Baseline Assessment on Electronic Waste

Management and Extended Producer Responsibility
in Displacement Settings in Ethiopia, Kenya, Uganda

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Programme description:
Support to UNHCR in the implementation of the Global Compact on Refugees
in the Humanitarian-Development-Peace Nexus
Energy Solutions for Displacement Settings (ESDS)

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Abbreviations

ARRA	Administration for Refugee and Returnee Affairs
CRRF	Comprehensive Refugee Response Framework
DRC	Democratic Republic of the Congo
EACO	East Africans Communications Organisation
EEE	Electrical and Electronic Equipment
EMCA	Environmental Management and Co-ordination Act
EoL	End-of-Life
EPR	Extended Producer Responsibility
ESDS	Energy Solutions for Displacement Settings
IDP	Internally Displaced Persons
LDC	Least Developed Countries
NEMA	National Environmental Management Authority
OGS	Off-Grid Solar
OPM	Office of the Prime Minister
POP	Persistent Organic Pollutants
PRO	Producer Responsibility Organisation
RAS	Refugee Affairs Secretariat
RRP	Refugee Response Plan
UN	United Nations
WEEE	Waste Electrical and Electronic Equipment

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ESDS Displacement Settings in Ethiopia, Kenya and Uganda

Project Info: **SUN-ESDS**

The BMZ commissioned Global Program "Support to UNHCR in the implementation of the Global Compact on Refugees in the Humanitarian-Development-Peace Nexus (SUN)", implemented by GIZ, seeks to support UNHCR in its role as facilitator of the implementation of the **Global Compact on Refugees** (GCR) and the Comprehensive Refugee Response Framework (CRRF) in selected refugee contexts and sectors. The program is part of the German Special Initiative "Tackling the Root Causes of Displacement, (Re-)integrating Refugees". It currently provides advisory services to UNHCR on a global level and supports UNHCR in creating and mainstreaming knowledge on the operationalization of the GCR.

The Energy Solutions for Displacement Settings (SUN-ESDS) component works closely with UNHCR and local partners to provide energy solutions that cater to the needs of both refugee and host communities in our project countries- Uganda, Kenya, and Ethiopia. SUN-ESDS is also the German contribution to the **Clean Energy Challenge** issued by UNHCR in 2019 with the following objective: **"All refugee settlements and nearby host communities will have access to affordable, reliable, sustainable and modern energy by 2030."**

The SUN-ESDS project works through three intervention areas:

Improving the policy framework through providing advisory services to governmental stakeholders to promote the inclusion of refugees into national service delivery systems. The project collaborates with the affected communities, and governmental, non-governmental and private sector partners to develop more sustainable energy solutions.

Greening infrastructure in displacement settings through supporting the solarization of UNHCR offices as well as settlement/camp and communal infrastructure, thereby promoting more environmentally sustainable and cost-efficient energy solutions. The project develops energy delivery models that are attractive to the private sector.

Increasing energy access through developing self-sustaining markets for basic energy related services and products, improving access to finance and promoting participatory design processes benefitting households, social services, and small businesses of both refugees and host communities while reducing the pressure on the environment.

We contribute to the following SDGs

Executive summary

Access to safe and sustainable energy is crucial to help refugees stay safe and rebuild their lives (UNHCR, 2019). In the 'Global Strategy for Sustainable Energy 2019-2024', UNHCR states that "all refugees, host communities and support structures should be able to satisfy their energy needs in a sustainable manner, without fear or risks to their health, well-being and personal security, while ensuring the least possible environmental impact" (UNHCR, 2019). Sustainable and cost-efficient energy solutions are recognised as being able to increase the self-reliance of vulnerable people and release social tensions. Therefore, giving access to safe sustainable energy to those in displacement settings and surrounding communities is of paramount importance.

As the recognition for the need of sustainable energy access in settlements increases, more Off-Grid Solar (OGS) devices and other electronic products are provided to the population. This increasing amount of e-product inevitably results in an increasingly important quantity of e-waste. However, in order to prevent hazardous materials contained in e-waste from contaminating the environment and people's health, e-waste needs to be managed appropriately. E-waste thus requires a tailored solution through both bottom-up and top-down approach in order to holistically and sustainably improve the situation. To design such solution and recommendations, a detailed analysis of the legal framework, the Electrical and Electronic Equipment (EEE) flows and the stakeholders involved in Ethiopia, Kenya and Uganda was required.

The detailed analysis of the legislations and regulations at international and national scale in Ethiopia, Kenya and Uganda was conducted and demonstrated the lack, if not the total absence, of e-waste legislation. EPR was highlighted as a strong complementary tool to ensure that producers and importers are responsible for their e-waste, and also to incentivise the eco-design of products. EPR systems have many different features which allow them to be tailored to many different contexts. However, an EPR system can only be put in place either through regulation or on voluntarily-basis by producers. Finally, a set of interviews were organised with key local stakeholders to better understand the EEE flows and the current e-waste management and disposal practices.

Based on all the analysis, a set of recommendations and actions were designed at different levels. At global level, for UNHCR to develop an e-waste management strategy, at national level, to improve the lack of regulations tackling e-waste in the targeted countries, and finally, at settlement level to improve the e-waste situation on site. These recommendations were complemented by a business-driven scenario based on the case study of Rhino Camp in Uganda, clearly outlining the different steps required to efficiently and rapidly improve the e-waste situation in settlement context and including the operations, the stakeholders, the enforcement and control as well as the financial mechanism required for a successful implementation.

Overall, in-depth information was obtained in Ethiopia, Kenya and Uganda regarding the current state of e-waste legislation, the EEE flows and the identity of various stakeholders along the EEE life cycle. The set of recommendations targeting the legislation, UNHCR e-waste strategy and settlements are aligned towards one same goal: the appropriate e-waste management in settlement to prevent any further environmental and health impact to persons of concern.

1 Context and objectives

1.1 Context of the study

Refugee situation in Ethiopia, Uganda and Kenya

At the end of 2019, 79.5 million people were forcibly displaced around the world, including more than 3.5 million in Ethiopia, 1.4 million in Uganda and 494,585 in Kenya (UNHCR, 2020a).

Within the 3.5 million displaced people in Ethiopia, nearly 75% are Internally Displaced Persons (IDP). Ethiopian IDPs result from large-scale displacement in Gedeo and West Guji zones and along the border between Benishangul Gumuz and Oromia Regions due to conflict-related crisis including inter-communal tensions (MSF, 2019). Refugees are spread across 26 refugee camps with limited services (UNHCR, 2018). Ethiopia was one of the first African countries to be part of the Comprehensive Refugee Response Framework (CRRF) set out by the UN General Assembly in 2016 to improve the protection of people on the move. The Administration for Refugee and Returnee Affairs (ARRA) works hand in hand with UNHCR to implement the CRRF.

Uganda is the fourth biggest refugee-hosting country in the world after Turkey, Colombia and Pakistan, hosting 1.4 million people. More than 60% originate from South Sudan and nearly 30% from the Democratic Republic of the Congo (DRC). Most refugees are located in settlements in the north west of the country, including Yumbe, Adjumani Obongi, Madi Okollo and Terego Adistricts (UNHCR, 2020b). In 2019, Uganda set environmental protection and restoration as top priority and key humanitarian-development nexus in the Uganda Refugee Response Plan (RRP) 2019-2020 (UNHCR, 2019a). The RRP also highlighted that an insufficient safe access to sustainable energy represents a major risk for refugees and host communities.

More than half of the refugees in Kenya originate from Somalia and nearly a quarter from South Sudan. Almost 85% of the refugees in Kenya reside in the Dadaab and Kakuma camps. The refugees' status and treatment in Kenya is governed by the 2006 Refugee Act and the 2009 Refugee Regulations and is implemented by the Refugee Affairs Secretariat (RAS). The Refugee Act provides that refugees should enjoy all the rights contained in the human rights treaties ratified by Kenya, including the right to free primary education and healthcare (UNHCR, 2019b).

Displacement setting and electronic products

Although the improvement of energy access throughout infrastructure in refugee and IDP camps results in significant improvements in quality of life, it also causes potential issues when electronic products and batteries are disposed of.

Generated by both energy-producing devices (such as Off-Grid Solar products) and consumer electrical appliances when they reach their end-of-life, Waste Electrical and Electronic Equipment (WEEE) contains a wide range of hazardous substances and toxic pollutants. When poorly managed, these substances such as lead, cadmium or chromium pollute the community and generate important health and environmental damage on both the people who handle the waste and the general population (Balde et al., 2017; Noel-brune et al., 2013; WHO, 2012).

Put aside the environmental and health impacts of e-waste, the manufacture of modern Electrical and Electronic Equipment (EEE) requires the use of rare and expensive resources such as copper and gold, which can be directly linked to important economic opportunity loss. Indeed, the intrinsic economic value from raw materials trapped in e-waste globally in 2019 was estimated at $57 billion USD (Forti et al., 2020). In addition, the growing global population and consumption pattern combined with the scarce nature of resources results in the crucial need for sustainable consumption and production (Balde et al., 2017). It becomes increasingly important to retain resources in the loop by shifting from a linear economy to a circular economy, aiming at decoupling economic growth, reducing waste and increasing resource-efficiency (Pouikli, 2020). Collecting and recycling WEEE not only helps retain resources in the loop but it also enables avoiding CO_2 emissions because no virgin material is produced, transport is minimized, and energy is recovered from non-recyclables (UN, 2019). Thus, the proper and efficient collection, treatment and recycling of WEEE is essential to ensure maximum social, environmental and economic benefits.

The quick development of Off-Grid Solar (OGS) solutions (solar home systems and pico lanterns) and their potential in displacement contexts raises legitimate concerns about e-waste production and the local capacity to manage toxic flow in areas where proper waste management infrastructure is often lacking. The risks are magnified by the fact that refugee and IDP populations, as well as the environment they are placed in, are already in a state of vulnerability. In order to develop actionable recommendations to prevent and minimize the negative impacts of WEEE on displaced populations and their environment, there is a need to better understand the regulation framework related to e-waste as well as to measure the flows and evaluate the management practices in that specific context.

1.2 Objective and scope of the study

The Energy Solutions for Displacement Settings (ESDS) project implemented by GIZ on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ) is part of a wider program called 'Support to UNHCR in the Implementation of the Global Compact on Refugees in the Humanitarian-Development- Peace Nexus' (SUN). It aims to tackle gaps in sustainable energy supply in refugee camps and settlements in Ethiopia, Kenya and Uganda. Through global advisory services and the implementation of technical measures in displacement settings, ESDS aims to tackle the gaps in sustainable energy supply in refugee camps and settlements in Ethiopia, Kenya and Uganda. In support to this, the main objectives of this assignment were to:

- **Review the existing e-waste legislative framework** in Ethiopia, Kenya and Uganda. This review encompassed national and international regulations on e-waste and their current enforcement status.
- **Analyse the Extended Producer Responsibility (EPR)** practices and highlight the key aspects.
- **Map the different stakeholders** and their roles across the life cycle of EEE.
- **Map the current e-waste flow** situation in ESDS project areas in Ethiopia, Kenya and Uganda, with a primary focus on the waste linked to ESDS-promoted products such as OGS appliances and their components (e.g. SHS, batteries).
- **Analyse the e-waste management and disposal practices** of the population as well as the private and humanitarian sectors. Emphasis was placed on the key trends for collection, handling and processing of e-waste in the ESDS project areas.
- **Develop a pilot project for e-waste collection** and management on a selected project site in one of the three countries, including implementation costs, key stakeholders, and the main barriers and opportunities.
- **Formulate actionable recommendations** for improved legislation, for a global UNHCR e-waste management strategy and for an EPR-based e-waste mechanism in the humanitarian sector.

2 Data gathering and assessment of e-waste situation in displacement contexts

2.1 Review of existing e-waste legislative frameworks

In most African countries, there is no overarching framework for e-waste management, only a few countries (Rwanda, Cote d'Ivoire, Ghana, South Africa, Madagascar, Egypt, Zambia, Cameroon, Nigeria) have specific legislation regarding e-waste, that is legally binding (act, law, statutory instrument etc.). A few other countries (Uganda, Tanzania, Kenya) also have policies relating to e-waste that are not legally binding (i.e. strategies, policies, guidelines etc.) (GSMA, 2020). While currently still in its early stages, more and more African countries are starting to look at take back legislations based on the Extended Producer Responsibility (EPR) principle, thereby legally requiring manufacturers and importers to finance the take back and proper recycling of products placed on the national markets. However, this is still in the early stages and currently only a few countries (Zambia, Nigeria, Ghana, with some other countries like South Africa revising their systems) have that in place.

Often not all EEE are included in the scope of legislation, sometimes they are only covering IT products and omitting OGS products, batteries, large appliances, lamps or air conditioners. However, it must be emphasised that proper collection and recycling of e-waste can hardly happen without either a legal obligation or a voluntary initiative from the industry (producers and importers or waste holders).

The following section outlines the current legal landscape regarding e-waste in the target countries. It is important to first note the international treaties that the countries have signed up to, as even though they are not legally binding, adhering countries are expected to transpose them into national law.

2.1.1 International conventions

Table 1: International conventions related to e-waste for Ethiopia, Kenya and Uganda

INTERNATIONAL CONVENTIONS		
The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal		
International treaty designed to: • reduce hazardous waste generation and its movements between nations; • prevent transfer of hazardous waste from developed to developing countries; • minimize the amount and toxicity of wastes generated; • ensure their environmentally sound management as closely as possible to the source of generation; and • assist least developed countries (LDCs) in environmentally sound management of the wastes they generate.		
Ethiopia	**Kenya**	**Uganda**
Entry into force in 2000, not transposed into law. Ethiopia has signed the Ban Amendment.	Entry into force in 2000, not transposed into law. Kenya has signed the Ban Amendment.	Entry into force in 1999, not transposed into law.
The Stockholm Convention on Persistent Organic Pollutants (POPS)		
The Stockholm convention focuses on the proper management of some components of e-waste: the imports of plastic products, electrical and electronic goods, computers, mobile phones, foams and flame retardants that form the bulk of the newly listed POPs occur. The main challenge that comes with chemical use is the proper management of chemicals across the lifecycle. Poor management of chemicals comes with a price due to poor health and degraded ecosystems.		
Ethiopia	**Kenya**	**Uganda**
Entry into force in 2004, there is a National Implementation Plan.	Entry into force in 2004, there is a National Implementation Plan.	Entry into force in 2004, there is a National Implementation Plan.
Bamako Convention (Regional)		
This treaty, ratified by the Member States of the Organisation of African Unity, came into force in 1998 and focused on prohibiting imports and controlling movement of hazardous wastes within Africa. It was born out of the need to overcome certain issues that the Basel Convention was not able to address completely including the failure to prohibit trade of hazardous waste to LDCs. The treaty prohibits imports of all waste without any exceptions and provides a much stronger tool to prevent trade of hazardous waste to less developed countries.		
Ethiopia	**Kenya**	**Uganda**
Ethiopia ratified the convention.	Kenya signed the convention but has not ratified it - not yet officially approved by its own internal procedure.	Uganda ratified the convention.

2.1.2 National legislation

Ethiopia

In Ethiopia, regulations concerning e-waste are quite minimal. The Proclamation No. 300/2002 Environmental Pollution Control Proclamation aims to reduce to a minimum the generation of waste and, when feasible, apply methods for the recycling of waste. It includes in its scope pollution, radioactive substances and municipal waste. However, it does not mention e-waste. The government put out in 2014 the Management of Electrical and Electronic Wastes Council of Ministers Regulation N…../2014, which determines the management of EEE and the electronic waste hierarchy, the EPR, consumers, and how WEEE should be collected, dismantled, reused, refurbished, recycled, labelled, etc. However, the actual status of this document is not currently known, therefore we can assume that it is not in force.

Kenya

In Kenya, diverse policies and legislation have prioritized the need to improve waste management and enhance education, training, capacity building and public awareness on the topic. The Environmental Management and Co-ordination Act (EMCA - 1999) - revised in 2015 is an Act of Parliament to provide for the establishment of an appropriate legal and institutional framework for the management of the environment and for the matters connected therewith. This act sets the baseline for all additional regulations in terms of waste management, including e-waste. A subsidiary legislation is the Environmental Management and Co-ordination (Waste Management) Regulations, 2006, which regulates solid waste, industrial waste, hazardous waste, toxic waste, biomedical waste and radioactive waste. E-waste is considered as a hazardous waste. The 2010 E-waste Guidelines have been developed with the strategic objective of providing a framework for the development of regulations and policies in Kenya. Specific objectives of the guidelines include enhancing environmental protection from e-waste, establishing a basis for a policy and regulatory frameworks on e-waste management and raising public awareness on sustainable management of e-waste in Kenya. The 2015 National Solid Waste Management Strategy 2015 provides current waste management and recycling practices in Kenya and sets out guidelines, recommendations, and targets for the country to enable waste management systems.

Kenya currently has several regulations concerning e-waste management that are still waiting to be approved. The draft 2019 National E-Waste Management Strategy has two main goals: review and streamline the existing policy, laws, standards and guidelines to be in line with e-waste management in Kenya and identify gaps and develop a national e-waste policy, laws, and standards to act as a model guiding the national strategy. The draft 2019 National Sustainable Waste Management Policy provides a framework for sustainable waste management nationally, through the full implementation of zero waste and circular economy principles, and through practical planning and implementation of waste management at the county level. The national government should also establish and fully implement coordinated policies and regulatory frameworks to address hazardous waste, electronic waste, industrial waste, agricultural chemicals and medical waste. The draft 2019 Sustainable Waste Management Bill seeks to establish appropriate legal and institutional framework for waste management in Kenya including establishment of a Waste Management Directorate. It explicitly mentions EPR for electronic products including establishing a registry.

Most recently, Kenya has put out The Environmental Management and Co-Ordination (Extended Producer Responsibility) Regulations 2020, which is still to be approved. The purpose of these regulations is to provide for mandatory EPR schemes for all products and packaging in all phases of their life cycle to enhance environmental sustainability. Electronic products are in the list of products subject to the EPR compliance scheme.

Also, it is worth flagging that since 2013, Kenya has drafted Environmental Management and Co-Ordination E-waste Regulations, though these have not gone into force yet. These regulations are intended to manage e-waste. It is stated that a producer who intends to introduce new or used EEE into Kenya shall apply for registration from the Authority and sets out intentions to develop an EPR for sustainable management of e-waste.

Uganda

The 2019 National Environment Act reforms the law relating to environmental management in Uganda and provides for the management of the environment for sustainable development. The recent act also introduces the concepts of EPR and product stewardship, however there are not a lot of details on how the enforcement would work. Uganda also recently published the National Environment (Waste Management) Regulations, SI 49/2020, which similarly to the act sets out objectives for e-waste management, EPR and take-back of e-waste, however, enforcement and compliance are not clear.

When it comes to e-waste, Uganda has several official documents. The 2012 E-waste Management Policy was developed to guide, promote and ensure the safe management of e-waste in Uganda, contribute to reduction of environmental degradation and for enactment of specific legislation for proper E-waste management and disposal to safeguard human life and the environment against the hazardous components in e-waste. The Strategy for E-waste Management was developed in 2013 to support the implementation of the E-waste policy approved by Uganda's cabinet in 2012. The strategy highlights nine key strategic actions and includes an implementation plan, monitoring framework, with targets and progress indicators identified, implementing agencies as well as timelines for deliverables. The Guidelines for E-waste Management were developed in 2016 to provide guidance and to ensure clarity on the role of each category of stakeholders in the lifecycle of electronic and electric products. The guidelines therefore serve to articulate the duties and responsibilities of each stakeholder, propose best techniques and approaches for each stakeholder, define linkages between the different duties and responsibilities of the stakeholders and provide a coherent e-waste management framework. Finally, the Finance Act, 2009, prohibits the importation of used refrigerators, freezers, computers and television sets.

Table 2: Summary of e-waste related regulations in Ethiopia, Kenya and Uganda

Country	National Legislation
Ethiopia	Draft Management of Electrical and Electronic Wastes Council of Ministers Regulation N…./2014 Ethiopia does not have any legally binding regulation on e-waste.
Kenya	The draft 2019 National e-waste Management Strategy The draft 2019 National Sustainable Waste Management Policy The draft 2019 Sustainable Waste Management Bill The draft Environmental Management and Co-Ordination (EPR) Regulations 2020 The draft Environmental Management and Co-Ordination E-waste Regulations, 2013 Kenya does not have any specific legally binding regulation on e-waste but has several draft non legally binding regulations.
Uganda	Electronic Waste (E-waste) Management Policy for Uganda, 2012 Guidelines for E-Waste Management in Uganda, 2016 Strategy for Electronic Waste Management, 2013 None of them are legally binding; the government of Uganda is working on having a legally binding piece of legislation concerning e-waste in the future.

2.2 Extended Producer Responsibility (EPR) systems

2.2.1 Context of EPR

The concept of EPR was first introduced in 1990 as "an environmental protection strategy […] making the manufacturer of the product responsible for the entire life-cycle of the product and especially for the take-back, recycling and final disposal." (Lindhqvist & Lidgren, 1990). It was later on defined by the OECD in 1996 as "the extension of the responsibilities of producers to the post-consumer stage of products' life cycle" (OECD, 1996).

The aim of an EPR policy is two-fold. Firstly, it allows to partially or fully shift the responsibilities – financial and/or physical – of waste back to the producer and away from the municipalities. Following the polluter-pays principle, it removes the economic and operational burden of managing the end-of-life (EoL) of products away from municipalities. Secondly, the internalisation of the treatment and disposal costs of a product by the producer incentivises eco-design as it represents a way to reduce the cost related to its EoL management (European Commission, 2019c; EXPRA, 2016). Hence, it allows to reduce the environmental impact of a product across its entire life cycle - from the production to the EoL phase. Over the past 20 years, the EPR concept has been widely implemented across the world as a way to prevent waste at the source and support the achievement of national collection, recycling and materials management targets (EXPRA, 2016; OECD, 2001).

2.2.2 Key aspects

EPR systems across the world have many different aspects and target various waste streams. The key features that define EPR systems will be discussed in this part, including the type of responsibility, the nature of competition, the cost coverage and the transparency as well as surveillance (Deloitte, 2014; EXPRA, 2013, 2016). These different features vary depending on the local and historical context, but also on the waste streams and scope (Deloitte, 2014).

a. Level of responsibility – Financial or Organisational

Across EPR schemes, the level of responsibility of a producer may vary from the financial responsibility to the organisational responsibility of the end-of-life management of the products. This can be explicitly required by regulations or voluntarily set by the industry. EPR schemes can be grouped in two main categories: the "financial" and "organisational" EPR schemes (Deloitte, 2014).

There are two types of "financial" responsibility. In the first type, producers simply have to finance the existing waste management systems, removing the economic burden from municipalities. Some of the advantages of that system include the preservation of the historical organisation and the easy adaption to the local context. The second type of financial EPR schemes works through contracts with municipalities to collect and manage the waste. Depending on the contract with the municipalities, the financial contribution can be proportionate to quantitative results including collection and recycling rate but also on quality check or treatment used (Deloitte, 2014). Hence, this type of financial EPR schemes can foster greater incentives for producers to improve the design of their product.

In the "organisational" EPR schemes, producers are financially responsible and are also partially or fully responsible for the organisation of the activities traditionally undertaken by the municipalities. With partial organisational responsibility, municipalities are responsible for some activities - such as collection - and producers are in charge of other activities - such as sorting, reselling the recycled material, etc. With full organisational responsibility, the producer is entirely responsible for the collection and treatment of the waste, often subcontracting these activities to waste collection and treatment companies. There are multiple advantages to a full organisational responsibility, including the direct surveillance of the waste management operations and the direct incentive to improve the cost-efficiency of the EoL management of products through eco-design (Deloitte, 2014).

b. Type of responsibility – Individual or Collective schemes

Regardless of the level of responsibility (whether financial or organisational), EPR is an individual obligation which can be exerted either individually or collectively by a group of producers (Eunomia, 2020).

In the case of an individual scheme, the producer takes care on its own (financially, and/or organisationally) of the EoL management of its products. Individual schemes are particularly relevant when the corresponding products market is highly concentrated and when producers can implement a take-back system to their consumers on their own (Deloitte, 2014). Otherwise, producers are responsible for waste volumes corresponding to their market share. In an individual scheme, producers tend to have a greater administrative burden, however, they have a direct incentive to improve the design of their product to decrease the cost of their EoL management (Tojo, 2003).

As EPR regulations often result in a high number of requirements and obligations for producers, it is quite common that a group of producers collaborate to implement the EPR obligations through a "collective scheme" (EXPRA, 2016). A collective scheme is also referred to as a Producer Responsibility Organisation (PRO) and implements the EPR obligations in the name of the members in exchange of a fee. The fee is usually calculated based on each producer's market share and on the eco-design of the product. The PRO will in turn organise and finance the collection and recycling operations. In other words, a PRO exempts the member companies from directly managing the waste they are responsible for. Collective EPR schemes allow to combine the costs for collection and treatment as well as for the organisation and supervision of these activities, and finally to manage the corresponding data (Deloitte, 2014). PROs play a crucial role in facilitating waste management, in establishing convenient collection points for consumers and in gathering data from each member producers consistently (Tojo, 2003). Depending on many aspects of the EPR, a wide variety of EPR schemes exist.

c. Nature of the competition

Competition arises at different levels and amongst different actors in an EPR scheme including competition between schemes and competition between waste collection and treatment companies (Deloitte, 2014). Competition between schemes arises when there are several schemes in the same waste sector and geographic zone. This competition allows producers to benefit in terms of price competitiveness, ensuring they are paying the true costs (Eunomia, 2020). In this case, competition can be regulated by an independent third-party which verifies the full coverage (product and geographic), the compliance of the PRO and the treatment quality. This clearinghouse can be spontaneously created by the producers or may be a regulatory requirement.

Competition at the waste management level including at collection, sorting and recycling stages is considered crucial as these services represent over 80% of a successful EPR organisation's total cost (Deloitte, 2014; EXPRA, 2013). This competition allows to control the costs within each sector and to ensure the true costs (Eunomia, 2020).

d. Cost coverage

EPR schemes can cover different types of costs, depending on the regulatory obligations and the voluntary coverage. EPR schemes often have to cover as a minimum legal requirement some operational costs including separate collection, transport and treatment of waste. They can also voluntarily decide to provide additional funds for supporting services including raising awareness as well as data gathering and reporting (e.g. amounts distributed, collected, recycled) (Eunomia, 2020). These costs can either be paid directly by the individual producer, or by the collective scheme using the fee paid by each producer.

e. Transparency and surveillance features

The need for transparency is two-fold: first at PRO level to allow producers to make informed decisions, and second for governments to monitor their performance (Eunomia, 2020). In a competitive PRO set up, producers should be able to determine which scheme to join and to discharge their responsibilities to by having a clear access to the fee structures of competing PROs. In addition, audits reporting the levels of recycling and of compliance should be clear and transparent to allow the government to adjust the regulation accordingly (Eunomia, 2020). All the later can be monitored by an independent third-party clearinghouse, where producers have to register and report their data, facilitating the highlight of free riders.

Case study of EPR Systems for WEEE in Europe

In Europe, EPR systems for WEEE are required by law at EU level and implemented at each country. Most countries have several not-for-profit collective EPR schemes competing between each other. The level of responsibility varies from financial to organisational. Usually 100% of the collection, sorting, recycling and treatment costs are covered by the EPR scheme. Producers are legally obliged to declare the amount of EEE put on the market and WEEE collected and treated on a yearly basis to the clearinghouse. Producers that do not comply risk penalties depending on the type of waste and quantities (Deloitte, 2012, 2014).

2.2.3 Applying EPR to displacement settings

As mentioned previously, EPR schemes are implemented at national scale by the legislator. If such policies existed at the present time within the target countries, there would be no question as they would also apply within the project locations. But such is not the case, although, as seen above, Kenya and Uganda currently have such policies in progress which may be published and enter into force in the next few years. In the absence of national policies, applying the polluter-pays principle under the shape of an EPR mechanism at the scale of a settlement for displaced persons will imply some adaptations as the targeted areas lack both monitoring and enforcement capacities.

EPR schemes are highly flexible on many aspects and a similar tool could be tailored to this very particular context. Successfully implementing a system similar to an EPR mechanism would thus require having a strong understanding of the identities of the producers, the products they bring on the market as well as the local context. The latter will be analysed and recommendations regarding the most optimal system will be outlined based on the analysis.

2.3 Map of current e-waste flows and stakeholders

In Ethiopia, Kenya and Uganda there are several key stakeholders involved in the e-waste management sector that can be broadly categorised as government agencies, off-grid companies and recyclers. The tables below provide a breakdown of some of the key stakeholders involved, as well as their roles and activities.

2.3.1 Government agencies

Table 3: The role of different governmental agencies in Ethiopia, Kenya and Uganda

Name	Country	Description	Role in the lifecycle of EEE
UNHCR	KE, UG, ET	The UN Refugee Agency. Their primary purpose is to safeguard the rights and well-being of refugees.	UNHCR have the power to change the refugee eco-system. They primarily have a protection mandate but through regulations and guiding documents, such as the Refugee Response Plans (RRP), they can support or prohibit the way EEE is sold and collected in displacement settings. Their partners or contractors also administer the movement of EEE.
UNEP	KE, UG, ET	The UNEP Global Environment Facility (GEF) was established to help tackle the most pressing environmental issues globally.	In the area, of off-grid lighting, the GEF facility is founded on policy de-risking, financial de-risking and knowledge management. They have the ability to support EPR legislation and implementation in country and can help develop cost-effective solutions to integrate informal workers in the e-waste sector.
IOM	KE, UG	International Organisation for Migration is an intergovernmental organization that provides services and advice concerning migration to governments and migrants, including internally displaced persons, refugees, and migrant workers.	IOM has a project in Kenya and Uganda, which aims to inform wider environmental policy in displacement settings. They are trying to improve the understanding of e-waste flows in such settings through research in 5 camps (2 in Kenya and 3 in Uganda). Their methods involve surveying households and those working for repair and waste services to map out the repair and waste locations in camps, as well as the disposal behaviour of consumers.
GIZ	KE, UG, ET	The Energy Solutions for Displacement Settings (ESDS) project implemented by GIZ on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ) is part of a wider program called 'Support to UNHCR in the Implementation of the Global Compact on Refugees in the Humanitarian-Development-Peace Nexus' (SUN). It aims to tackle gaps in sustainable energy supply in refugee camps and settlements in Ethiopia, Kenya and Uganda.	ESDS, and other commissions within GIZ are supporting the implementation of the UN GCR and its CRRF by improving the access to sustainable energy products and services in refugee camps/settlements and hosting communities through a sustainable and market-oriented approach. GIZ aims to reduce the environmental impact of WEEE from off-grid solar through commissioned research and pilot schemes on WEEE in displacement settings.
National govt	KE, UG, ET	Ethiopia has the Ministry of Environment, Forest and Climate Change and the Ethiopian Environmental Protection Authority Kenya has the Ministry of Environment and Forestry and the National Environmental Management Authority (NEMA) Uganda has the Ministry of Water and Environment the National Environment Management Authority	Kenya, Uganda and Ethiopia all have a similar policy setup, with a ministry in charge of policy and a regulator in charge or regulating those policies. These bodies create the current ecosystem of regulation in terms of e-waste management, with varying levels of success and policies in place.
Local and county govt	KE, UG, ET	Local and county governments in East Africa are a form of public administration which often exist as the lowest tier of administration within a given state.	Few e-waste policies exist at this level apart from UNHCR waste management standards, which are implemented on a local level often with the assistance of local government. Depending on the context, environment issues are mostly managed by district and sub-county local govts.
Refugee Affairs Secretariat, OPM, ARRA	KE, UG, ET	The Refugee Affairs Secretariat, Office of the Prime Minister (OPM) and Agency for Refugees and Returnees Affairs (ARRA) are the Government representatives through which is provided leadership regarding the management of refugees, humanitarian aid and migration under the Executive arm of government in the target countries.	Displacement Settings camp/settlement management are overseen by these agencies. The monitoring of the movement of goods is done through their coordination mechanisms.

2.3.2 Off-grid companies

Table 4:The role of different off-grid companies in Ethiopia, Kenya and Uganda

Name	Country	Description	Role in the lifecycle of EEE
D.Light	UG, KE, ET	Founded in the US in 2007, D.Light is now one of the largest producers of pico-solar products in the world, selling over 20 million products across four hubs (Africa, China, South Asia and the United States).	D.Light is a key player in the life cycle of EEE, largely due to their high quality low cost products that can be bought from numerous distributors across East Africa. Though they do not sell specifically in displacement settings (apart from in Bidibidi through the AMPIRE project), their solar lanterns are present in many camps due to informal networks.
M-Kopa	UG, KE	Founded in 2011 and headquartered in Kenya, M-KOPA has equipped over 800,000 people with off-grid energy systems to date.	Like D.Light, it is likely that some of M-KOPA's systems are present in displacement settings however they offer larger appliances (TV's, fridges), which are more expensive and require PAYGO financing, meaning few systems will be present.
Fenix International	UG	Set up in 2009, Fenix has brought decentralised energy solutions to more than 700,000 customers, largely though solar home systems. They are headquartered in Kampala, Uganda.	Fenix operates in numerous displacement settings in Uganda. Owing to their prominence in these areas, they also have coordinated efforts to deal with the End-of-Life management of their products.
BBOXX	KE	Incorporate in 2010, BBOXX is a UK company that has sold more than 150,000 products in 30 countries, largely across sub-Saharan Africa.	BBOXX is known for being active in displacement settings but like D.Light and M-KOPA, some of their products could unintendedly arrive in refugee camps. What differentiates their End-of-Life Management system is an energy lease model, where the battery is owned by BBOXX and therefore has a higher chance of being dealt with properly at End-of-Life.

2.3.3 Recyclers

Table 5: The role of different recyclers in Ethiopia, Kenya and Uganda

Name	Country	Description	Role in the lifecycle of EEE
Enviroserve	KE, UG	EnviroServe is the predominant certified recycler in East Africa, with 30 years of waste management experience globally. They handle the transportation and disposal of hazardous and non-hazardous waste.	Enviroserve has a plant in Rwanda that handles e-waste from Uganda and Kenya. They are a key player in the life cycle of EEE, offering services to most off-grid companies.
WEEE Centre	KE, UG	WEEE Centre was registered as a limited liability company in Kenya in 2012. They offer 8+ years of waste management experience and have a particular focus on e-waste.	The organization is also a key player in the handling of EEE, serving private and public sector clients in Kenya and East Africa. In the off-grid industry, however, their operations are primarily focussed on Kenya.
Informal recyclers	KE, UG, ET	Due to the lack of adequate infrastructure for e-waste management, the presence of a thriving informal scrap-dealing sector can be observed in Kenya, Ethiopia and Uganda. This often involves the scavenging of valuable components from e-waste, which can pose severe threats to the environment and the human health of workers exposed to such waste.	Although not a distinct body in itself, the informal recycler is potentially the most important stakeholder in the life cycle of EEE in displacement settings. Currently, most of the e-wastes generated in all three countries end up in the hands of the informal recycling sector.

2.3.4 Developmental organisations/ NGOs

Another category of stakeholders which has been highlighted during the study are NGOs and other humanitarian/development organisations. They run a variety of operations and infrastructures within the settlements – schools, water points, hospitals, etc. – usually in partnership with UNHCR. This means that UNHCR has a responsibility to ensure that the actions of NGOs and development organisations are sustainable, economically and environmentally. Some of the organisations operating in the screened locations include DCA, DLG, Red Cross, Oxfam, IRC, Energy 4 Impact, Windle Trust, Water Mission, Rice Win, Peace Winds, the Norwegian Refugee Council.

These stakeholders can be involved in waste management activities, such as sensitization campaigns or collecting certain specific waste flows such as PET bottles, and their field knowledge and skills are useful for the implementation of many waste-related activities. However, due to the nature of the funding model and the relative short-term presence of NGOs in the field, their activities can negatively impact the ecosystem.

The primary impact of NGOs on e-waste in displacement settings is through the subsidisation of new off-grid solar products onto the market. This stems from many third sector organisations having motivations and targets to reach SDG 7, ensuring access to affordable, reliable, sustainable and modern energy for all. There are two methods used here: either subsidising an off-grid solar company in a displacement setting or through 'freebie' product giveaways. Unless the donor or UNHCR have strict contractual requirements around the return of those products at End of Life, most of these freebies and subsidised products will be improperly disposed of.

2.3.5 E-waste flows

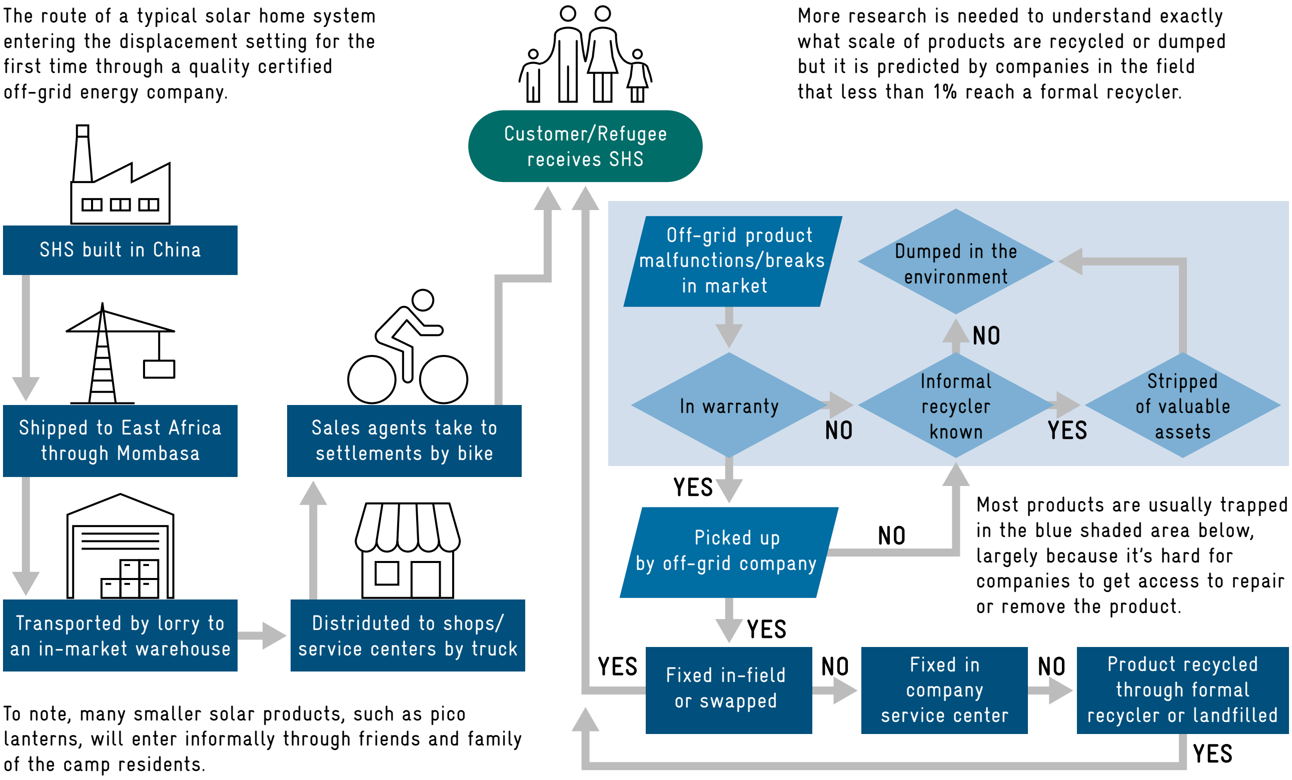
To understand the flows of e-waste throughout ESDS project areas in Ethiopia, Kenya and Uganda, it is worth considering the make-up of these products. The type of e-waste found in these settings are most likely to be solar lanterns, radios and torches but to comprehend the full scope of the materials present and their expected life-times, it is worth considering the typical components of Solar Home Systems, as seen in Table 6.

Due to the informal nature and lack of fixed addresses in displacement settings, precise e-waste flows of the materials in the following figure cannot be found with any real certainty. From the stakeholder consultations, it became clear that for most off-grid solar companies it is difficult to track their products through the life cycle without using tracers, which would be costly and difficult to achieve without breaching data protection rights of customers. What can be understood is the life cycle of a typical product through a formal business model i.e. the sale of a quality product from a certified off-grid solar company. This is mapped out in the following figure.

Table 6: Typical components of SHS, main materials/components (in bold: mainly targeted during informal recycling processes) and typical lifetime

Component groups	Typical material compositions	Expected life-times
PV panels	Crystalline silicon, glass, **aluminium**, **copper**, trace elements (indium, tin, gallium…)	› 10 years (technical lifetime), but usually replaced at end of warranty (5 years) at least for certified products.
Control devices	**Printed circuit boards**, solder paste, various electrical and electronic components, plastics…	5 – 15 years
Lead-acid batteries	Lead-acid batteries: **lead**, **lead-oxide**, plastics, electrolyte (sulfuric acid)	2 – 6 years for lead-acid but this is often reduced due to poor maintenance or mis-use e.g. if an automotive battery is used (designed for providing high current for a short duration, not to supply current for a long duration), it would have a short lifetime and would need to be regularly replaced, generating more waste.
Li-ion batteries	Li-ion batteries: Graphite, various organic substances, copper, aluminium, lithium, plastics…	4 - 10 years for Li-ion, which can also be reduced due to poor maintenance or misuse e.g. excessive charging leading to thermal run away
Associated components	**Copper**, plastic insulation, battery mounting racks, cable covers	› 10 years, but usually replaced with the SHS.
Connected Equipment (lamps, radios, water pumps, fans, TVs…)	Various plastic types, **aluminium**, **copper**, **ferrous metals**, various electrical and electronic components (microchips, displays, **transformers**, resistors…)	2 – 10 years

Figure 1: Example of supply chain & e-waste in displacement settings



2.4 E-waste management and disposal practices

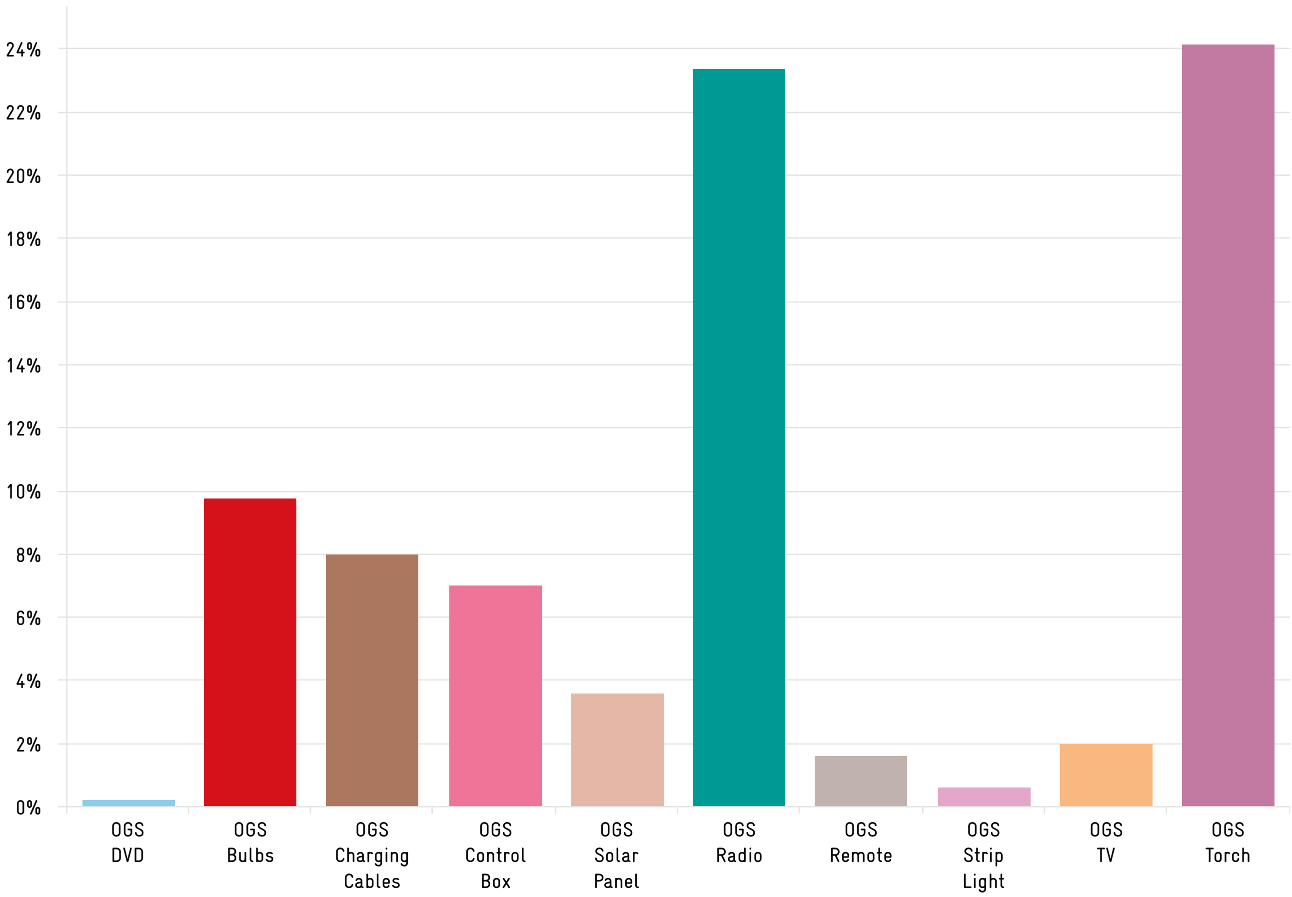
Understanding how people manage and dispose of their e-waste at the end of their usable life is a key input to have an in-depth understanding of the local context and ensure the correct management of e-waste. A survey was highlighted as the most efficient way to fully grasp people's behaviour. However, due to the current pandemic situation which has restricted movement, it was made extremely difficult to safely access the settlement and to conduct a survey of the population. Consequently, it was decided not to conduct a survey at the moment and rather to look at the results from a consumer survey on e-waste management in Kenya. Some results from this survey are considered good ground to building assumptions towards e-waste management practices of people in displacement settings.

2.4.1 Methodology and results of the survey

An OGS company in Kenya conducted a study in 2019 on 500 consumers living in remote areas (CDC, 2020). The survey was two-fold and included on one side understanding people's behaviour towards e-waste and on the other side the potential incentives that could be used to attract consumers in returning their e-waste.

Firstly, the survey highlighted the number of customers with non-functioning OGS electrical appliances and key components, with non-functioning OGS radio and torches as the two OGS items found most commonly at customers' house.

Figure 2: Percentage of customers with non-functioning OGS appliances and key components (CDC, 2020)



Considering these are the most sold, this is not a surprise, but it does, perhaps, demonstrate the relatively short lifespan of radios and torches. This may partly be due to the portable nature of the products, which often contain weak components (such as the antenna in the case of the radio). Nonetheless, it is something that should be monitored and considered. The short warranty periods for these components and the low-cost (and therefore low value in repair) exacerbates the issue and provides a perfect storm for creating a stockpile of low-value e-waste in customer homes.

To ensure the correct management of WEEE, it is important to understand how people handle their products when they reach the end of their usable life. As shown by the following figure, most people living in remote areas would simply keep the e-waste at home (40%). This relatively high portion of hibernation can be explained by the social status of owning electronic products. Keeping old e-products, such as a TV, is a way to display their domestic progression to a new TV. Keeping both the old and the new item is hence a way to remind visitors of heightened economic status (CDC, 2020).

Within the 7% of people who answered they would dispose of the product, 37% would burn the e-waste, while others would dump it in trash piles or bury it (see figure below).

We can further assume that people who keep the e-waste at home eventually follow the discard pattern mentioned above. Whether consumers burn, bury, dump, leave outside or keep at home e-waste, all these options have significant environmental and health impact. Hence, it is important to guarantee that proper information is disseminated to ensure consumers understand the positive impacts of proper e-waste management.

Figure 3: Consumer action with e-products at the end of life (CDC, 2020)

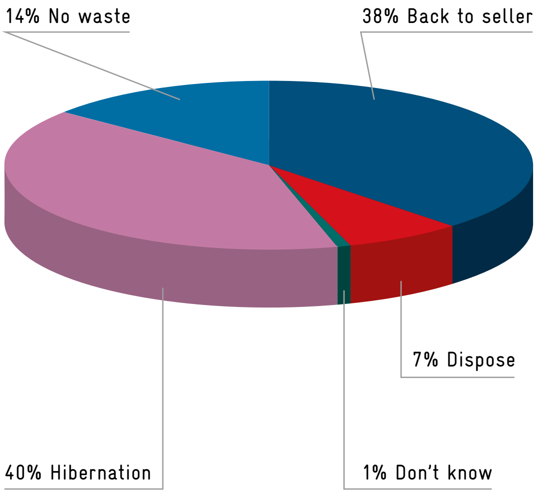
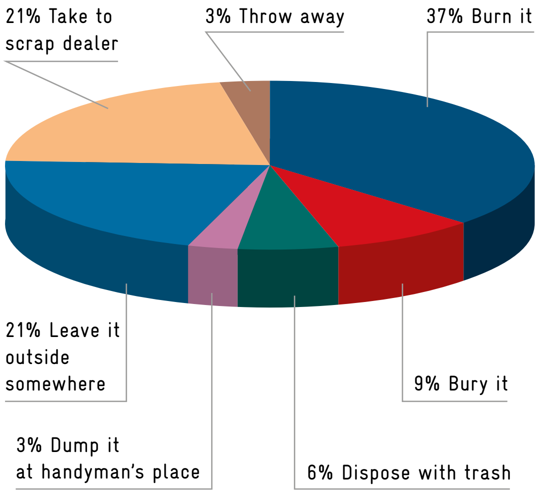


Figure 4: e-waste disposal practices (CDC, 2020)



2.4.2 Building assumptions towards e-waste management practices in displacement settings

We can now apply the results of that survey to the situation in the targeted displacement settings. All information about e-waste management practices in displacement settings is indirect and was gathered through the series of interviews with all stakeholders involved. The described situations in the three countries share many similarities with the Kenyan survey above in terms of WEEE flow and consumer behaviour.

Still, some differences must be taken into account:

- Information is very scarce about the size and composition of the EEE/WEEE flow;
- Displacements settings, although often remote, are densely populated areas, inducing more waste concentration;
- None of the interviewed stakeholders reported the presence of any informal e-waste management activities.

The information that we could gather from the three target countries also describe situations that are also quite similar in their core, in spite of variations in some details. These strong similarities allow us to attempt to draw a general picture of waste management practices in displacement settings. That picture is described below:

Inside the settlements, the most frequent household waste system is dumping all waste in community pits which are dug by the population at block level. Once full, these pits are usually covered with soil or burned to reduce the volume of waste and thus avoid congestion. Dedicated waste collection points also exist in specific locations or infrastructures, such as markets, hospitals etc. These can take the shape of waste banks (small warehouses) or bins. Once full, bins and banks are usually emptied in the pits or left to overflow. Some waste collection and disposal activities are conducted by WASH partners inside the settlements, usually in order to move the waste to communal landfills outside the settlement, but these activities are often temporary due to their being driven by punctual funding. By all accounts, all solids wastes are mixed up and no segregation is made for e-waste.

The results from both the customer survey in remote areas in Kenya and the interviews with the stakeholders in all targeted countries and locations point towards the same direction: the way e-waste is currently managed in displacement settings relies on substandard practices which maximize the dispersion of toxic substances in the surroundings. This represents a danger to both the environment and people's health, and strong actions need to be taken to solve this issue.

3 Concept development for a pilot

The concept development aims to plan in detail for the implementation of a pilot e-waste collection and recycling project on one selected project site. After choosing the project site, the costs of operation are evaluated and the opportunities and barriers for the implementation of a business scenario are analysed in order to formulate actionable recommendations targeting both UNHCR and the GIZ ESDS program.

3.1 Choice of pilot location

The first requirement for the implementation of a pilot project is choosing the location. After first consultation with GIZ and UNHCR representatives, a first list of potential locations was built, involving displacement settings in the 3 target countries:

Table 7: Potential displacement settings locations in Ethiopia, Kenya and Uganda for pilot

Ethiopia	Kenya	Uganda
Pugnido Camp 1	Kakuma Camp	Rhino Camp Refugee Settlement
Pugnido Camp 2	Kalobeyei Settlement	Imvepi Refugee Settlement
Nyunyiell Camp		Kiryandongo Refugee Settlement
		Lobule Refugee Settlement

The selection of the pilot site was conducted according to several criteria:

- Security conditions,
- Existing activities (including implementation status of GIZ ESDS),
- Data availability (an essential criterium due to the postponing of the field mission),
- Population size,
- WEEE potential,
- Type of site: settlement or camp.

Following this evaluation, a consultation with GIZ and UNHCR stakeholders allowed to confirm the choice of **Rhino Camp Refugee Settlement as the chosen site for the concept development of a pilot project.** Located in Terego and Madi Okollo Districts (former Arua District), Rhino Camp Refugee Settlement was first established in 1980 and is currently hosting over 123.000 Persons Of Concern, mostly refugees from South Sudan.

The combined facts that some amounts of EEE have previously been distributed in the settlement and throughout Arua district, that a comparatively good level of information is available on the settlement, that distribution points such as energy kiosks already exist and that WEEE recycling is very weak in the country, highlight the interest and potential of Rhino Camp as a pilot project location.

Table 8: Assessment of displacement settings locations for a pilot project

Locations	Country	Security conditions	Existing activities	Data availability	Population size	WEEE potential	Type of site	Global rating
Rhino Camp	Uganda	**	***	***	**	**	Settlement	***
Imvepi	Uganda	**	**	***	**	**	Settlement	**
Kakuma	Kenya	**	***	**	***	**	Camp	**
Kalobeyei	Kenya	**	**	**	*	**	Settlement	**
Kiryandongo	Uganda	**	*	*	*	*	Settlement	*
Lobule	Uganda	**	*	*	*	*	Settlement	*
Pugnido Camp 1	Ethiopia	*	*	*	**	*	Camp	*
Pugnido Camp 2	Ethiopia	*	*	*	**	*	Camp	*
Nyunyiell Camp	Ethiopia	*	*	*	*	*	Camp	*

3.2 Estimated costs

There are two fundamental approaches to define the financial baseline for the EOL management:

- One based on a **procurement quote from recycling contractors**, which is based on acquisition of quotes from recyclers and benchmarking/comparison;
- The other is based on adopting an **activity-based costing** approach (Magalini et al., 2016), which considers the technical cost for each step of the recycling chain; while for collection and transportation it is quite straightforward, the assessment of recycling costs considers the average composition of products, the value of the fractions obtained through the dismantling process and the time/cost associated with the dismantling process itself.

The second approach is usually adopted when assessing or comparing different offers or to evaluate the plausibility of quotes, especially if recyclers are audited and mass balance can be obtained to evaluate the results of the dismantling process. On an operational level, there are four main cost elements in take-back and recycling operations to consider:

- **Access to waste**: includes the costs (or revenues) to obtain the waste from the original holder (the consumer). In the majority of developed countries, consumers get rid of their waste for free (or in some cases they even have to pay); however, in the context of developing countries, it is actually the opposite in most cases: the holder of the product to be discarded expects economic compensation when disposing of the waste. When the products or fractions are valuable, an informal competition may exist for access to the waste, driving the amount of the expected compensation even higher, to the point where the material value of the product barely compensates its purchasing cost. This is true for circuit boards or mobile phones for instance, less so for OGS waste whose material value is low in most cases. On the other hand, when the holder of the waste is a formal organisation or business, the legal context can force them to transmit it to certified recyclers, which allows the latter to charge a fee for the collection and recycling service of e-waste.
- **Collection**: which depends on existing infrastructure, or in some cases might also mean the cost of setting infrastructure up, including for example hiring/ leasing a space, purchasing containers, cages, bins etc. to collect and store waste at the collection points. This also includes salary of staff at collection points. Collection is generally achieved through a both push and pull strategy, involving a mix of fixed collection points and mobile on-the-spot collection. Partnerships with informal stakeholders can be instrumental.
- **Transport**: normally includes all the transportation costs from the collection point to the treatment plant or sometimes even from the consumers' location itself, such as for door step collections.
- **Treatment**: represents the net costs for proper treatment, including disposal of hazardous fractions. Each treatment plant processing e-waste incurs in operative costs: labour costs, energy costs, depreciation of capital investment, other costs related to the functioning of the plant itself; e-waste being processed into the plant is dismantled and results in different fractions that are sold on national or international commodities markets. Some fractions have positive value (representing a revenue) while others have a negative value for disposal or further treatment (representing a cost). Revenues generated at this stage need to balance all the chain of costs. Because of this, the treatment can involve other ways to add value to the waste, such as refurbishing or reuse of functional components.

In the case of the present assignment, an important fact that must be taken into account is that upon research and consultation of several stakeholders, **we could not find any formal electronic waste recyclers in Uganda** that currently have active operations as well a minimum level of compliance to international e-waste management standards.

Based on previous experiences in the subregion and on feedback from stakeholders in the 3 target countries, two structures established in Uganda have been identified as having some links with electronic waste recycling: the company Zero Waste Consult and the non-profit Computer for

Schools Uganda. Further research led to discarding them as potentially competent WEEE recyclers, for the following reasons:

- Neither organisation is primarily concerned by waste management (one is a consulting firm and the other is a nonprofit aiming at bridging the digital divide);
- None of the consulted stakeholders in Uganda ever had any interaction with them, including major solar players with pressing needs for the EOL management of their products;
- Upon contact, neither was responsive enough to set up a call or answer some questions.

The company Battrise Ltd was also identified, but specializes on reviving Lead-acid batteries, which represents a very narrow subsector of electronic waste.

Finally, although such information is very difficult to gather from a distance, it is strongly suspected that, as happens in most countries in sub-saharan Africa, many informal stakeholders usually known as "scrap dealers" are active in the field of collection and dismantling of e-waste. Unfortunately, the waste management practices of these stakeholders, driven by a strong concern for cost reduction and lack thereof for health and the environment, are far from sustainable. This prevents any possible collaboration on the recycling side. Confirming or correcting this prospective analysis of the informal sector should be one of the targets of the field mission.

As a consequence, in order to implement the first approach (i.e. getting quotes from various recyclers), information as well as quotes and price indications were gathered from different recyclers from other completed projects and ongoing pilots. All the costs have been converted in US dollars per kilogram of e-waste (USD/kg):

- For access to waste the baseline assumes zero as most favourable value; the worst-case scenario considers 0.1 $/kg (derived from previous studies done in 2016-2017 in Kenya, Rwanda and Nigeria (DFID, 2017) and recent operational experiments in Cameroon (WEEECAM, 2020).
- Maintenance costs for collection have been neglected as at the moment no specific collection points exist in the target settings, so waste collection will need to rely on pre-existing infrastructures such as energy kiosks, repair shops or waste banks. This means that no costs are assumed for the first mile collection (from the consumer's household to the collection point).
- For transport costs it has been assumed that transport and pick-up is done with lorries; some recyclers quoted up to 2 $/km up to a max of 650 $/day while others offered for 150 $/day the full day of lorry. In some cases, the payload of the truck was also varying from 1,250 kg up to 30 tons (t). It was assumed in the calculation a maximum payload of 5 t which corresponds to the pick-up of a full container of mixed electronics. The itinerary is from Rhino Camp to Kigali (Rwanda), as it is the location of the closest known compliant e-waste recycler with existing activity in Uganda (namely Enviroserve Rwanda). The distance is 600 to 700 km, with an estimated payload of 4 tons for our calculations.
- For the treatment some recyclers quoted some items per kg and some others per unit. In the case of prices provided per unit, the conversion has been made assuming an average weight per product. Tables below summarise the main assumptions and data. In all cases, the minimum, maximum and average value have been calculated. The value of WEEE – and thus its treatment cost - being highly variable depending on the fractions considered, the evaluation made is focused on the target flows mentioned in the terms of reference, and thus assumes that the WEEE is comprised of 80% mixed solar product waste and 20% small IT waste. As no recyclers are currently active in Uganda, the provided prices are derived from quotes provided by recyclers active elsewhere on the continent (NEFCO, 2020).

Table 9: Cost assessment of a pilot project

Costs (USD/kg)	Access to waste	Collection	Transport (600km, 4,000 kg)	Treatment	Total (USD/kg)
Min	-	-	$ 0.24	$ 0,56	$ 0,80
Max	$ 0.10	-	$ 1.04	$ 1,84	$ 2,98
Average	$ 0.05	-	$ 0.64	$ 1,21	$ 1,49

The results above should be taken with a grain of salt. Indeed, the heavy dependence of recycling costs on the prices of the raw materials they comprise, and the fact that the WEEE recycling sector is at a low stage of development in sub-saharan Africa at large, both result in highly volatile costs for this type of operation.

Furthermore, the lack of specific information about the quantity and composition of the WEEE flow in the targeted locations (see “potential opportunities and barriers”) creates some uncertainty regarding the accuracy of estimates. Nevertheless, the above estimates are conservative and should be sufficient to cover most of the cost of correct collection and recycling of WEEE in Rhino Camp Refugee Settlement. An overall budget can be estimated on that basis once sufficient information has been gathered about the volumes of e-waste inside the settlement.

3.3 Potential opportunities and barriers to the implementation of a business-driven scenario

In order to actually work, all stakeholders taking part in a WEEE collection and recycling mechanism should have a good reason to do their job. Some of them need to be accountable to their internal hierarchy or to a third party (local authorities, government, funders): such is usually the case for large institutions. But to motivate private stakeholders, which will be the main operating force of the mechanism, the activity projected for them needs to be economically rational. In other words, the projected benefits must outweigh the investment in time and resources. This is what we call a business-driven scenario: a mechanism in which all business-driven parties have a business interest in doing the right thing.

A list of issues has been investigated throughout series of targeted interviews in order to identify the main opportunities and barriers to the development of a business case scenario for WEEE collection and recycling in the context of Rhino Camp settlement.

Table 10: Opportunities and barriers to the development of a business case scenario for WEEE collection and recycling in Rhino Camp settlement

Issue	Current situation	Opportunities	Barriers
EEE and WEEE flows	Free movement of individual people and their goods in and out of the settlement. According to UNHCR, WEEE represents less than 1% of solid waste in settlements.	Easy access to the settlement.	No monitoring or estimations for volumes and compositions of EEE/ WEEE flows.
Presence / distribution of solar equipment	Some water systems powered with solar energy Solar streetlights around some key installations: health centres, schools, water points etc. 40,000 solar lanterns distributed to households by UNHCR and partners in Arua district. Existence of Energy kiosks. Solar systems on social institutions.	Significant volumes have already been distributed, confirming the relevance of a waste collection scheme.	
Waste management practices	Solid waste mostly disposed of in the open or in informal collection points. Few to no existing landfilling/ incineration systems. E-waste is not segregated. Existence of a few phone repair shops operated by local people.	Waste is easily accessible, with no existing competition.	Sensitization level is very low resulting in potential difficulty in inducing behavioural change.
Collection points	Institutions (market, health centre…): waste bins or waste banks Households: waste pits in the open Collection points are never emptied	Abundance of potential collection and storage points.	No waste segregation, no maintenance of waste collection points.
OGS companies involvement	Businesses need permission from the Office of Prime Minister to enter a settlement for commercial purposes.	All interviewees were seeking to be involved in a waste management system.	High perceived complexity to access to the settlement. Distribution usually done by third-party sellers.
WEEE recyclers involvement	No WEEE recycler exists in Uganda	Possible to consider recyclers from neighbouring, more advanced countries (Kenya, Rwanda…)	Transportation is costly due to the distance, and complex due to border crossing.
Take-back scheme for UNHCR	Field offices: all waste is disposed of in waste banks. Large WEEE items; are sent to Kampala headquarters for disposal.	Field offices can manage their waste through the schemes that will be set up.	Need for a budget dedicated to the proper management of e-waste from the branch, as well as internal sensitization.
Costs	See estimated costs above : rough estimate at 1,5 USD/kg to cover collection and recycling operations.	Overall costs low due to low volumes of waste	Cost per device is high compared to sales margins per product.

3.4 Incentives to drive behavioural change

3.4.1 Methodology and results of the survey

The survey conducted in 2019 by an OGS provider on 500 consumers living in remote areas in Kenya also looked into potential incentives for consumers to return their e-waste (CDC, 2020). Customers were offered different types of incentives and asked which one they were most sensitive to. The survey highlighted that customers who are offered free products are more attracted to return their e-waste compared to other incentives.

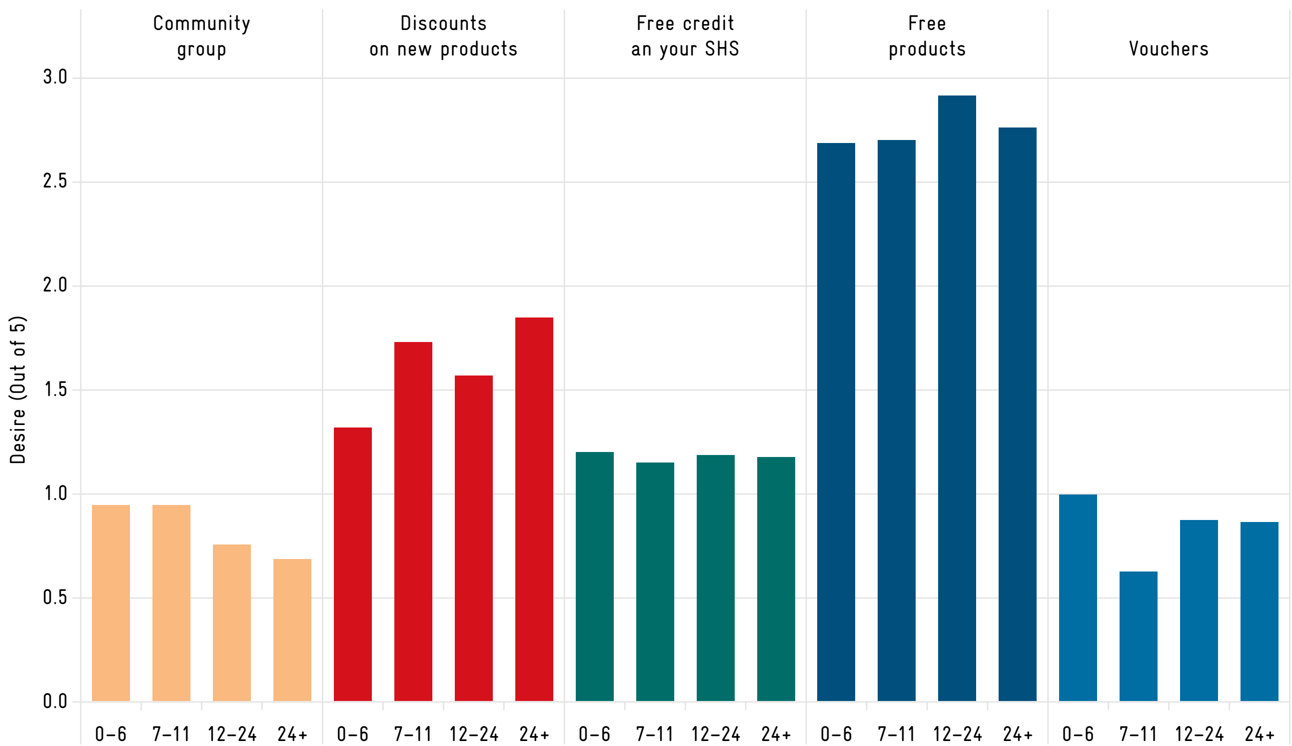
Whether or not it was made clear that the value for each incentive was equal, consumers tend to prefer having a small product for free. An interesting fact is the lack of appeal in the community group incentives, presumably reflecting the lack of direct personal benefit from a personal action. The response to free credit for their solar home system was of limited interest probably due to a small benefit to them compared with the other options provided. Despite an almost direct cash payment, vouchers were one of the least attractive options for incentives. Finally, the most preferred option "Free Product", would be an unsustainable solution for incentivizing take-back of e-waste due to the high value associated with them.

In the final incentive structure, three options were considered as relatively strong incentives to return any non-functioning electronic item. The incentives chosen are:

1. an awareness campaign to act as a control to provide a baseline,
2. offering a discount on a new purchase of a radio or torch,
3. providing a voucher.

These incentives need to be further tested on the ground and a pilot test is crucial to validate the information and results obtained from the survey before implementing them.

Figure 5: Enthusiasm for incentives by time (in months) as a customer (CDC, 2020)



3.4.2 Building assumptions towards e-waste return incentives in displacement settings

The analysis conducted on each part of a collection and recycling mechanism demonstrates not one clear path, but an array of possible solutions, all feasible in theory. Among these options, the choice will depend on the following:

- The strategic priorities of the stakeholders involved (UNHCR, GIZ, Ugandan authorities);
- The logical continuity between the different parts of the overall plan;
- The specificities of each location.

As a consequence, there will not be a one-size-fits-all, ready-to-replicate solution, and we do not have all the cards in our hands to determine with certainty which options would be the most appropriate even in the case of the pilot project – the upcoming field mission will greatly help closing this gap.

Nevertheless, we have devised a business scenario for the realisation of the pilot project by choosing the options we deemed the most appropriate to its specific situation. This scenario is succinctly described in part 5.3, after formulating our general recommendations.

4 Actionable recommendations

Based on this analysis of the legal framework, the EPR system, the EEE flows, the e-waste disposal practices, the stakeholder mapping and the data from the case study in Rhino camp settlement, a set of recommendations has been designed along 3 themes:

- Improving legislation, regulation and enforcement,
- Setting up a global UNHCR e-waste management strategy, and
- Managing e-waste in displacement settings through an EPR-style approach;

Each recommendation was declined into potential actions to be taken, primarily by UNHCR or GIZ, in order to improve e-waste situation in settlements.

4.1 Recommendations to improve the legislation, regulations and enforcement

A set of recommendations has been designed aiming at improving the legislation, regulations and enforcement regarding e-waste in the target countries.

4.1.1 Advocate for the development of a legal framework regarding e-waste in each country

A clear, consistent and well-enforced WEEE regulatory framework, complete with a financial mechanism, is a solid, complete and durable solution the e-waste problem, in displacements settings or elsewhere, as is the case for many other types of waste. Therefore active stakeholders willing to make a difference in that field should have this as a long-term goal and put some efforts into advocacy.

Based on the analysis of the e-waste legislative framework in Kenya, Ethiopia and Uganda, it has been made clear that there is a need for Governments to persevere in developing and improving consistent legal frameworks regarding e-waste.

In particular, Kenya needs to finalize the 2013 and 2020 draft Environmental Management and Co-Ordination E-waste Regulations as they have a lot of potential in regards of e-waste management.

The interviews with local stakeholders also pointed out the important role played by the informal market. This is partially due to a lack of legislation and/or lack of enforcement. Thus, it is recommended to tackle this issue by developing legislation that will target free-riders and develop enforcement methods.

In that context, both UNHCR and GIZ should take action, depending on their respective positions and links with the relevant institutions.

Action 1: UNHCR should target and approach relevant government institutions in order to initiate discussions on the topic of e-waste management, starting with the context of displacement settings but highlighting the need for policy making at the national level. If UNHCR is not in direct relationship with the relevant institutions, it can go through other UN branches which may be better positioned (UNEP, UNIDO, ITU, UNDP).

Action 2: GIZ should directly approach the relevant government institutions to share knowledge and sensitize on e-waste. Supporting countries in the policy development process like happened in the past at East African level through the GIZ Global Expert pool project could enable further progresses.

4.1.2 Advocate e-waste issues to the local authorities and the need for legal framework

Policymaking is a complex process that heavily relies on the relationships between the institutions involved and their respective focal points. In that regard, each country has its own unique and complex institutional landscape, making a one-size-fits-all approach inappropriate. In that situation, our advice is to raise awareness with other institutions than the primary target. This will add momentum to the advocacy and potentially trigger some constructive dynamics we could not possibly have planned for, for instance through personal relationships or seemingly unrelated projects.

In the case of displacement settings, the most obvious secondary targets are the regional and local authorities, which are close to the field, with whom UNHCR and GIZ may have ongoing contacts and which may help moving the topic forward in the central administrations.

Action 1: Both UNHCR and GIZ should initiate discussions about e-waste issues to the local authorities they have access to, in order to increase their awareness of the issue.

4.1.3 Advocate for the need to increase product warranty length from producers/ importers.

As demonstrated by the previous analysis, products most commonly sold (OGS radio and OGS torch) are also the most broken in people's home, probably due to weak components and short warranty. However, cheap and short-term warranty exacerbates the e-waste issue and provides a perfect storm for creating a stockpile of low-value e-waste in people's home. To prevent this, UNHCR could require in its internal policy that all e-product providers (whether producer or importer) provide a minimum of 3 years warranty period. The latter would incentivize the e-product provider to improve products quality and would thus increase the value in repair of the products, and hence decrease the amount of product becoming waste.

Action 1: UNHCR: include warranty length as a criteria in procurement tenders for EEE and OGS devices.

Action 2: Service integrator (see 4.3): modulate the fees according to warranty length.

4.2 Recommendations for a global UNHCR e-waste management strategy

UNHCR has the opportunity to improve the e-waste management situation in displacement settings by developing its own strategy independently from the national or international legislation. Below is a set of recommendations for the development of a global UNHCR e-waste management strategy.

Formulating recommendations of global scope is difficult as the choice of a strategy among many possible alternatives is highly context dependent. Whatever the settings, the main objectives must remain (i) to dispose of the e-waste generated in the most virtuous way possible and (ii) to avoid, at all costs, any impact of toxic e-waste chemicals on human health and the environment.

Although international-standard recycling may not be realistically available everywhere, significant improvements are usually achievable in a simple, realistic manner. The overall goal is to climb up the following pyramid towards more virtuous practices – starting, in many cases, at the bottom – considering that the two bottom rows are not compatible with objective number 2 above.

4.2.1 Take a pledge setting strategic priorities along with core objectives

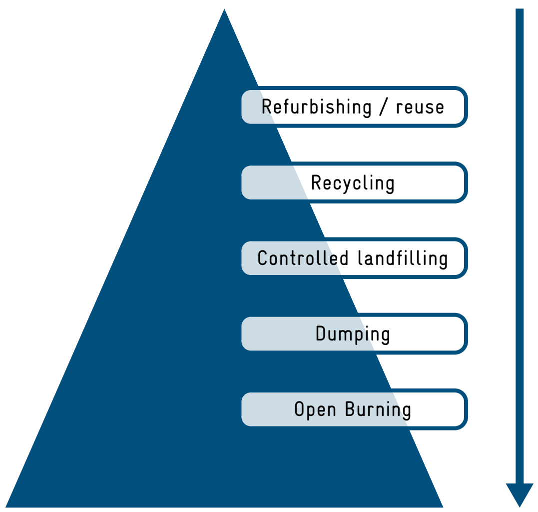
A strategy is a means designed to reach a goal. Therefore, the first step should be to define a desired situation and state this as a goal for the institution. This can be achieved through taking a pledge. The pledge should integrate the role of the UNHCR at the global scale, and also integrate the need to be declined and adapted to local contexts. UNHCR should specify the time required to convert the pledge into strategies and budgeted action plans at national and local scale.

Upon defining these strategic priorities along with the overall objectives, UNHCR should firmly commit to them through a clear, written decision taken at top international level, to be applied and implemented under the defined conditions by all offices and services.

Action 1: UNHCR: identify e-waste as an issue, define a global goal and commit to it publicly.

Action 2: GIZ: provide technical support to UNHCR to assess the global situation and define a suitable target.

Figure 6: Waste disposal hierarchy (top: most preferred – bottom: least preferred)



4.2.2 Join forces with other UN Agencies active in E-waste Management Sector

Gathering support in an endeavour is a good way to guarantee some results. UNHCR is a part of the UN ecosystem where many e-waste initiatives already exist, led by many other branches. These are centralized in a global initiative led by the UN Environment Management Group called the UN system wide response for tackling e-waste. Our advice is for UNHCR to join that initiative in order to benefit from the accumulated knowledge and experience of other UN branches.

Action 1: UNHCR: join the UN system wide response for tackling e-waste.

4.2.3 Raise awareness (internally and externally)

Unsurprisingly, awareness of the dangers of e-waste appears very low among Persons Of Concerns. In order to kindle a change of behaviour and improve adoption of best practices such as waste segregation, UNHCR should run awareness campaigns regarding the danger that e-waste represents to health and to the environment. This can be done through the operational WASH, health and environment, and education partners in the settlements with the means deemed most effective. This action would also have a strong dissemination power as the best practices in relation to e-waste management would be exported by people leaving the settlement.

Also unsurprisingly, e-waste being completely outside the core topics of action of UNHCR, some internal work is needed to improve knowledge and expertise of UNHCR staff.

Action 1: UNHCR: carry out awareness raising campaigns in offices and settlements.

Action 2: GIZ: train UNHCR on e-waste (ex: webinars, workshops)

4.2.4 Convert the global e-waste pledge at national and local scale

After clearly committing to a goal and improving internal knowledge, the following part should be to decline that goal at national, then at local level. The end result should be that each individual office has set up an action plan with timelines and budgets, adapted to the local conditions, in order to reach the general goal as declined by the relevant country headquarters.

Action 1: UNHCR: Identify the local context by gathering information on the legislative framework, the stakeholder involvement, the EEE and WEEE flows in the settlement. Depending on the level of legislation, different paths of actions can be taken by UNHCR:

- If legislation exists and is enforced: ensure compliance and traceability of e-waste management in settlements.
- If legislation exists but not enforced or not enough: UNHCR needs to put in place enforcement measure to ensure compliance in settlements, through local authorities lobbying, or alone.
- If insufficient legislation: need to put in place a complementary system to have an e-waste management system at HCR infrastructure and UNHCR administrated settlement level based on an EPR approach (see next chapter)

4.3 Recommendations in displacement settings based on an EPR approach

We expect that in most cases the local regulatory framework on e-waste will be found to be generally insufficient. UNHCR will therefore have to devise and implement its own mechanism for e-waste collection and recycling at settlement/camp level, while making sure the system is compliant to the existing regulations.

4.3.1 Evaluate the feasibility of the EPR-based project (as described in the following recommendations) with the relevant local and/or national authorities.

UNHCR should first check with the relevant authorities the feasibility of putting in place the system at settlement level. This will enable UNHCR to potentially adapt it to the current context and also to be aligned with the current measures taken by the local authorities.

Action 1: UNHCR: contact relevant authorities in charge of administrating the settlements to present the EPR approach and see whether it needs adaptation.

Action 2: Put in place or improve the monitoring mechanisms to measure the volumes of EEE or WEEE entering or inside the settlement and use the results to design or improve the monitoring system.

4.3.2 Select a single organization responsible for the implementation of a centralized system for collection and recycling

Organise a tender to select one organization responsible for the management of the e-waste. These may include organisations that are already involved in e-products in ESDS locations (e.g. Oxfam).

Action 1: UNHCR + GIZ: Define the role and tasks of the service integrator in charge of operationalizing the collection and recycling mechanism, run a tender to select entity.

Action 2: GIZ: Train the service integrator on e-waste and the precautions to be taken. (only if needed, i.e. in case the entity lacks specific e-waste expertise)

4.3.3 Put in place a financial mechanism to ensure that the costs are paid by the manufacturer/producer/importers

Action 1: UNHCR: Estimate the costs of collection and treatment, create a fee grid, ensure all organisations that bring EEE inside the settlement pay their fee

4.3.4 Ensure a viable and efficient collection system

Action 1: Service integrator + UNHCR: ensure WEEE collection points are made widely accessible across the settlement and there is a centralised depot location where all the collected WEEE is redirected to. UNHCR should also update the relevant guidelines for organisations to separate their waste.

Action 2: Service integrator + GIZ: Provide incentives for people to return e-waste to energy kiosk. An appropriate incentive system to encourage voluntary deposit of WEEE by population should be selected based on the results from a local survey and its implementation. If there are energy kiosk in the settlement, incentivize consumers to return e-waste to the energy kiosk.

Table 11: Summary of all the recommendations

THEME	RECOMMENDATIONS	Actions by UNHCR	Actions by GIZ
Legislation & Regulation	Advocate for the development of a legal framework regarding e-waste in each country	✓	✓
	Advocate e-waste issues to the local authorities and the need for legal framework	✓	
	Advocate for the need to increase product warranty length from producers/importers.	✓	
Global UNHCR e-waste strategy	Take a pledge setting strategic priorities along with core objectives	✓	✓
	Join forces with other UN Agencies active in E-waste Management Sector	✓	
	Raise awareness (internally and externally)	✓	✓
	Convert the global e-waste pledge at national and local scale	✓	
Displacement Settings and EPR approach	Evaluate the feasibility of the EPR project (as described in the following recommendations) with the relevant local and/or national authorities.	✓	
	Select a single organization responsible for the implementation of a centralized system for collection and recycling	✓	✓
	Put in place a financial mechanism to ensure that the costs are paid by the manufacturer/ producer/importer	✓	
	Ensure a viable and efficient collection system	✓	✓

4.4 Pilot project: elements of a business scenario

The gathered information and conducted analyses make it possible to define the outline of an e-waste collection & recycling scenario in the context of the pilot project in Rhino Camp Refugee Settlement, in a fairly simple, concrete and action-oriented manner. This outline scenario is purposely described in a broad manner and could be refined by taking advantage of a future field mission.

Stakeholders

- **Supervisory body**: UNHCR and the Prime Minister's Office create a joint task force in charge of supervising all activities pertaining to e-waste management inside the settlement. Other entities can be included in that body if deemed appropriate (WASH IPs, local/county representatives …). It is the highest deciding body in the system.
- **Service Integrator**: through a tender, an organisation is selected to take on the role of Service Integrator on a non-profit basis, in charge to coordinate the operational and financial mechanisms (a role usually assumed by PROs in classic national-scale EPR schemes). The Service Integrator collects fees from producers, manages the collection and recycling system for existing as well as historical e-waste, and periodically audits the various stakeholders involved such as producers or waste operators. Its goals are to make sure that all e-waste is recycled properly and that the operational stakeholders respect their duties and commitments.
- **Waste Operator**: Through a tender, a one-year contract is signed with a compliant recycling company, which comes to take the waste for a predefined price whenever the warehouse is full. The tender needs to be open to candidates from outside Uganda. The offer will include a predefined price per weight for the period as well strong guarantees of compliance and traceability with conditions and methods of regular audits.
- **EEE / Off-Grid Solar Distributors**: all stakeholders introducing EEE in the settlement for distribution purposes (including UNHCR and its Implementing Partners) must both report the volumes of EEE being put on the market to the Service Integrator, and pay a proportionate fee to the Service Integrator in order to cover the costs of running the collection and recycling system.

Operational mechanism

Towards individuals, fixed collection points for e-waste are established by the Service Integrator throughout the settlement, possibly relying on existing infrastructure such as waste banks or energy kiosks in order to mutualise costs, where incentives are distributed to individuals in exchange for e-waste (data suggests distributing small products for free works best).

Towards organisations, the Service Integrator directly addresses them in order to ensure that e-waste is segregated in separate containers. The Service Integrator offers in exchange a free service of e-waste collection when the dedicated container is full.

WEEE from households and organisations is periodically moved to a single warehouse at least the size of a shipping container, which concentrates e-waste from the whole settlement. When enough e-waste has been collected in the warehouse, the contracted Waste Operator is contacted to remove it.

Financial mechanism

The overall costs of the mechanism, including the collection and recycling operations but also the operating costs of the Service Integrator, are estimated based on the present study as well as other relevant sources and data gathered from the field (notable estimates of the amount of WEEE to be treated). Quantities of EEE put on market are also estimated, based on which a fee grid is calculated to cover the necessary costs including those of managing the historical waste.

All EEE distributors entering the settlement are made to declare the volumes of EEE introduced and to pay the corresponding fee from the established grid in order to cover the costs of collection and recycling. Costs for collection and recycling have been estimated at $ 1.49 per kg. The fee also needs to cover the costs of operation of the PRO itself, which needs to be defined in some detail before attaching a price to it. In order to account for a part of historical e-waste that will be collected at the beginning, the fee amount should comprise a security margin that can be adjusted with time and returns of experience. Overall, $ 2.00 per kg of waste seems a reasonable estimate in light of the information currently available. It is unfortunately impossible to formulate overall budget estimates for the operation of this pilot or a period of one year with reasonable precision at this stage, considering that no accurate information is available on quantities of e-waste.

The gathered fee amounts then pays for the collection mechanism and incentives, the service of the Waste Operator as well as the activities of the Service Integrator.

Enforcement and control

In order for reporting and paying obligations to be endorsed in written form by the EEE distributors, it is possible to integrate this as a requirement in previously existing compulsory formalities – namely, in this case, to the MoUs that the distributors must sign with the OPM in order to carry out any kind of commercial activity inside the settlement. The distributors' compliance and the level of free-riding, as well as the recycler's compliance, are controlled by the PRO. Regarding the Waste Operator, the standards it must comply to need to be defined in the terms of reference of the selection tender along with modalities of audit by the Service Integrator.

Replication

The core of this scenario is quite easily replicable in other displacement settings. Although some necessary adaptations must be made to the local contexts, such as the quantities and nature of the EEE/WEEE flows, the status of the regulatory framework, the presence or absence of government supervision of the settlements, EEE distributors and compliant recyclers. The best-working scenarios are the ones that are well adapted to the local specificities. Therefore, applying this scenario to any other settings should start with a feasibility study seeking to identify the adaptations most relevant to conduct.

5 Conclusion

Access to affordable, renewable energy sources in displacement settings raises the issue of electronic waste management. Indeed, waste management is generally poorly managed in these settings, and electronic equipment introduce a highly toxic type of waste which threatens the health and environment of people within the concerned camps/settlements, primarily the Persons of Concern. Therefore, a reflection aiming to design and implement a mechanism for the collection and recycling of electronic waste in displacement settings is justified.

In the present study, we have considered the situation under various angles.

A study of the regulatory landscape related to e-waste in the three targeted countries – Ethiopia, Kenya, Uganda – reveals a variable but generally insufficient regulatory coverage, with the impossibility to rely on national-scale mechanisms, thus highlighting the need to develop original solutions based on the local situations.

A general study of Extended Producer Responsibility mechanisms, coupled with a stakeholder analysis, set the base to reflect on possible adaptations of known solutions.

These reflections were carried on to the next level in the detailed, action-oriented study of one carefully selected pilot location. Although the current global context prevented us from conducting any activities directly on the field, an array of targeted interviews and detailed existing studies which provided costing and behavioural data in the area allowed us to identify the main opportunities and barriers to the development of a business-driven scenario.

This in turn let us formulate a number of recommendations coupled with suggestions of actions to reach three main objectives:

- Stimulating the development of an appropriate regulatory framework,
- Building a global e-waste management strategy for UNHCR,
- Formulating concrete propositions for e-waste management in displacement settings, relying on tailored adaptations of EPR mechanisms.

Finally, all of these were put together in a brief description of the possible outlines of a scenario which could plausibly result from the previous investigations.

6 Annexes

Table 12: questions and answers from the presentation webinar on Nov 3rd

Q1	Does this system apply only to the newly manufactured products? what about older products?
A1	EPR fees are collected for product newly put on market only, but collection includes historical waste. Therefore the fees and logistics can/should be adjusted to take the additional recycling costs from historical waste into account if this is the strategy.
Q2	If it is possible to have for the distributed ones how can you put the importers in to a commitment or agreement.
A2	Usually an EPR system is put into place by regulation, not by agreement. If nothing is legally binding then agreement is the only way and can only be achieved on a voluntary - and therefore probably incomplete - basis. Displacement settings don't have legislation of their own, but obligations can still be enforced with some creativity, for instance through existing regulations or procurement rules
Q3	Do the international conventions work to regulate the quality of the products (fake and genuine goods)?
A3	Not really - applicable international conventions (Basel and Stockholm) mainly deal with waste, not products
Q4	Which EPR implementation strategy will work for these countries? Regulation or producers? what is your recommendation?
A4	Those countries have draft policies (not legally binding) or bills (which will be legally binding). The best strategy is to aim for legally binding regulations to ensure a level playing field for manufacturers/producers. In the meantime, some results can already be achieved on a voluntary basis.
Q5	How is the EPR applicable to none producing countries?
A5	EPR applies to producers/manufacturers/importers that are introducing in a country the goods. The act of placing a product on a market is not done by a country but by an organisation, therefore the latter is responsible, not the former.
Q6	While presenting the supply chain I feel the study has already considered the formal supply line but considering the reality on the ground the informal market chain is the most challenging not only in creating E-Wastes in the environment but also for the E-waste management specially because of lack of clear information. What is the suggestion of the study for the problem?
A6	This is a general problem with enforcement which is 100% related to the level playing field. if you have legal obligation (EPR bill implemented) you have to enforce it, otherwise only few companies will be paying. You can have, at least in displacement settings for the volumes of products purchased by UNHCR or other donors, the companies supplying to pay upfront, or be contractually obliged to take back in the future.
Q7	Is there any control mechanism for producers to follow their EP responsibility? If so: how is enforcement being done?
A7	Usually producers are registering with authorities to prove they are compliant. In the case of the pilot project, producers could commit to reporting their volumes and pay the corresponding fees as part of their MOU with the Prime Minister Office. After that you would just need to inspect some shipments from time to time.
Q8	How does e-waste that comes into a country through not gazetted channels (Counterfeits) get computed into the total waste volumes, since they are not regulated through EPR systems?
A8	Counterfeited or smuggled are not counted as import. but they will pop up as waste anyway. The basis of EPR is that those companies visible by authorities are paying for the waste arising. This is why is important the enforcement. Smuggling is a bigger problem. As include VAT evasion, custom duties, tax evasion etc.
Q9	Transporting WEEE is quite challenging task. As you mentioned some companies are available in Kenya and Rwanda to recycle the e-waste. Have you seen/tried to see some companies found within the waste producing countries? In Ethiopia there are some battery producing companies even if they are not state-of-art.
A9	There are good companies in Kenya and Rwanda. One was set-up in Ethiopia in Akaki and managed by government right no, but isn't very active.

Q10	What are the requirements for establishing pilots in terms of regulations and technical feasibility?
A10	You can set-up a pilot only making sure collection is done according to local waste management rules the only issue is clarify where the funding for waste management is coming from: 1) UNCHR budget or 2) charge companies introducing the appliances into the camps. In our study we suggest the latter. Once the funding is secured, the logistics are fairly easier to arrange, even considering transboundary shipment as some companies know how to handle it.
Q11	Has waste or e-waste prevention been within the scope of the study? E.g. a prequalification requirement for suppliers of the solar products, with repairability or access to spare parts as a criteria? To my extend of knowledge some off-grid solar companies have local assembly lines in the sub-region and could work on it.
A11	Not really. But this could be added in the procurement part. We had the example of preferring companies with longer warranty (which can be used a proxy for the quality). You have more freedom using the procurement leverages, especially in absence of legal mandatory obligations for producers. Also GIZ is currently doing some work on it and is going to have a study/conceptual work commissioned on E-Waste reduction (O+M, repair, warranties etc.)
Q12	Extension of warranty lengths has been mentioned as one of the recommendations: can you please remind us what sort of warranty lengths are proposed in these settings by solar companies?
A12	At the moment they mostly revolve around 2 years, but efforts are being made by solar companies in order to aim for 3 years or more.
Q13	Do we know the cost benefit balance of recycling e-waste? I mean, is it possible for a producer/distributor company to cover its operating costs (e-waste collection) with the cost of selling this e-waste to recycling company (like enviroserve for example) ?
A13	For an e-waste dismantler, making ends meet usually involves on of the following : receiving subsidies, having sub-standard practices such as burning the waste or underpaying its staff, or cherry-picking the most valuable fractions only while avoiding to manage the rest. No one has proved it could be done otherwise in Africa so far, although some experiences are in progress. The subsidies allowed by the EPR system allow to level the playing field and give compliant recyclers some compensation for the pains they take to recycle e-waste properly.

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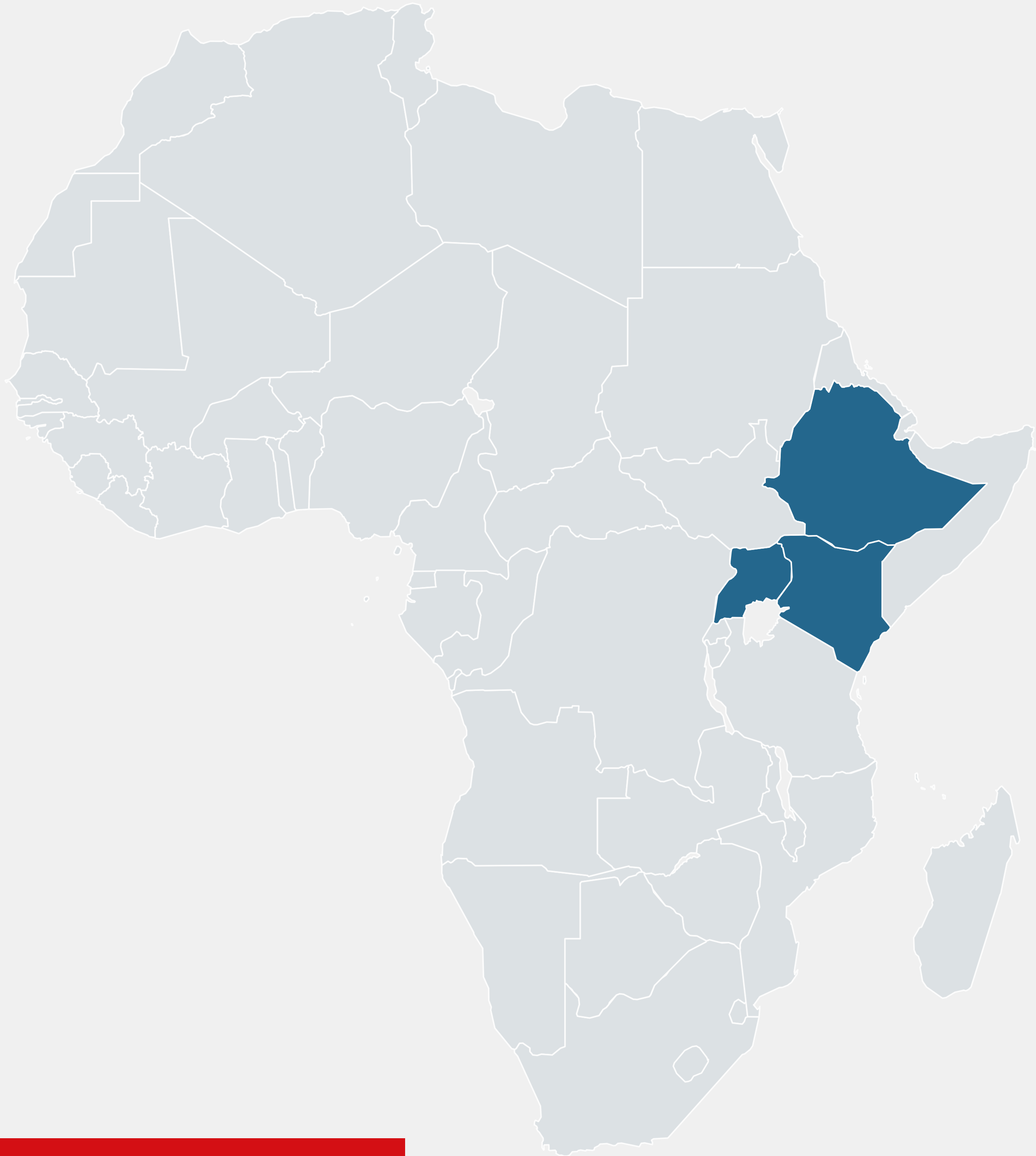

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