EEP Africa

NORDIC DEVELOPMENT FUND

Solar E-Waste Management Innovations in Sub-Saharan Africa

Webinar

Tuesday 26 May 2020

16:00 – 17:30 (East African time)

In Partnership With clasp

SPEAKERS

EEP Africa and Our Approach to Environmental & Social Risks

Fred Eklund, Portfolio Coordinator, EEP Africa

Clasp and the Global LEAP Awards Solar E-Waste Challenge

Monica Wambui, Clean Energy Access Associate, CLASP

Rebecca Rhodes, Project Manager, GOGLA

Hannah Blair, Communications Associate, CLASP

Declan Murray, Independent Consultant

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Introduction to EEP Africa

Webinar on Solar E-Waste Management Innovations in Sub-Saharan Africa

26 May 2020

EEP AFRICA – QUICK FACTS

- Multi-donor, blended finance trust fund
- Current donors: Austria, Finland, NDF
- Managed by NDF and integrated with the NDF climate finance portfolio
- Early stage grant and catalytic loan financing for **innovative clean energy** projects
- Focus area: Southern and East Africa

AUSTRIAN DEVELOPMENT AGENCY

Ministry for Foreign Affairs of Finland

NDF NORDIC DEVELOPMENT FUND

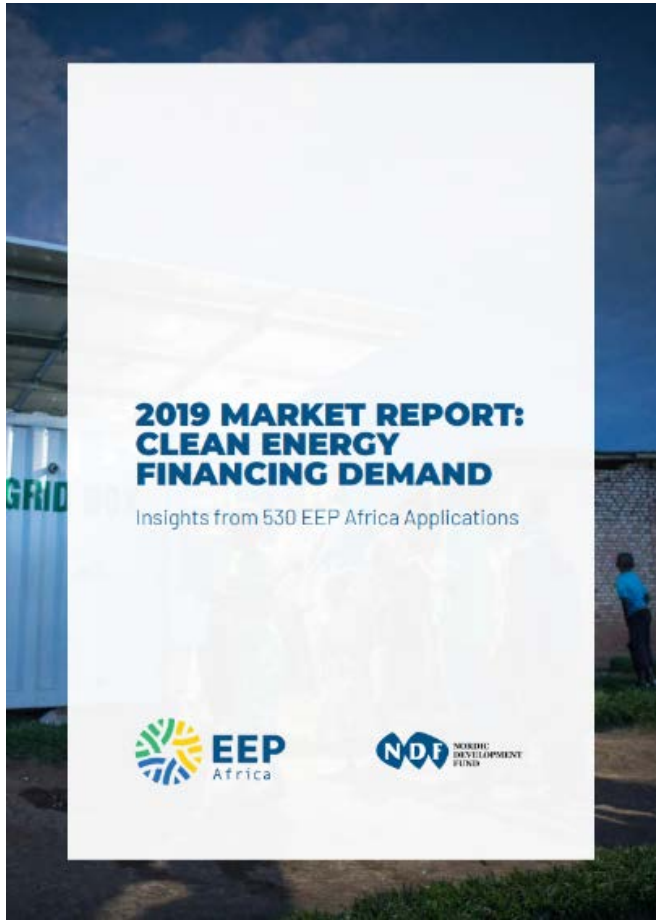
EEP AFRICA PILLARS

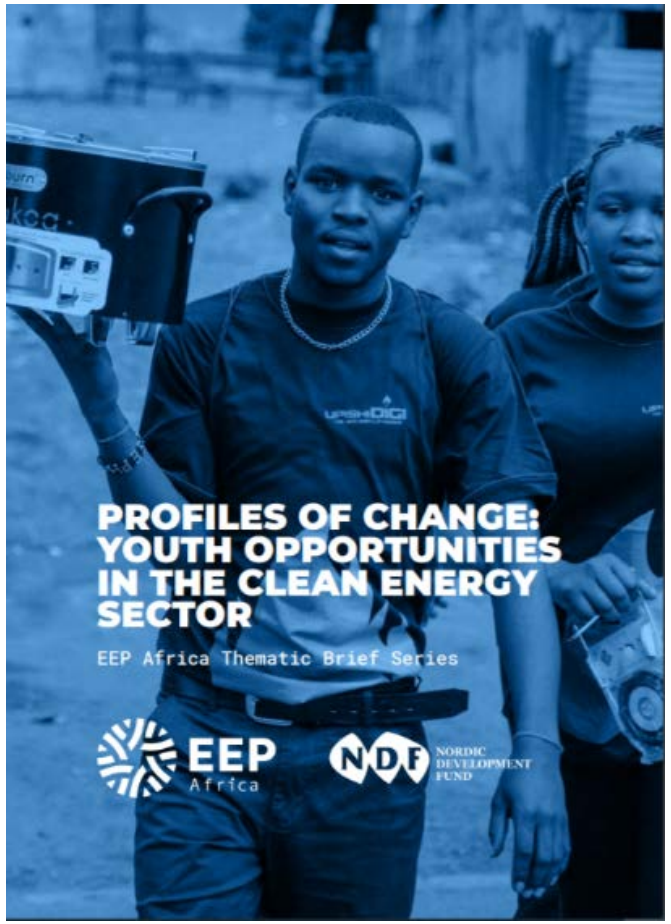
Clean Energy Financing

Investment Facilitation & Business Development

Knowledge, Policy & Partnerships

KNOWLEDGE, POLICY AND PARTNERSHIPS

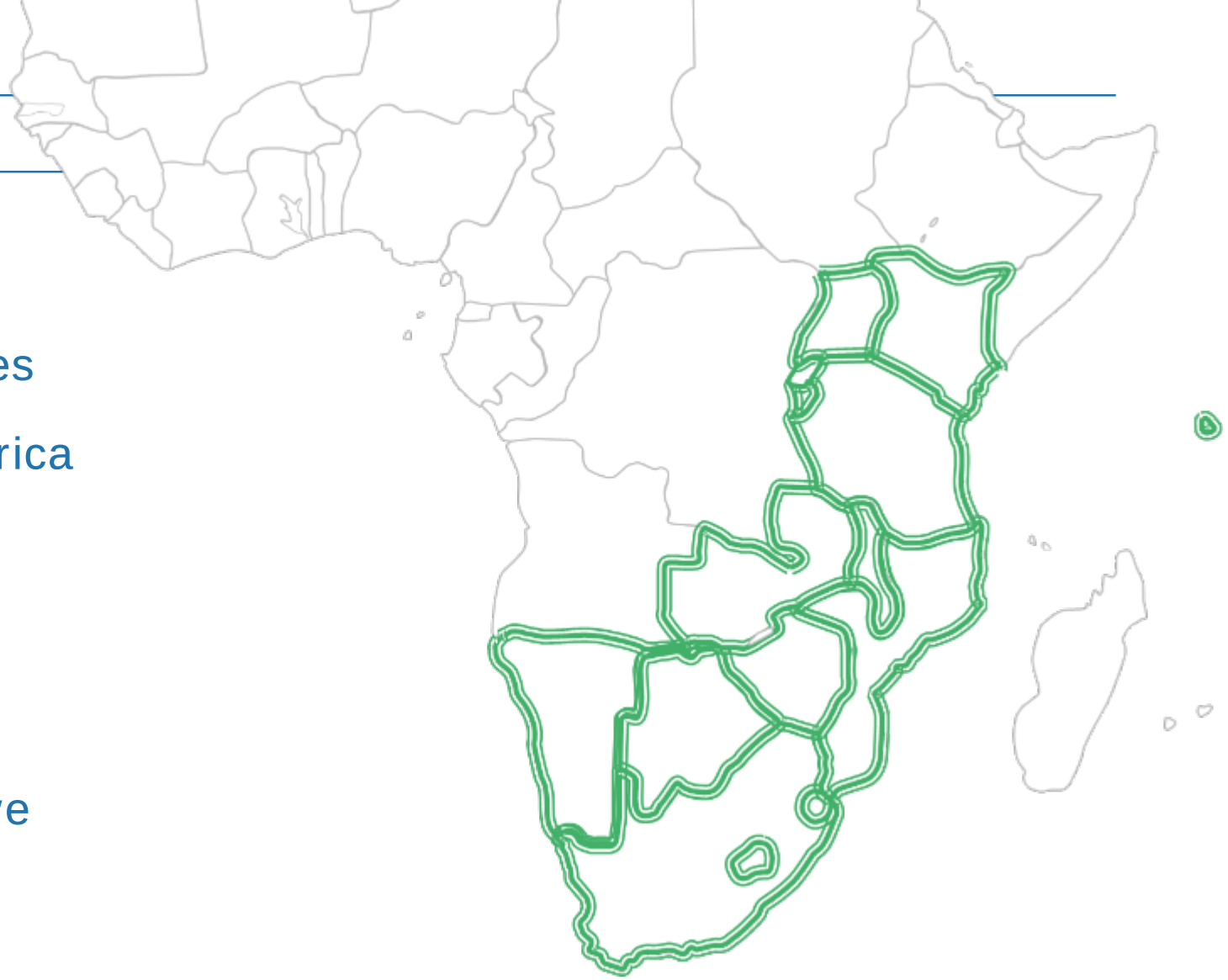




FOCUS COUNTRIES

1. Botswana
2. Burundi
3. Eswatini
4. Kenya
5. Lesotho
6. Malawi
7. Mozambique
8. Namibia
9. Rwanda
10. Seychelles
11. South Africa
12. Tanzania
13. Uganda
14. Zambia
15. Zimbabwe

Regional



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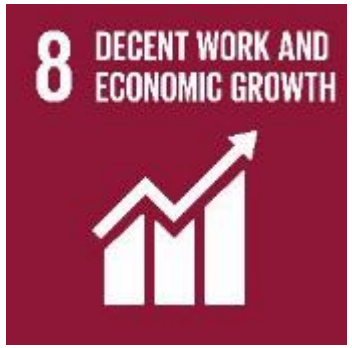
Clean energy and energy efficiency

Solar PV
Biogas and liquid biofuels
Cookstoves and solid biomass
Hydro and wind power
Energy efficiency
Waste-to-energy
Hybrid solutions

PORTFOLIO RESULTS since 2010

Annual savings on energy-related expenditure	Women in leadership	People with enhanced energy access	Direct job creation	GHG emissions reduced or avoided
93 million EUR	40 %	5 million	8,750	1.4 million tCO_2e



Environmental & Social Risk Mitigation

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E&S RISK MONITORING

- Business development support to reduce, mitigate or avoid risks
- Knowledge exchange among project developers and other stakeholders on mitigation measures

Application | **Implementation** | **M&E**

- Identification and assessment of E&S risk factors in proposals
- Support throughout the contracting process in developing mitigation
- Contract clauses committing project developers to address risk factors

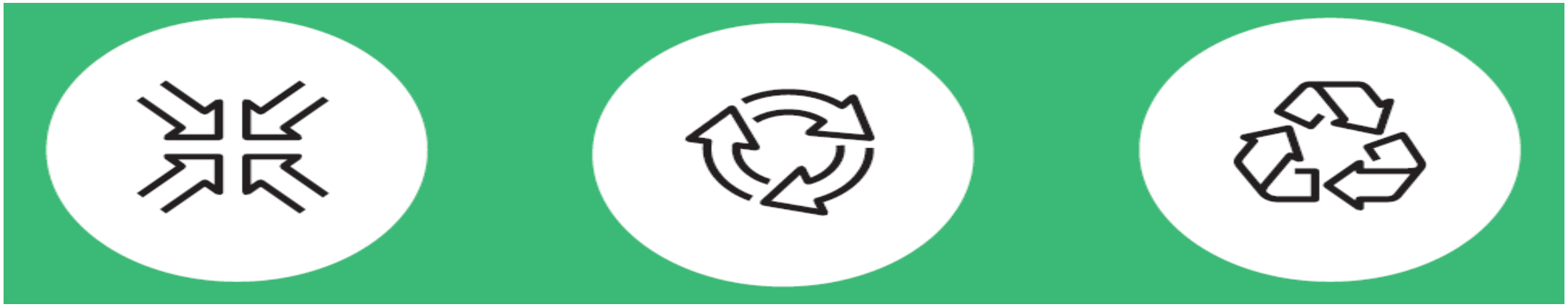
- Regular reporting on risk status and mitigation measures
- Continuous monitoring of project risks by the EEP team
- Site visit verification of risks and results

POLICIES & GUIDELINES

All projects in the EEP Africa portfolio must follow the policies and guidelines as outlined in:

- **NDF Environmental & Social Policy and Guidelines**
- Call for Proposal Application Guidelines
- Administrative Manual for Project Implementation
- NDF Policy on Anticorruption and Integrity

E-WASTE MANAGEMENT IN THE PORTFOLIO



REDUCE

Jaza Energy has moved from lead acid to Lithium-ion batteries, increasing batter lifetime up to 6 years and reducing the number of batteries used and replaced.

REUSE

REDAVIA is partnering with equipment suppliers in Tanzania to establish an exchange scheme for diesel-powered equipment, enabling suppliers to redeploy old equipment.

RECYCLE

Zonful is establishing a recycling facility in Zimbabwe. A feasibility study is being initiated that will assess the value chain and volume of batteries that could be recycled.

EEP Africa Call for Proposals

Clean Energy Powering Green Growth

EEP Africa

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CLEAN ENERGY POWERING GREEN GROWTH

Clean Energy for Productive Use

8 DECENT WORK AND ECONOMIC GROWTH

Clean Energy in Circular Economy

Increased economic activity & job creation

OVERVIEW OF THE CALL

- **357** total applications submitted by 10 March 2020
- **14** countries of implementation
- **41** countries of applicants; **79%** registered in region
- **39%** women-led companies or social enterprises
- **€345,000** average grant request (30% co-financing required)

Types of projects:

- **57%** pilot/demonstration stage; **23%** scale-up
- **43%** solar PV; **13%** waste-to-energy; and **6%** energy efficiency
- **50%** stand-alone systems; **27%** mini-grids

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New Innovative Approaches

- Energy as a service to agro-processing
- Business models that include the ability for customers to trade energy or earn credits based on use (implemented through block chain technology)
- Electric vehicles with batteries charged using energy from mini-grids; 3 wheelers, electric fishing boats and e-motorcycles with milk freezer boxes for the dairy sector
- Dynamic business models that are scalable based on demand (smart mini-grids and scalable SHS)
- The call attracted some “game changing” pilot projects such as battery revitalization, microgrid SHS, demand side management through internet of things approaches.

Thank you!

Learn more:

https://eepafrica.org/

Contact us at:

info@eepafrica.org

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Solar E-Waste Management Innovations

EEP Africa Portfolio

Global LEAP Awards Solar E-Waste Challenge Team
26 May 2020

Background

- **Growing market**: In 2018, an estimated 180 million OGS products were sold globally. **2.23 million solar products** sold in East, West & Central Africa in the second half of 2018 (GOGLA).
- **Product lifespan**: expected to be **3 years** for PSPs and **5 years** for SHSs.
- **E-waste quantities**: An estimated **10,000 metric tonnes** will be produced in 2020.
- **Poor data**: Lack of data, especially on non-quality verified products, make estimates unreliable.

Photo source: Fenix

Background

- Sustainable management of solar e-waste is an **emerging priority** for the off-grid sector.
- Recapture & recycling of off-grid solar e-waste is particularly challenging for three reasons
  - Collection
  - Battery Diversity
  - Multiplier Effects
- Efforts remain nascent across sub-Saharan Africa.

Photo source: WeTu Kenya

The Challenges

- **Distribution, maintenance & repair**
  - Replace- lack of spare parts
  - Repair- informal sector
  - Affiliate and non-affiliate products
  - Location of customers
- **Recycling Capacity & Volumes**
  - Insufficient public infrastructure
  - Volumes for profitability
- **Product Design**
  - Multiplier effects
- **Legislation**
  - Most bills still remain in draft and governments lack support for implementation

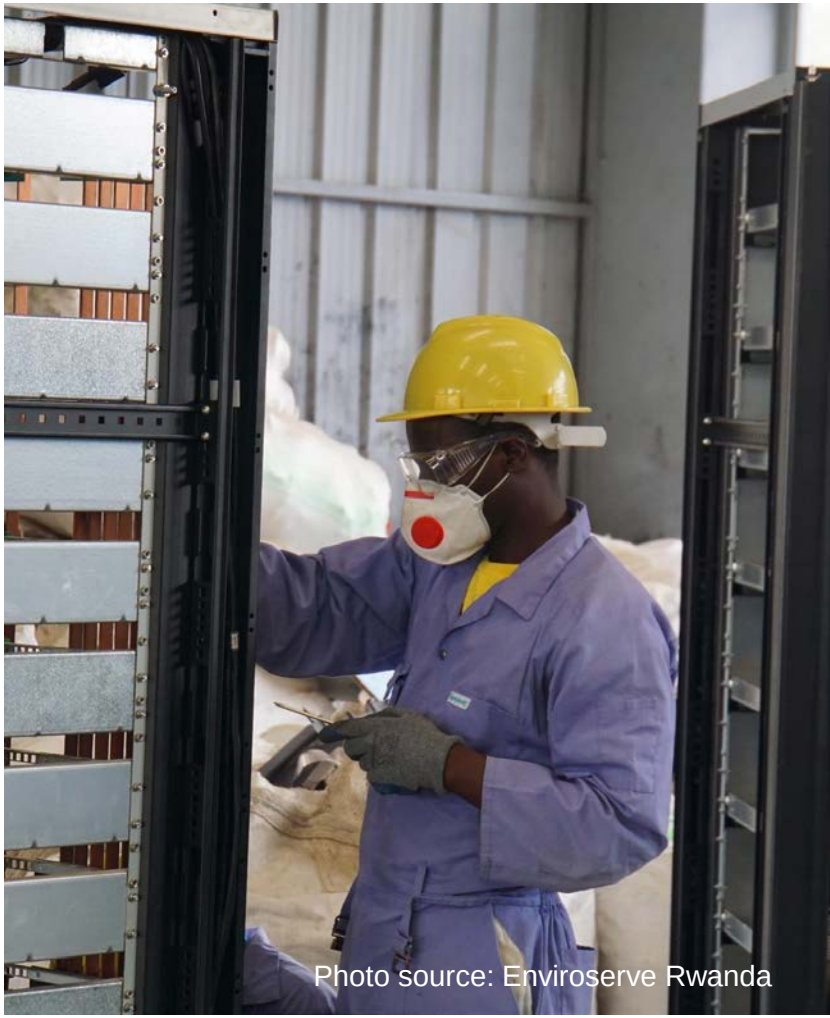


Photo source: Enviroserve Rwanda

The Global LEAP Solar E-Waste Challenge

Supporting innovative approaches to solar e-waste management across sub-Saharan Africa.

- **$2.2 million** made available to support the creation and implementation of innovative sustainable e-waste management solutions
- 1st Round
  - Solutions for takeback, repair and recycling
- 2nd Round
  - R&D focused on improved product design and battery technology

Solar E-Waste Challenge Summary

Round 1

- **8 winners across 5 countries**: Nigeria, Kenya, Uganda, Rwanda & Zambia
  - 3 recyclers and 5 SHS companies

Round 2

- **4 winners across four countries**: Kenya, Tanzania, Benin & Burkina Faso

Take-back and Collection: Overview

Take-back and collection is an integral part of a company's e-waste management strategy to deal with end-of-life (EoL) products.

Supplementary to normal reverse logistics for in-warranty products.

There are several advantages to leveraging the consumer relationship beyond the warranty period:

- Meeting EPR legislation
- Risk mitigation - reduces health hazards and environmental pollution
- Avoids circulation of EoL products with dubious quality repairs
- Improves brand perception and customer retention

Take-back and Collection: Raising Awareness

Lack of consumer awareness about the hazards of e-waste and recommended means of disposal is a **barrier to recovery of e-waste**.

Communication is a central pillar of take-back schemes:

- Messaging should be **clear and concise**
- Focus on **positive messaging** rather than detailing hazards
- Utilise touch points throughout the customer journey
  - Difficult for cash-based sales with one-time transaction
  - PAYGo companies have many more opportunities to connect

Awareness Campaigns

- SMS and radio messaging to reach last-mile communities
- Integration of e-waste messaging with marketing materials
- Clear disposal information on product packaging and at installation
- Collaboration with national campaigns or waste-management facilities

Take-back and Collection: Incentivisation

Incentives required to motivate customers to give up EoL solar products and **overcome barriers such as attachment and perceived value**.

Take-back schemes being piloted have considered the **perceived value of products** in the informal sector, and the **cost of transport** to collection centres.

Discounts on replacement products encourage **customer retention** and maximise the **positive impacts of solar energy**.

Types of incentivisation:

- Discount on new solar product or appliance
- Mobile airtime
- Merchandise
- Agri-inputs


Photo Source SolarAid

Take-back and Collection: External Partnerships

- **Third party services:**
  - E-waste management facilities with collection services in urban or peri-urban hubs
  - Community-based collection points such as schools and filling stations
  - Often mixed-waste collections - **sufficient volumes to reach economy of scale**

Photo Source Enviroserve, Rwanda

Enviroserve, Rwanda

- Community Collection points in every district
- Partnerships with OGS companies in Rwanda:
  - Collections
  - Communication with customers

Take-back and Collection: External Partnerships

- **Informal sector**
  - Many consumers will **first seek to repair or repurpose** a broken electronic product, and will go to the local informal sector
  - **Large footprint** and community network for OGS companies to tap into to **increase take-back and collection volumes**
  - **Requires incentivisation**; financial, training, certification, franchising etc.

Informal Repair & Refuse Sector:

- Subsistence waste collectors / pickers
- Repairers ("*Fundi*") - non-registered workshops or individuals
- Recyclers, typically extracting precious metals through poor, unsafe practices

Photo source: Fenix

Take-back and Collection: Grantee Initiatives

Take-Back:

- d.light
- Fenix
- Sunny Money
- Solibrium
- WeTu

- Mix of own and other products
- IP issues
- Value of incentive

Collection:

- Enviroserve
- WEEE Centre
- Hinckley

- Working in partnership with OGS companies
- Consumer Awareness

Repair and Refurbishment: Overview

- Repair vs. Refurbishment
- Despite Lighting Global & GOGLA requirements for products warranty, **maintenance & repair is limited**
  - Replace rather than repair protocols
  - Limited to urban areas
  - Variability in processes
  - Balance between initial sales & after-sales services
  - Informal repair sector
- Repair/refurbishment are context & product specific
  - PSP vs. SHS lifespan
  - High cost of replacement parts & low revenues


Photo source: Solibrium Solar

Repair & Refurbishment: Opportunities

Opportunities:

- After-sales services increase customer trust in off-grid solar products
- Secondary solar market for solar products
- Further research to better understand product lifespans
- Partnership to outsource repairs


Photo source: D.light

Repair and Refurbishment: Grantee Initiatives

Sunny Money

- Repair manual & step-by-step videos
- Web app to demonstrate most common repairs
- Online marketplace for refurbished components
- Battery replacement

Solibrium

- Take-back/buy-back system for faulty or broken products
- Repair and refurbish these products for resale
- Refurbish components for resale to informal sector

WEEE Centre

- Upskilling the informal sector through trainings on repair

Recycling: Overview

Areas

1. Regulation
2. Economics
3. Capacity

Examples

1. Hinckley Recycling
2. WEEE Centre
3. Enviroserve


Photo source: Enviroserve Rwanda

Recycling: Regulation

Uneven spread and ambiguous status of solar

e.g. Hinckley Recycling

Table 1: Baseline e-waste status in EAC, Ghana and India and implications for Off-Grid Industry[6]

Country	E-Waste legislation	Availability of recycling infrastructure	Off-Grid Products specifically in scope	Betteries in scope	Main EEE in scope (connected SHS)
BUR	First Draft	Fair / Poor	No	No	TV, Radio, Fans, water pumps
KEN	Draft, pending final approval	Fair / Good	Potentially	Yes	TV, Radio, Fans, water pumps
TAN	Expected draft in 2019	Fair / Poor	No	N.A.	N.A.
RWA	Published	Fair / Good	Under discussion (to be in)	Yes	TV, Radio, Fans, water pumps
UGA	No Draft	Poor	No	No	TV, Radio, Fans, water pump
GHA	Published, not enforced	Fair / Good	Yes / Partially	Yes	TV, Radio, Fans, water pumps
IND	Published, not enforced for off-grid solar	Fair / Good	Not in scope	Separate Batteries legislation for LABs	TV, Refrigerator, AC

SOURCE: GOGLA / Sofies, 2017, updated August 2019

Recycling: Economics

It's costly and recyclers need volumes

e.g. WEEE Centre

Table 6 Material composition[18] for representative products and average prices for fractions.

	PC1	PC2	PC4	Market destination	Average price (incl. transport) €/t
Average weight (g)	**150**	**906**	**2,450**		
Steel	20	160		Local	140
Copper			418.6	Local	2.649
Aluminium				Local	615
Plastics				Local	129
Pb Batteries				Overseas	363
LIP Batteries	100	100	100	Overseas	-3.250
PV modules		411	1,180	Overseas	-185
CFL (Hg)	30	30	107	Overseas	-675
LED				Overseas	80
Mixed Plastics (incl. BFR)		205	551.4	Overseas	23
Printed Wiring Boards (PWB)			93	Overseas	500

SOURCE: DFID, 2017

Recycling: Capacity

Absence of controlled facilities on continent so vast majority of processing is carried out by artisans, individually or in groups

e.g. Enviroserve Rwanda

Recycling: Conclusion

- Better to pre-empt legislation
- Expensive
- There is potential to create jobs & economic value in-country

Battery Technology: Introduction

Distinguishing Characteristics

- Battery Diversity: Lead acid & Li-Ion- handled different across their usage life and end of life.
- Weak Link: shortest life span (2-6 yrs). Attributable to poor usage and unoptimised design.
- Pose a negative health & environmental impact.

The Global LEAP Awards team visiting Enviroserve Rwanda's research partner CMU Africa in their solar battery test lab (Kigali, November 2019)

Battery Technology: Grantee Initiatives

Informal Sector Engagement

- Batteries (esp. lead acid), have high scrap value & are often scavenged for sale or reuse
- Informal players have vast last mile presence and access to the end-consumer

Second Battery Life

- 70% usable capacity at EoL
- What are the requirements, challenges and applications?

Battery Management Systems (BMSs)

- Customized BMS will capture salient parameters and offer more precise measures of the State Of Health.


Photo Source: Solaris OffGrid

Battery Technology: Grantee Initiatives

Hinckley

- Informal sector engagement to collect batteries.
- In partnership with CMU plan to build out refurbished Li-Ion battery packs and pilot possible usages such as UPS

Fenix

- Utilize last mile presence to collect e-waste.
- Reach out to their customers in both the rural(agents) and urban peri-urban areas (service centers)
- Collaborate with the scrap collectors/ pilot incentives & identify most optimal


Photo Source: Fenix

Battery Technology: Grantee Initiatives

Acceleron

- Patented refurbished battery packs that are easy to take apart & optimized BMS
- Build out the entire supply chain: battery sourcing & refurbished battery sales.

Lagazel

- Testing refurbished batteries on several applications to be fitted into existing manufacturing lines.
- Adapting of innovative BMS to optimize cell operation in battery pack & effectively ensure service continuity.

M-KOPA Labs

- Build smart algorithms into BMS that to reduce failure and degradation.

Solaris Offgrid

- Ease the replacement of batteries & avoid purchase of new SHS kits.
- Integrate a BMS to allow for the use of different capacity battery packs.

Resources

- Solar E-Waste Market Scoping Report
- Sustainable Solar E-Waste & Battery Technology Report
- Global LEAP Awards Solar E-Waste Project Spotlights
- Global LEAP Awards Additional Resources

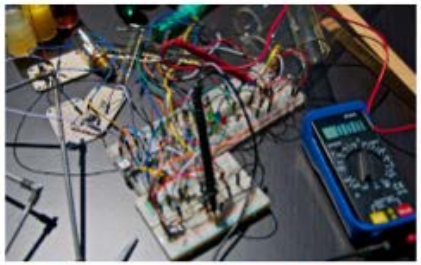
Photo source: Fenix

Resources: E-Waste Toolkit

https://www.gogla.org/e-waste

Introduction to Recycling

Module 1 is a high-level technical understanding of how each component is recycled and where to begin with identifying recycling partners. Learn more



Design for Reduction of E-Waste

Module 2 will focus on waste reduction strategies within the off-grid solar sector, looking at circular design principles and how they can be applied. Learn more

Financials of Solar E-Waste

Module 3 will look at the financials of solar e-waste by breaking down its supply chain, identifying where the costs lie and who is responsible for them. Learn more.

Policy and Regulation

Module 4 of the E-waste toolkit aims to provide a high level introduction to e-waste legislation, existing typologies and their financing mechanisms. Learn more.

E-waste and the Consumer

Module 5 focuses on the consumer experience, awareness and disposal behaviors upon product end-of-life. Learn more

Take-back and Collection

Module 6 of the toolkit focuses on take-back and collection channels, challenges and incentive. Learn more.

The GOGLA e-waste toolkit is being funded by Swedfund. The design and content of the Toolkit is being developed in association with the GOGLA E-waste Working Group.

Photo credits: Jeffrey M. Walcott for GOGLA, various from Unsplash

Opportunities

- Improved products
  - Interoperability
  - Minimum e-waste footprint
- Consumer awareness campaigns
- Collaboration within the off-grid sector
- Extended Producer Responsibility programs
- Government and stakeholder engagement for policy and regulations

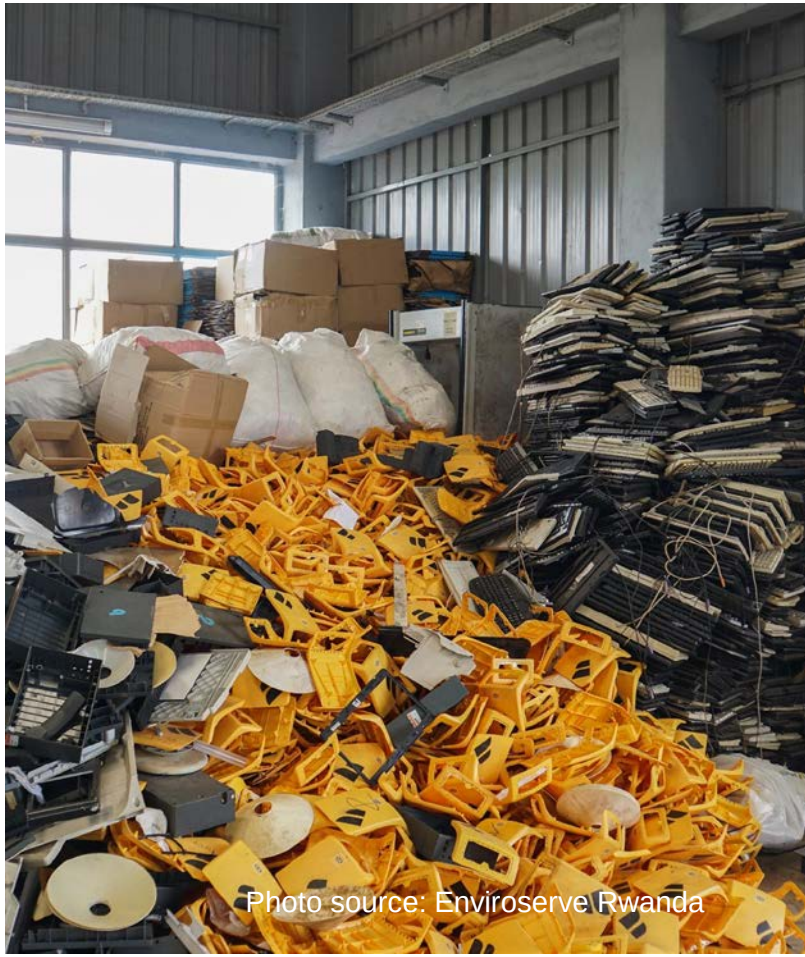


Photo source: Enviroserve Rwanda

Photo Source: WeTu

Thank you!

Learn more at:

https://eepafrica.org/

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Learn more at:

https://clasp.ngo/

https://globalleapawards.org/