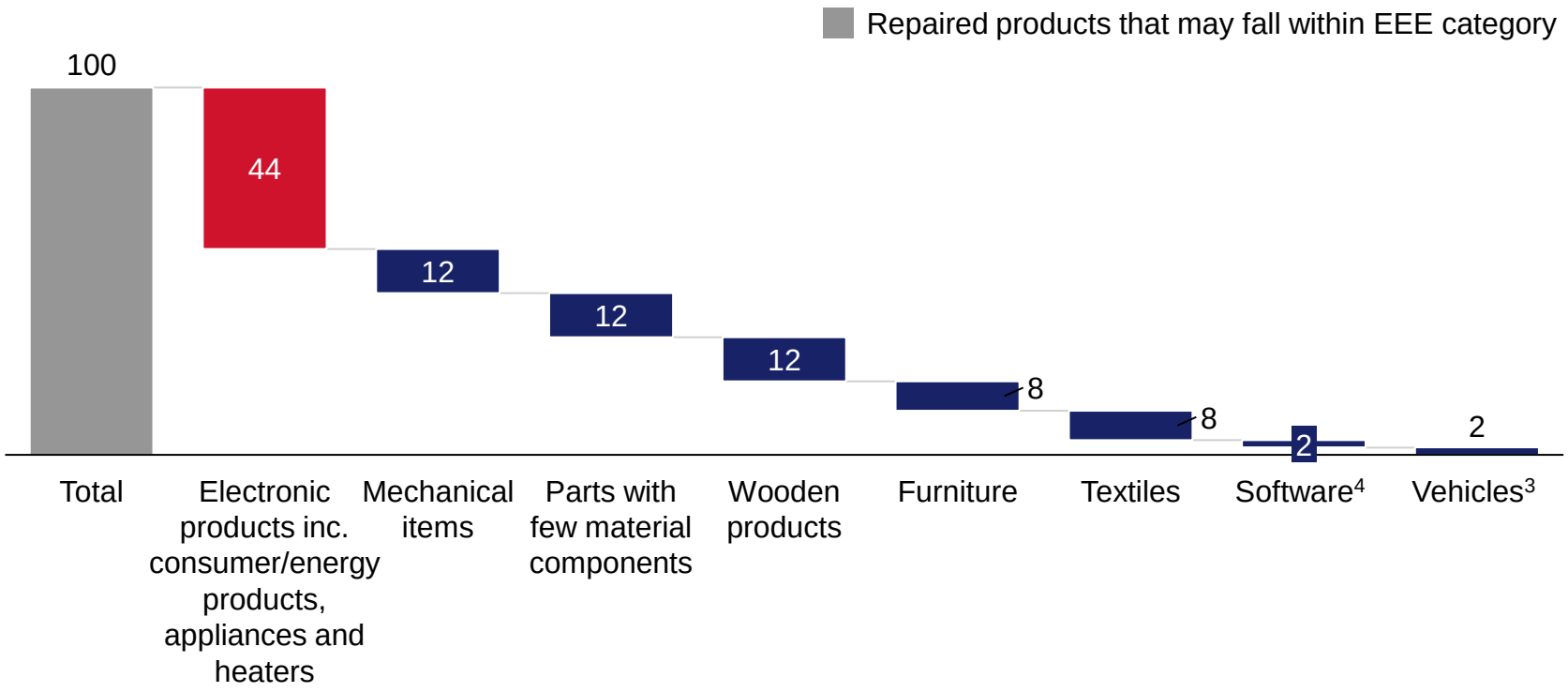
How can EPR support the scale up of collection, recycling, reuse/repair of electronics in Kenya?

- Collection
- **Repair**
- Processing

In Kenya, electronic products accounted for ~45% of repaired items in 2021

PRELIMINARY **NON-EXHAUSTIVE**

Categories of repaired items, along a technology spectrum, as reported in the Repair Survey for Business in Kenya[1] (February 2022), %



1. The survey was conducted in February 2022 with ~1,000 respondents categorized as youth and 69 businesses within various professional associations
2. Vale is based on aggregated data from market reports from middle to high income countries where repair activities are estimated to make up between 0.5% - 1.5% of overall GDP.
3. The vehicle category could have low repair value potentially due to the target survey respondents who were mainly youth and may not own vehicles
4. Software repair may refer to a repair job for a piece of programming designed to resolve functionality issues, improve security and add new features.

Source: Better Futures Colab & UK Aid, Landscaping the Repair and Reuse Economy in Kenya, 2022 ; Press search

Kenya's repair market is estimated to be worth ~1% of GDP, valued at USD 940 million in 2019 and USD 970 million in 2020[2]

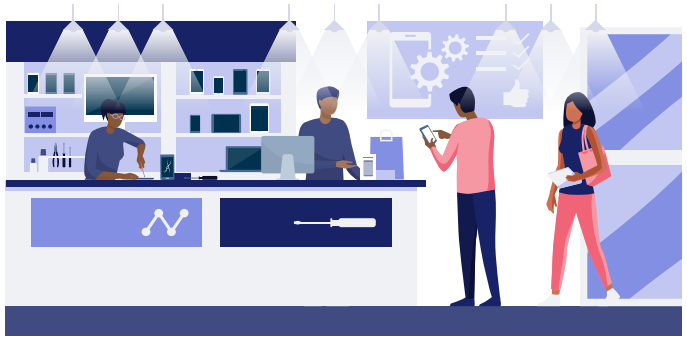
~45% of the repaired products in 2021 were electronics.

- **This could be driven by the increase in uptake of consumer electronics** such as laptops and televisions etc.
- Such items require repair and services support eco-system in order to reduce amount of e-waste generated by disposal of used electronics

Globally, electronic products can be repaired through formal and informal channels

PRELIMINARY

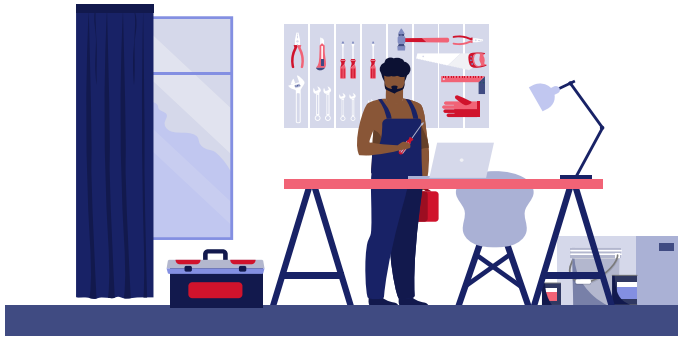
Formal repair sector



Formal electronic repair services are characterized by the following:

- **Formal training courses** for repair businesses sometimes offered under terms and conditions dictated by manufacturers
- **Licensed repair shops and service depots** recognized by relevant regulatory authorities or certifications from brand owners and/or manufacturers
- Repair practitioners who have **repair certifications and credentials**
  - This may include repair services offered by authorised electronics distributors and retailers

Informal repair sector



Informal electronic repair services have the following characteristics:

- **Independent repair practitioners who grow their repair skills through the informal training systems,** practical learning, and social network of repair community
- **Often unregulated and unregistered (without trading licenses) private operations** that avoid paying tax and being monitored by the government authorities

The choice between formal and informal repair services is mainly influenced by

- **Financial value of the electronic product**
- **Geographical location of the repair service provider**

Most in-warranty repair services are handled by the OEM authorised distributors and retailers whereas the out-of-warranty products are handled by a mix of the formal and informal repairers.

Source: Sabbaghi et. Al, The Current Status of the Consumer Electronics Repair Industry in the U.S.: A Survey-based Study, 2017; Stakeholder engagement

Globally, formal sector offers service centres, in-home visits, and publish spare parts information on products

Services offered by corporates for repair/reuse based on global case studies

PRELIMINARY **NON-EXHAUSTIVE**

✓ Relevant for Kenya ✓ May be relevant for Kenya

Services offered	Company	Description	Relevant for Kenya
Repairs through service centers	Samsung Electronics America	Launched the following services in March 2022: • **Samsung Service Centres** with Samsung-certified professionals and genuine parts • **Independent Service Providers (ISP) across various certified** locations and trained technicians, Samsung genuine parts	✓ Already established in Kenya
	Microsoft	**In** May 2022 released plans to scale up repairability through **expansion of repair facilities**	
	EE	UK Mobile Network Operator **EE** launched **in-store repair service for cell phones** to ~50% of its ~550 store network for all devices irrespective of network	
Repairs via in-home visits	Samsung Electronics America	Announced it would conduct visits to customers directly for repairs, making it convenient to receive in and out of warranty repair services.	✓ Already established in Kenya
Self-service repair	Samsung Electronics America	Announced plans to enable consumer repairs on some cell phones and tablets by **providing access to genuine device parts, repair tools, and step-by-step repair guides**	✓ Relevant for countries with electronics manufacturing
	EE	In April 2022, **launched the Self-Service Repair program** to facilitate **sale of official Apple device parts and tools to consumers**. Furthermore, Apple promised seven years of iPhone part availability	
	Microsoft	In May 2022, Microsoft promised to improve the availability of spare parts, tools, and repair instructions. The company partnered with iFixit to allow users access tools and information for self-repairs	

Source: Samsung; EE; Microsoft; Press search

Globally electronics companies offer repair services via service centres, in-home visits, or self-service

Kenya does not have electronics manufacturers and therefore their model may need to be different. E.g., electronics distributors, retailers and service centres could partner with OEMs to increase availability of repair information and authentic spare parts to scale up repair of electronics

In the formal sector in Kenya, electronics distributors, retailers and brand owners are the main electronics repair service providers

Electronic repair services offered by formal service providers

PRELIMINARY **NON-EXHAUSTIVE**

Service	Details	Example companies
Repairs through service centres	Some electronics brands, distributors and retailers have **facilitated repair centres for both in and out-of-warranty electronic products.** However, some service centres only offer services for specific brands	**Distributors, retailers and brand owners e.g.,** OPALNET, Hotpoint Appliances Ltd, Samsung
Repairs via in-home visits	**Some brands and distributors offer after sales repair services involving in home visits** for both in and out-of warranty products. This applies more so to bulky items including large household appliance e.g., refrigerators, washing machines	**Distributors, retailers and brand owners e.g.,** OPALNET, Hotpoint Appliances Ltd, Samsung
Repair buses	**Buses with repair experts and spare parts are sent out to specific parts of the country for repair services based on demand.** Services are offered to both in-and-out of warranty products	**Distributors e.g.,** OPALNET
Reuse and refurbish	**Some of the collected electronic products upon assessment by the service centres or waste management operators are fit for re-use**. Some of the waste management operators then repair and refurbish this products and introduce them for secondary use	**Waste management operators e.g.,** WEEE CENTRE, WIK

Formal electronic repair services in Kenya are **offered for both in-warranty and out-of-warranty electronic products**. In-warranty services tend to be free-of charge while out-of-warranty repair services come at a fee to the consumer

Source: Interviews with electronics importers, distributors and retailers

Informal repair services have scaled in other countries through reuse and remanufacturing of used EEE

Examples of reuse and repair services offered in other countries

PRELIMINARY **NON-EXHAUSTIVE**

Theme	Country	Description
Reuse and remanu-facturing	**China**	In Guiyu and Hauqiangbei, some of China's most popular destinations for imported and used EEE, **dismantled components are used in other products such as children's toys, digital signs and low-cost mobile phones**
	India	In **Nehru used electronics traders provide the parts and materials to enable the making of new things, from an individual computer to larger-scale re-manufacturing** unit e.g., for toys or a mobile battery back-up In National Capital Region (NCR), including Delhi, **electronics reuse industries have amassed** in several neighborhoods, **each specializing in different aspects of the process, including trade, dismantling, warehousing, repair, and refurbishing**
	South Africa	**Used cellular phones used in new products,** e.g., as a wireless communication unit in a vending machine
Repair	**South Africa**	High demand for cell phone repair services in rural and peri-urban communities has led to the growth of services offered by small and micro enterprises (SMEs)
	India	In 2020, a recycler in Bangalore, E-Parisaraa, **made profit primarily from repair and refurbishment services of electronic devices** and appliances as opposed to e-waste processing

In Kenya, **EPR could support increased collection of used EEE which could be repaired, reused and/or remanufactured by MSMEs** e.g., to increase penetration of household appliances

In other markets e.g., **China, India and South Africa, the informal repair and reuse services involve remanufacturing to extend the lifespan of electronics**

Informal repair **services could be scaled up in rural, per-urban and low-income areas where there is limited access to formal repair services**

Source: J. Corwin, Nothing is useless in nature": Delhi's repair economies and value-creation in an electronics "waste" sector, 2017; iFixit, 2016, National Institute of Environmental Health Sciences

The informal sector in Kenya plays a major role in collection of used and waste EEE and could be leveraged to scale up the electronic repair services

PRELIMINARY

Services offered	Details
Collection	In Kenya, **collection and aggregation of used electrical and electronic equipment is done mainly by the informal sector through door-to-door collection, scavenging at dump sites and collection of unwanted materials from technicians** and waste management operators
Dismantling and disassembly	A significant proportion of the informal electronics sector is involved in the **manual dismantling and disassembly which allows high quality extraction of electronic components** which can be used as spare parts in the repair and refurbishment of other EEE or sold to other waste management operators
Repair and reuse	The **main electronics products repaired include repair of IT and telecommunication equipment** including cell phones, laptops and household appliances

Quote

Informal workers facilitate mass collection of electronic waste albeit in small portions individually e.g., one picker could deliver about 5 pieces per day

– Waste management expert

Informal sector is useful in disassembly of electronics allowing high recovery of materials when compared to mechanical dismantling which shreds whole products

– Waste management expert

Consumers in rural and low-income areas turn to informal repair services for electronics due to perceived lower cost and closer geographical proximity to the service providers

– Repair and informal sector experts

In Kenya, there are **~1.1 million informal workers** in the electronics and electrical equipment sector **out of which more than 50% are in the electronics repair industry**[1]

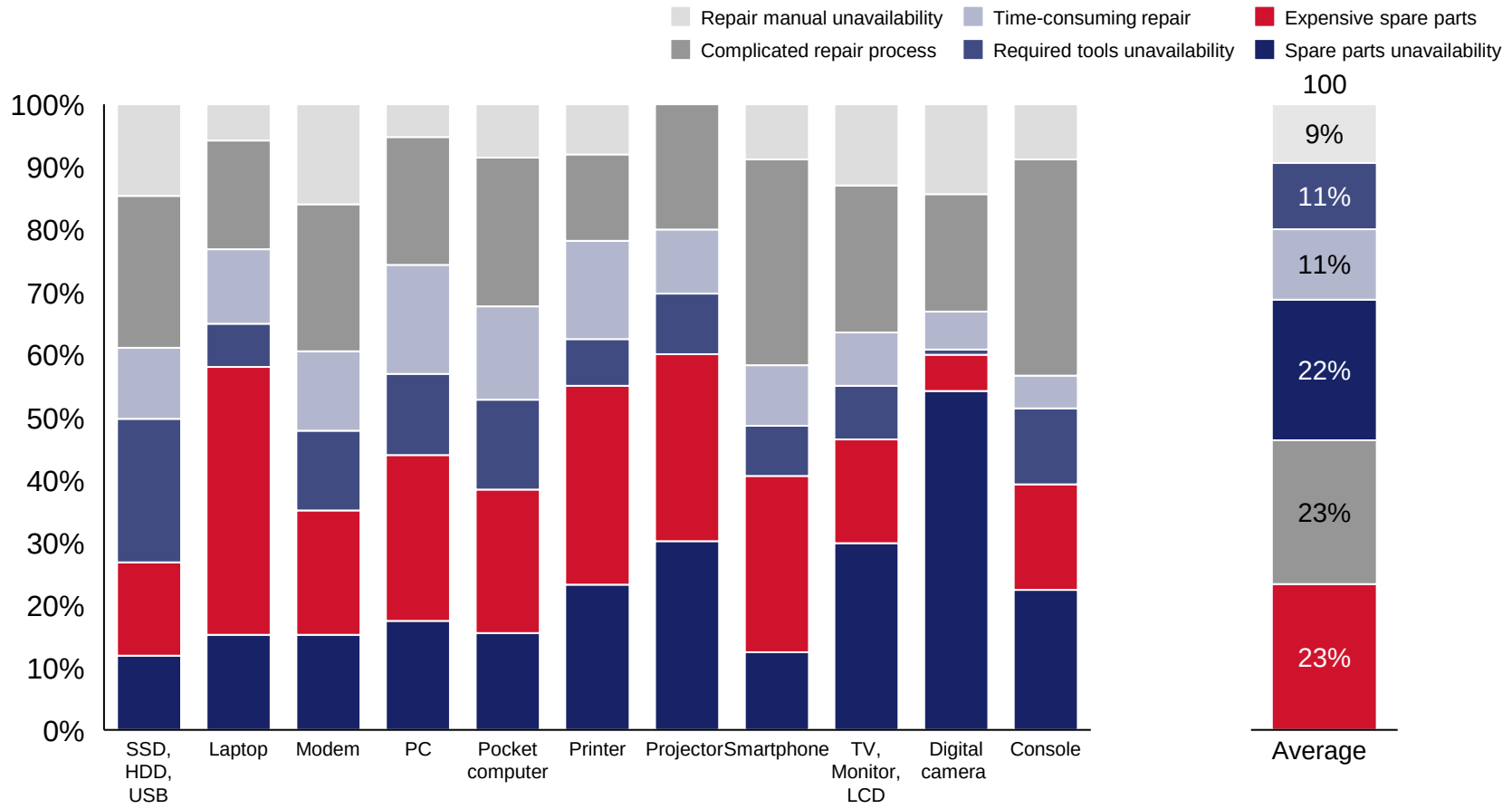
1. According to Kenya National Federation of Jua Kali Association

Source: Better Futures Colab & UK Aid, Landscaping the Repair and Reuse Economy in Kenya, 2022; EWIK; Kenya National Federation of Jua Kali Associations

In the US, the cost and availability of spare parts is a major challenge facing the electronics repair industry

PRELIMINARY

The most repaired electronic products and the reasons behind an unsuccessful repair in the US



Source: Better Futures Colab & UK Aid, Landscaping the Repair and Reuse Economy in Kenya, 2022; E-WIK;, Sabbaghi et. Al, The Current Status of the Consumer Electronics Repair Industry in the U.S.: A Survey-based Study, 2017; Expert interviews

Across all the products reviewed, **the three main challenges facing the repair of electronics are**:

i. **Expensive spare parts**

ii. **Complicated repair process**

iii. **Spare parts unavailability**

This could be driven by the limited production of spare parts by Original Electronic Manufacturers over a specified period

Globally, legislative support could facilitate the uptake of repair services for electronics

Selected country case studies on initiatives to scale up repair services for electronics

PRELIMINARY **NON-EXHAUSTIVE**

Country	Description
France 	• In 2020, **France passed the Anti-Waste for a Circular Economy Act (AGEC) requiring French business to display a repairability score** which gives a grade out of 10 - with 10 deemed the most repairable. • Electronic products covered by the law are televisions, laptops, washing machines & lawnmowers
United Kingdom 	• **Introduced the "Right to Repair" law in 2021** requiring manufacturers to **make spare parts available to citizens and third-party repair companies.** • The law covers dishwashers, washing machines, washer-dryers, refrigeration appliances, televisions and electronic displays.
Austria  **Germany** 	• **Offered financial incentives to encourage repair instead of replacement:** E.g., Thuringia state operated a public finance bonus scheme where consumers receive up to €100 per person for repairing a defective electrical device instead of opting for disposal.
India 	• **Aims to scale up repair services though the Electronic Repair Service Organization (ERSO) Policy**. The policy aims to facilitate: i. Creation of repair hubs ii. Easing of custom processes to enable import and export of electronics for repair iii. Creation of logistics repair channel for fast turn around time iv. Incentivizing repair of foreign equipment e.g., by reimbursement of excess tax revenues

Source: World Economic Forum; Press Search; Expert interviews

Currently**, Kenya has low electronics manufacturing taking place** and therefore **does not require legislation mandating manufacturers to consider repairability** during design and production

However, regulatory support e.g., through EPR could facilitate increased availability and improved quality of electronic repair services. For instance, through implementation of EPR regulations, PROs could mandate provision of repair guidelines and parts as well as setting repair targets on collected used EEE where applicable

In Kenya, the cost and availability of spare parts is a major challenge facing the electronics repair industry

Challenges faced in the repair of electronics in Kenya

PRELIMINARY **NON-EXHAUSTIVE**

	Theme	Challenge
Challenges faced by repair/reuse service provides	**Access to spare parts**	**There is little electronics manufacturing and assembly in Kenya,** therefore availability of authentic spare parts is low Additionally, some OEMs also limit production of parts to a specific period e.g., 5 years
		Imports of spare parts carry tariffs resulting in high costs and restricts access to components especially for the informal workers
	Lack of repair standards	OEMs only provide repair guidelines to authorised service centres leaving out majority of repair facilities. Designs and complexity varies across different brands requiring specific knowledge for effective repairs
	Inadequate training of repair service providers	**There are inadequate training opportunities** on the repair and refurbishment of EEE which limits the technical expertise available
Challenges faced by consumers	**Absence of take-back schemes and drop-off facilities**	**There is only 1 take-back scheme with about ~80 drop off points** The scheme is pioneered by a collaboration of Safaricom, Carrefour and WEEE centre and there is low consumer awareness about the program
	Consumer preference to replace instead of repair	**Low level of willingness to repair low-priced products,** as sometimes more affordable to replace whole product instead of repairing. The uncertainties with the repair time, cost, and quality also determine the repair decision path.

Source: Better Futures Colab & UK Aid, Landscaping the Repair and Reuse Economy in Kenya, 2022 ; Opalnet Limited; EWIK

Quote

Electronics spare parts are usually produced by the OEM for only ~5 years after the initial release date of the electronics. This limits access to repair services in the long run

– Electronic distributor

The tax duties and tariffs imposed on spare parts along with the inability to negotiate prices due to purchase in low volumes restricts access to parts

– Informal sector expert

Beyond the official OEM authorised service centres, there is limited publicly available information on electronics repair

– Electronic distributor in Kenya

We have worked with NITA to develop training curriculums on e-waste management and repair of electronics to increase technical capabilities

– Waste processing experts

The public does not have a lot of information on where to drop off used or waste electronics. Furthermore, the existing drop-off points are only in urban centres with rural areas are largely ignored

– Electronics importer and distributor

For some of our TVs, repairing the screen only could cost KES 10,000. Some individuals therefore opt to replace the entire product as opposed to fixing the broken television set

– Electronic distributor in Kenya

There are several initiatives that could scale up repair of electronics through implementation of EPR to manage e-waste

Priority enablers to scale electronics repair in Kenya

PRELIMINARY **FOR DISCUSSION**

Industry stakeholder assessment on relative benefit: High Medium Low

Category	Potential initiatives	Potential role of EPR	Impact	Potential stakeholders	Relevant sector
Access to spare parts	**Scale up partnerships between Original Electronic Manufacturers (OEMs) and authorised distributors** to increase availability and access of authentic spare parts across an array of certified repair service providers.	The EPR funds raised through the e-waste PRO could **facilitate increased repair certifications and OEM approved training programmes** to scale up access to spare parts country-wide	●	Producers; PRO; Jua Kali Association	Formal and informal sector
Repair standards	**Develop repair guidelines in collaboration with tertiary and vocational training institutes in Kenya to be shared with OEM repair service franchises**	**Repair guidelines could be made available to the certified entities** through franchise partnerships generated by members of the e-waste PRO e.g., between service centres and vocational training facilities	●	Producers; PRO; Jua Kali Association; MOEF; Training institutions	Formal and informal sector
Training capabilities	**Develop partnerships between service centres and training institutes** to facilitate development of training programs appropriate for electronic repair services	The e-waste **PRO could facilitate availability of repair information through training partnerships for** members within the PRO	●	PRO; Jua Kali Association; MOEF; Training institutions	Formal and informal sector
Take-back schemes	**Producers of electronic waste including retailers and distributors can roll out take-back schemes** through pilot programs to facilitate trade in and return for used EEE.	**Producers and waste management operators could offer incentives** e.g., discounts and loyalty points to consumers who deliver used EEE that could have a secondary life or could be dismantled for functional for spare parts	●	Producers; PRO; Waste Management Operators; Consumers	Formal sector
Mandates	**Outlining clear targets and mandates for e-waste** PRO to achieve through producers, waste management operators and other relevant stakeholders.	**Through implementation of EPR regulations, mandates such as collection targets for repair**, refurbishing or remanufacturing of used and waste EEE could be critical in the management of electronic waste volumes in Kenya	●	MoEF; PRO; Waste Management Operators	Formal sector

Source: Interviews with retailers, distributors waste management operators and other private sector stakeholders

Agenda

What are the categories of e-waste in Kenya?

How much e-waste is generated in priority sub-sectors?

How can EPR support the scale up of collection, recycling, reuse/repair of electronics in Kenya?

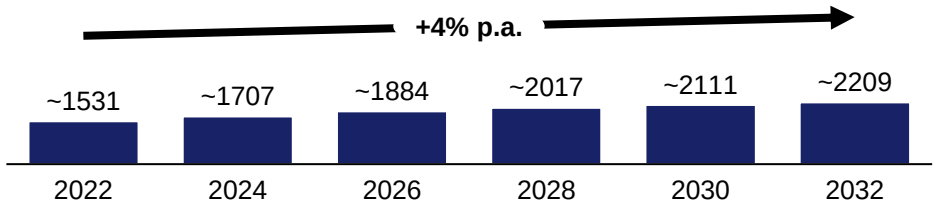
- Collection
- Repair
- **Processing**

E-waste volumes are set to increase, and there is insufficient processing technologies meaning there is a need to scale up processing in Kenya

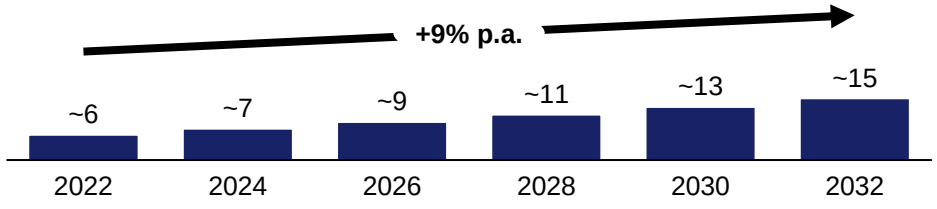
PRELIMINARY

Estimated growth in e-waste volumes in Kenya

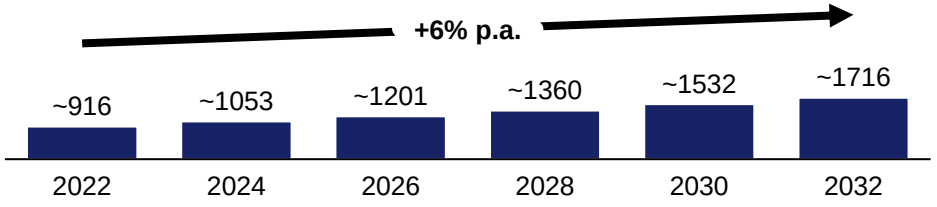
Estimated volume of waste generated by cell phones disposed in Kenya between 2022 and 2032, *tonnes*



Estimated volume of waste generated by refrigerators disposed in Kenya between 2022 and 2032, *thousands of tonnes*



Estimated volume of waste generated by irons in Kenya between 2022 and 2032, tonnes



Inadequate processing technologies in Kenya

To scale up e-waste processing in Kenya, the following types of equipment would be required based on best practices globally:

i. Shredding equipment

ii. Dust removal equipment and filters

iii. Separator equipment e.g., magnetic separator or eddy current separator

iv. Crushers such as impact mill

Some waste processors may opt for manual dismantling of electronic equipment for better quality extraction of precious metals

The current processing in Kenya does not meet the best practices indicated above as it mainly involves:

i. Manual dismantling of electronic equipment. This allows better extraction of precious metals e.g., gold and copper when compared to mechanical processing but is labour intensive

ii. Export of plastics and metals to other waste processors:

- Some materials such as PCBs cannot be processed in Kenya due to lack of efficient technologies and thus are stock-piled for export
- Some form of plastics have low demand as they are not food grade quality

Bans on import of e-waste in other countries lower export potential for Kenya

Countries that were/are major importers of e-waste are putting in place restrictions on the importation of whole EEE end-of-life products or sub - components of e-waste e.g., plastic cases used in electronics

China, which imported ~70% of electronic waste before 2018 instituted a ban on e-waste imports from 2018

- Other Asian countries that would have been alternative destinations have since imposed strict restrictions on importation of e-waste:

Vietnam banned the importation of plastic cases used in electronic equipment

Thailand banned imports of ~430 categories of e-waste in 2020

Malaysia imposed restrictive measure on e-waste imports including issuing import levies, suspended import licenses

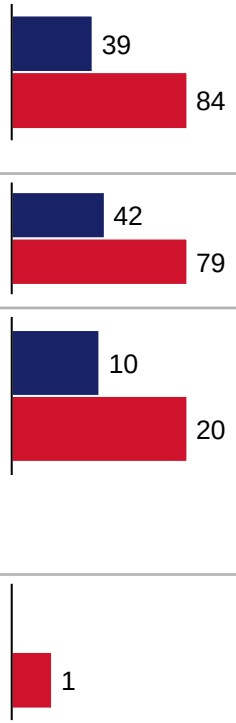
Source: Internal analysis; WEEE Centre; EWIK; Expert interviews; Press search

Countries generating and collecting large volumes of e-waste are able to meet the volumes required to sustain processing facilities

Country case studies of the number and type of electronic waste processing facilities

PRELIMINARY

Country	E-waste data	Collection facilities	Treatment facilities
Italy[4]	Collection rate – 38.7% Recycling rate – 84%[1]	• **903 facilities for collection and basic treatment** • **Presence of guidelines on operational methods and best practices** for different EEE products based on individual components	• **59 treatment plants**: 14 - cooling and freezing, 47-large household appliances, 19-TVs and monitors, 37-small household appliances and 11- lighting
Belgium[5]	Collection rate – 42% Recycling rate – 79.3%[1]	• **8,663 collection centres** presenting a ratio of 1 facilities for every 1,300 citizens	• **14 treatment facilities and 10 specialized processors** for different WEEE. The facilities can meet capacity of waste generated locally - only 4% of total WEEE in 2019 was treated outside Belgium
India	Collection rate – 10% Recycling rate – 20%[1]	• **Legislation has driven the set up of formal recycling facilities**~300 authorised e-waste recyclers with annual capacity of ~800 kt. National laws mandate that only authorised dismantlers and recyclers collect e-waste • **Capacity building programmes and trainings** on handling, dismantling and refurbishing of e-waste	• **Legislation has driven the set up of formal recycling facilities**~300 authorised e-waste recyclers with annual capacity of ~800 kt. National laws mandate that only authorised dismantlers and recyclers collect e-waste • **Capacity building programmes and trainings** on handling, dismantling and refurbishing of e-waste
Kenya	Collection rate – n/a Recycling rate – 1%[1]	• **There are ~80 privately organized collection facilities country wide** e.g., operated at Safaricom shops, Carrefour Supermarket and WEEE Centre collection points	• **5 facilities with limited capacity to dismantle, refurbish and in some cases export e-waste generated in Kenya**[3]**:** 1. WEEE centre 2. Enviroserve 3. Sintmund Group 4. Sinomet Kenya Limited 5. E-waste Initiative Kenya (EWIK)



Based on the experience of Italy, Belgium and India, there are several enablers of e-waste processing :

i. **Expansive e-waste collection and processing infrastructure**

ii. **Presence of specialized facilities**. Italy and Belgium have recycling rates of ~80% compared to a global average of ~18% partially due to investment in specialized facilities enabling processing of the e-waste generated locally

iii. **Capacity building of waste processers** is a critical element of scaling up e-waste processing as seen in India

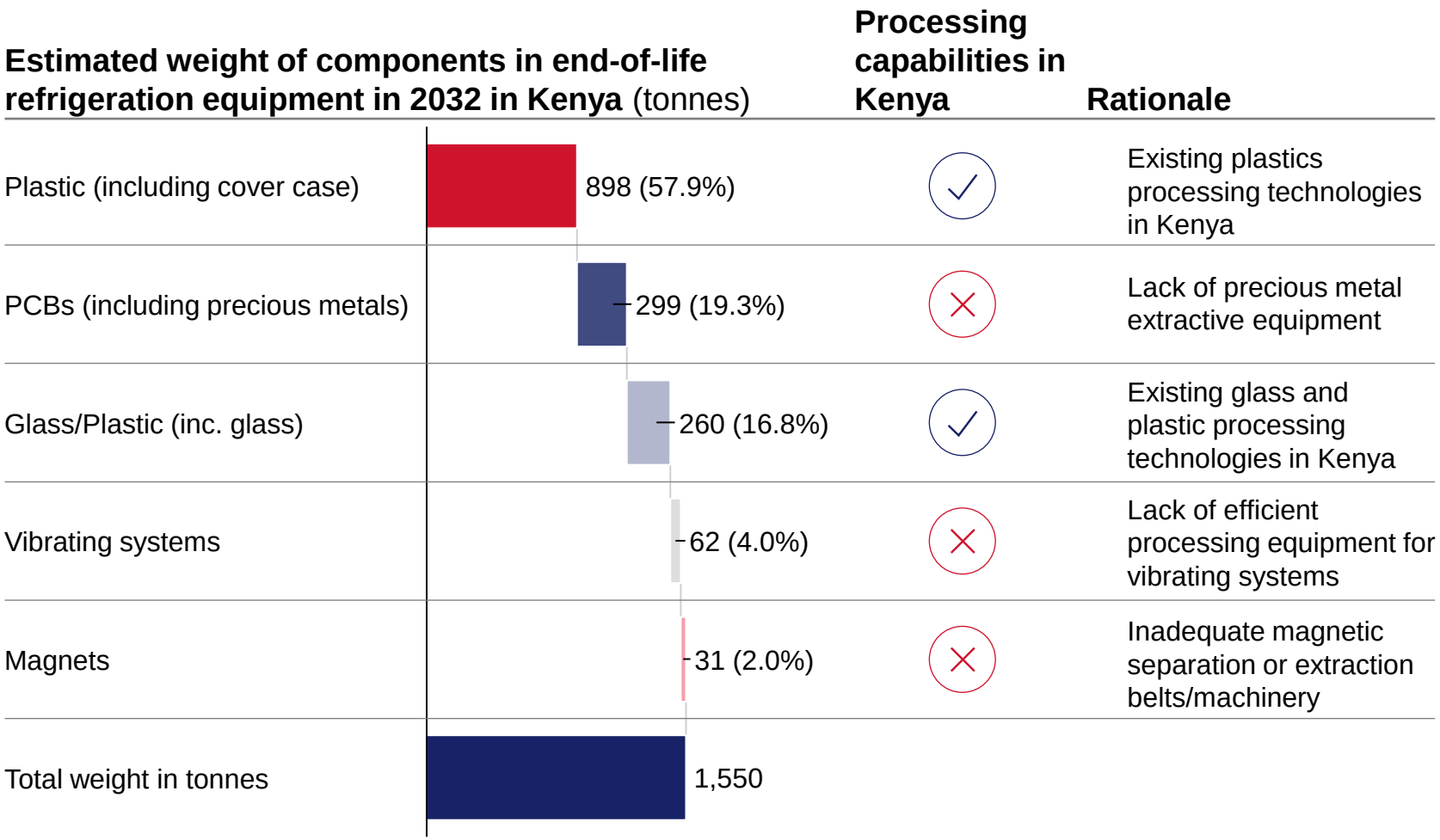
1. This refers to the amount recycled out of the collected e-waste volumes
2. Underutilized as in 2016 t~438,000 tonnes of waste formally and informally recycled in India
3. WEEE Centre and EWIK have combined capacity of ~3,600 tonnes annually yet ~51,300 tonnes of e-waste was generated in Kenya 2019
4. The e-waste generated in Italy 2019 was 1,063,000 tonnes – population of ~60,000,000 people
5. The e-waste generated in Belgium 2019 was 234,000 tonnes – population of ~ 11,500,000 people

Source: Adelphi, Analysis of Extended Producer Responsibility Schemes, 2021, Global E-waste monitor, EWIK; WEEE Centre; Central Pollution Control Board - India

~75% of components of a cell phone could be processed in Kenya, with the remainder not currently processed

Processing capabilities exist in Kenya

Processing capabilities do not exist in Kenya



1. Precious metals in mobile phones include gold, silver, palladium, aluminium and copper

Source: ACS Sustainable Chem & Eng, Characterizing the Materials Composition and Recovery Potential from Waste Mobile Phones, 2018; WEEE Centre; Press search

~75% of components used in cell phones can already be processed in Kenya after dismantling. These include plastics e.g., Polycarbonate

~25% of components have no facilities for processing in Kenya today, e.g., PCBs, with precious metals These components tend to be stored for export or dumped on landfill

For the components not currently processed in Kenya, there would need to be sufficient volumes of waste collected, and value to the component collected, to achieve economies of scale for processors

To achieve such volumes for processing or export, **neighbouring countries could consider regional pooling of e-waste to make it economically viable for processors**

Nearly ~100% components of refrigeration equipment could be processed and/or disposed in Kenya

✓ Processing capabilities exist in Kenya ✗ Processing capabilities do not exist in Kenya

PRELIMINARY

Estimated weight of components in end-of-life refrigeration equipment in 2032 in Kenya (tonnes)		**Processing capabilities in Kenya**	**Rationale**
Metals (Steel)	6,289 (42.8%)	✓	Existing processing equipment
Compressor	3,329 (22.6%)	✓	Existing processing equipment
Plastics	2,294 (15.6%)	✓	Existing processing equipment
Foam	1,480 (10.1%)	✓	Ongoing partnership
Non-iron fraction from the casing	740 (5.0%)	✓	Existing processing equipment
CFC-11	126 (0.9%)	✓	Ongoing partnership
Glass	92 (0.6%)	✓	Existing processing equipment
Water	92 (0.6%)	✓	Existing processing equipment
Oils	74 (0.5%)	✓	Existing processing equipment
Capacitors	55 (0.4%)	✓	Existing processing equipment
Cable	55 (0.4%)	✓	Existing processing equipment
CFC-12	43 (0.3%)	✓	Ongoing partnership
Others	37 (0.3%)	✗	No existing processing / disposal mechanisms
Mercury containing switches	0	✗	
Total weight in tonnes	**14,706**		

1. The main plastics used in refrigerator production include polyurethane (PU), polystyrene (PS), polypropylene (PP), styrene-butadiene-acrylonitrile copolymer (ABS), and polyethylene (PE). These five major types of plastics cover almost 90% of the plastic parts used in refrigerators.

Source: GIZ, Guideline on the Manual Dismantling of Refrigerators and Air Conditioners, 2017

~99% of the materials in refrigeration equipment may be processed in Kenya after dismantling. These include:

i. **Metals** e.g., steel
ii. **Plastics** e.g., PU, PS, PP, ABS and PE[1]

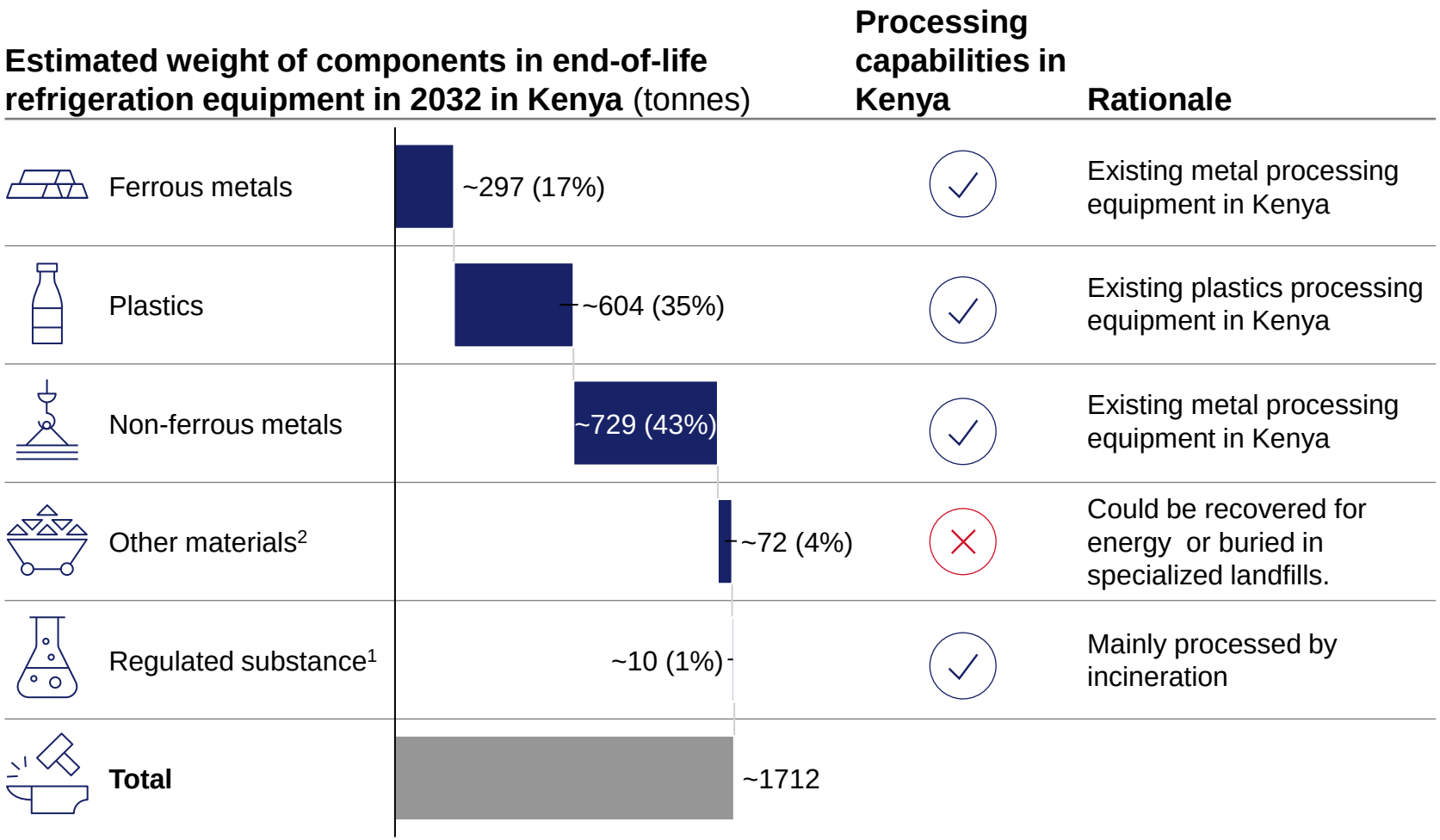
Other hazardous material e.g., CFCs and mercury containing components require specialized disposal mechanisms not currently available in Kenya

For economic viability for processors there would need to be sufficient volumes of waste collected, and value to the component collected, to achieve economies of scale

Neighbouring countries could consider regional pooling of e-waste to achieve sufficient volumes to make it economically viable for processors

~95% of the components used in the production of irons can be processed in Kenya

Processing capabilities exist in Kenya Processing capabilities do not exist in Kenya



1. Controlled substances mainly comprising of capacitors
2. Other recovered materials are mainly made up of plastics, rubber, dust and mineral fractions e.g., ceramics

Source: Eco-Systèmes

~95% of the materials used in production of irons may be processed in Kenya after dismantling. These include:

i. **Ferrous metals** e.g., steel and cast iron
ii. **Plastic resin** e.g., PP
iii. **Non-ferrous metals e.g.,** aluminium and copper

Similar to refrigeration equipment, there would need to be sufficient volumes of waste collected, and value to the component collected, to achieve economies of scale for the waste processors

Neighbouring countries could consider regional pooling of e-waste to achieve sufficient volumes to make it economically viable for processors

Some components may not be economically viable to be processed in Kenya due to low waste volumes generated

Selected case studies of benchmarks for the processing capacities of various electronic components

Material currently not processes in Kenya	Estimated waste volumes from the 3 priority areas[1]	Estimated total waste volumes in Kenya	Capacity per plant *(tonnes p.a.)* [2]	Benchmark entity	Benchmark country
Plastics[4] (Mainly PC+ABS Blend)	**<4,000[3]**	**<23,530[7]**	22,050	**Roy Tech Environ**	USA
			50,000	**MGG Polymers**	Austria
Plastics[5] (Mainly ABS)			50,000	**Greentech Solutions**	USA
			15,000	**Van Werven Ireland Ltd**	Ireland
			19,000	**Karatsialis Bros & Co**	Greece
			20,000	**Skytech SAS**	France
Glass	**~350**	**~2,060**	~90,000	**Daniel Rosas S.A**	Spain
			50,000	**SRPV Industriels**	France
Polychlorinated biphenyls (PCBs) containing precious metals	**~300[6]**	**~1,760**	39,000	**Enviroserve**	UAE
			8,000	**Eco recycling Limited - Vasai**	India
			30,000	**Eco recycling Limited - Bhiwandi**	India

1. Estimated volumes of waste for generated in Kenya in 2032 for priority sub-sectors i.e., IT and telecommunication equipment, large and small household appliances
2. Average processing capacity per plant based on international benchmarks (tonnes per annum)
3. This figure covers the waste generated from various plastic polymers used in electronics including PU, PS, PP, ABS and PE. By 2032, IT and telecommunication equipment, large and small household appliances are estimated to generate 900, 2,300 and 600 tonnes of waste annually
4. Mainly process polycarbonate + Acrylonitrile Butadiene Styrene (PC+ABS Blend) but also other plastic polymers
5. Mainly process Acrylonitrile Butadiene Styrene (ABS) but also process other forms of plastic
6. This figure only looks at PCB waste generated by mobile phones in 2032 and does not include other IT equipment e.g., laptops
7. Total estimated volumes of waste generated in Kenya by plastics, glass and PCB waste components across all electronics

Source: Expert interviews; NERC –NEWMOA, 2020; MGG Polymers GMBH; ENF Recycling

The materials under analysis are components of the three priority products i.e., cell phones, refrigerators and irons

In order to determine whether a material can be processed in Kenya, the considerations include:

i. **Volumes of waste generated by the different** electronic components

ii. **Capacity requirement of existing waste processors**

Due to the low volumes of e-waste generated in Kenya compared to the capacity of processing plants globally, **lead PRO could develop partnerships for exporting some components e.g., plastics** to other players with capacity to profitably process such components

With many countries banning importation of e-waste, where possible, Kenya may need to prioritize scaling up partial local processing

Select case studies on recent developments on import and export of e-waste

PRELIMINARY

Restriction	Country	Details
Full ban on whole products and components imports	**China** 	• **In 2018, China imposed an import ban on end-of-life electronic products and components**. Until the ban, over ~70% of the world's e-waste i.e., ~350 million tons p.a. was exported to China • China through EPR has encouraged environmentally friendly product design by electronics manufacturers – Since 2011, **the Chinese government has provided subsidies for domestic recycling of electronics**, with mandatory contribution from manufacturers and importers.
	Thailand 	• **In 2020, Thailand banned imports of ~430 categories of e-waste** including end-of-life products and components. • Items banned range from electronic circuit boards to old television and radio parts.
	Vietnam 	• **In 2018, Vietnam banned the importation of plastic cases of used electronic equipment,** such as: television, computers and office equipment. – Vietnam had imported an average of ~1,466.6 tonnes between 2015 and 2017 but in 2018, imported ~53,000 tonnes perhaps due to the ban in China (36x)
Restrictive measures	**Malaysia** 	• **Malaysia imposed restrictive measure on e-waste imports** including issuing import levies, suspended import licenses, and cut off electricity and water to illegal recycling operations.
	Vietnam 	• In 2019, **Vietnam stopped issuing waste import licenses**

Some countries used to import e-waste at scale e.g., China

However, many of these countries have imposed bans due to environmental and public health concerns. Some countries e.g., China have banned importation of whole products while others e.g., Vietnam have banned specific components

Therefore, countries that are reliant on export of e-waste could:

- **Consider practices to improve domestic recycling**
- **Invest in new manufacturing design** to reduce waste at-source

1. Countries yet to ratify the BAN amendment include United States, Canada, Japan, Australia, New Zealand, South Korea, Russia, India, Brazil, and Mexico

Source: Basel Convention 2022; Thailand Pollution Control department Press search

Several initiatives could facilitate increased processing of the e-waste generated in Kenya through implementation of EPR

Priority enablers to enable increased processing of e-waste generated in Kenya

PRELIMINARY **FOR DISCUSSION**

Industry stakeholder assessment on relative benefit: High Medium Low

Category	Potential initiatives	Potential role of EPR	Impact	Potential stakeholders
Regional pooling	**Regional pooling of e-waste to make it economically viable for export**	Lead e-waste PRO could facilitate partnerships with other used and waste EEE collectors in neighbouring countries to pool together sufficient waste volumes for export to other processing plants	●	PRO; Waste management operators
Subsidy distribution	**Distribution of EPR subsidies to processors to encourage local recycling of certain components**	Funds raised through EPR fees could partially be distributed to waste processors to facilitate the collection of waste EEE components that meet sufficient volumes and technical expertise to be processed locally at capacity that is economically viable for processors	●	PRO; Waste management operators
Fee modulation	**Charging higher EPR fees on components that are harder to repair, reuse or recycle to disincentivize use of certain materials**	Lead PRO could potentially charge higher EPR fees on components based on ease of repairability, reusability and recyclability to encourage producers use materials that are at end-of-life	●	PRO; Producers
Capacity buidlng	**Capacity building on best practices in e-waste management**	EPR fees could also be used to create awareness and training on proper ways of handling, dismantling, refurbishing and disposing e-waste components	●	PRO; Waste Management Operators; Consumers

1. WEEE centre has a dismantling and partial processing capacity of ~200 tonnes monthly, E-WIK 100 tonnes monthly and Enviroserve ~50 tonnes monthly bringing it to an estimated total capacity of ~4,200 yet according to global E-waste Monitor, ~51,000 tonnes of e-waste was generated in Kenya in 2019

Source: Interviews with retailers, distributors, waste management operators and other private sector stakeholders