



# E-waste Toolkit Module 5&6 Briefing Note



Customer, take-back and collection



## Executive summary

**This Briefing Note gives an overview of the complex relationship between consumers and e-waste, and how off-grid solar companies can design and implement effective take back and collection schemes. Many companies already have return and replacement processes in place to deal with in-warranty products and a growing number are now looking to take on the challenge of end-of-life, out-of-warranty products.**

For off-grid solar products – like other consumer electronics – the journey from consumption to disposal is complex. Repair and reuse can take many forms; component parts may take on different journeys; and customers typically “hibernate” devices after use. Consumers are rarely well-informed of the value and risks of e-waste products at end-of-life or the recommended means of disposal. Further, it is common to develop an emotional attachment to such objects that enter our homes and enrich our lives.

Understanding these complexities can help a company design an effective take-back scheme by tailoring marketing campaigns and incentives. Data shows that trusted off-grid solar brands are in a strong position to influence consumer behaviour at product end-of-life, and there are several benefits to doing so. A tangible starting point for companies introducing a take-back scheme is to incentivise consumers by offering a discount on a new product in return for an old, broken solar product; and with other

companies, establishing collaborative methods to exchange returned products to the original distributor. A mature e-waste ecosystem in off-grid markets also includes third-party waste-management services and informal collection, repair and ‘recycling’. Beyond internal take-back programmes, off-grid companies can look to engage these external actors to develop a holistic e-waste solution.

Take-back and collection is an integral part of a company’s e-waste management strategy and an opportunity to engage new and existing customers and strengthen the brand. It is also a risk mitigation activity; reducing health and environmental issues for consumers and communities, and avoiding brand damage through products entering the informal repair sector and returning to market with dubious quality. By leveraging the consumer relationship beyond the warranty period and encouraging repeat purchases, companies can ensure that the positive impact of access to clean, affordable electricity is maximised.

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# Introduction

**The Global E-Waste Monitor estimates that in 2020, more than 50 million metric tonnes of e-waste will be generated globally<sup>1</sup>. Only 20% of this total is collected and recycled or disposed of appropriately. This Briefing Note explores some of the reasons why this figure is so low, and what off-grid solar companies can do to engage consumers and increase take back and collection of waste products.**

Off-grid solar companies commonly offer product warranties (typically one year for a solar lantern and two years for SHS) and have established operations in place to take-back and repair or replace defects. Consumers have a clear reason to return products while in-warranty. However, the majority of products reach end-of-life (EoL) after their warranty has expired, when a company has no obligation to repair and a consumer has no incentive to return.

Furthermore, the path from product breakdown to disposal is complicated. Studies show that broken solar products do not immediately become electrical 'waste'. Rather, when an off-grid solar product stop working, there are a variety of things people may do with it - including storage, display, repair or repurposing - that are driven by social, cultural and economic factors. Outside of the formal economy, steps can be taken to repair or repurpose a product without input from the original provider. Further to this, consumers are often attached to products on an emotional as well as financial level and may keep a non-functioning product at home for a long time.

Knowledge gaps around consumer behaviour exist even in mature consumer electronics industries. Yet there is an emerging body of research on e-waste and the consumer in the off-grid solar sector that looks at consumer awareness and disposal behaviour, and explores different incentive types and models for take-back schemes.

Though this innovation is still in its infancy in the industry, a few projects, notably funded through the Global LEAP Solar E-waste Challenge, are being piloted with the aim of establishing cost-effective take-back models and help the industry learn more about success factors. GOGLA is working with the Global LEAP projects to capture and share good practice on take-back schemes and plans to publish the findings in early 2021. This Briefing Note offers insights on the relationship between consumers and their off-grid solar products at end-of-life, and details strategies for companies to improve take-back and collection.



# Consumer perspectives and practices with off-grid solar waste

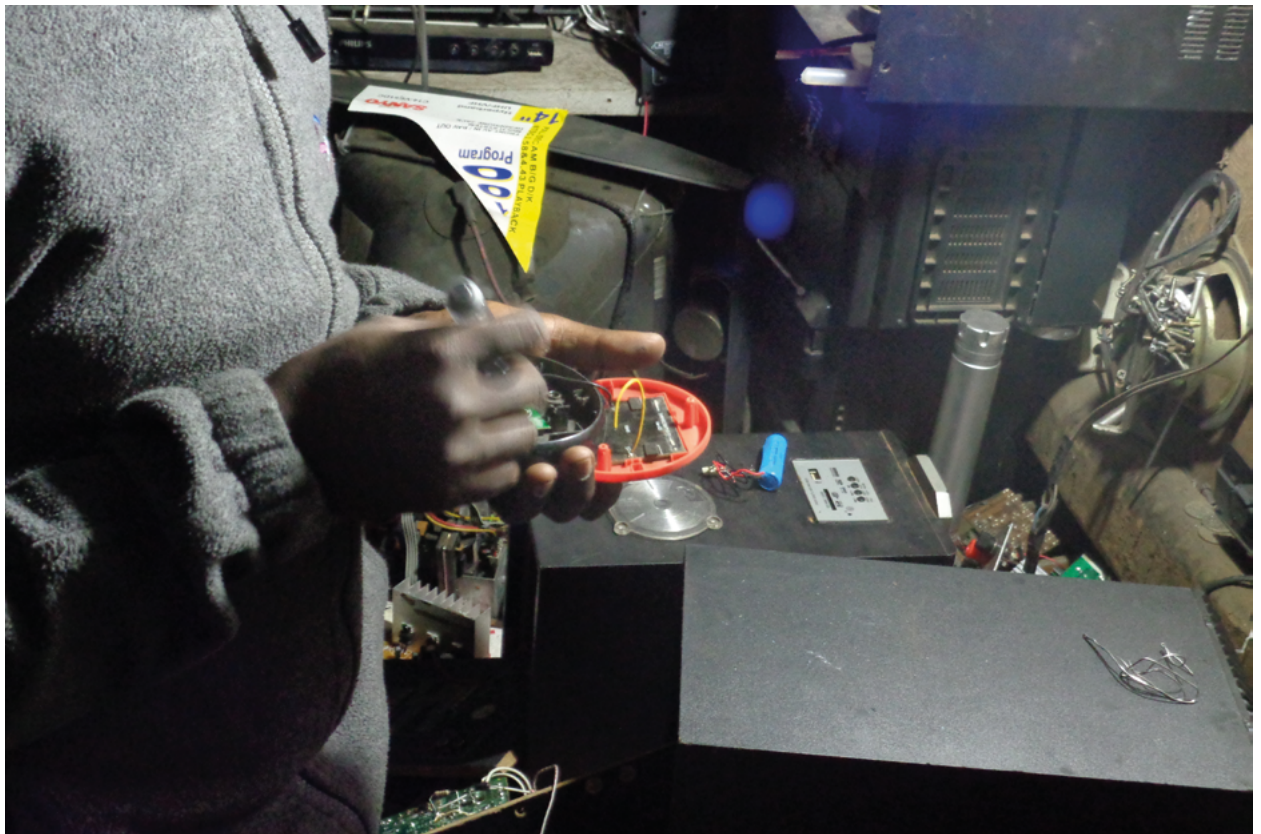
For off-grid solar products – and many electronic goods – the journey from consumption to disposal is complex and far from linear. Repair and reuse can take many forms; component parts may take on different journeys as they are added and removed; and storage and hibernation patterns are diverse<sup>2</sup>. Understanding these complexities may help companies implement successful e-waste management strategies that effectively engage consumers and increase rates of take-back and collection.

## When is waste, waste?

At what point does a solar home system or a solar lantern become waste? The answer is not as definitive as you might think. This is in part because there are different ways of conceptualising solar waste. E-waste regulations provide a definition to govern the storage and transportation of e-waste, but there is also a much more fluid notion of e-waste that begins in a user's home. In a household environment, the act of discarding electronics as e-waste occurs when the owner decides the item is no longer useful to

them due to failure, technical capability, cosmetic condition, age, replacement, aspirations and other factors<sup>3</sup>. It does not automatically become e-waste only when it is non-functional. Even when an electronic system may be broken, the consumer may still have value for it.

Case study 1, at the next page, demonstrates that parts of broken solar systems may retain a use or value for the consumer as they can be re-used and re-configured with other parts in various combinations. By their nature, many off-grid solar products have multiple functions including lighting, phone charging and radio. If one component breaks, the product is likely still to be of use to the consumer. There may therefore be several different stages of a single product's disfunction before it can be considered wholly EoL, and in markets like Kenya, broken solar systems are falling into existing networks of broken consumer goods that go on to find new lives and new uses. Monitoring and forecasting the amount of e-waste that will be produced is an integral part of implementing proper e-waste management.



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<sup>2</sup> Adapted from the Afterlives of Solar power (Cross & Murray, 2018)

<sup>3</sup> Solving the E-Waste Problem (Step) White Paper: One Global Definition of E-waste. StEP, ((StEP), 2014)

## Consumer perspectives and practices with off-grid solar waste

### **Waste not, Want Not: A consumer's relationship with products at end-of-life**

Kenneth lives a kilometre from the small trading centre of Sango in Bungoma County, Kenya. He was visited by researchers investigating solar e-waste, where he displayed his collection of off-grid solar products. Two solar lanterns and a solar powered torch were on a table in the centre of the room. Above, a third solar lantern was attached to a wooden beam. None of the solar products were fully functional – and each came with its own photovoltaic panel but only one of them was in the house, displayed on the table. Neither Kenneth or his son knew where the others were, and the remaining panel was also broken. The family had found other ways to charge their solar products – the one attached to the wooden beam was powered by a car battery in the corner of the room, whilst the other two products were taken every 2 or 3 days to the family shop in Sango to charge from the mains electricity grid.

When not on display for the benefit of visiting researchers, Kenneth's solar devices live on top of a cabinet alongside five kerosene lanterns. He keeps them here for safety; as he puts it while gesturing to the living room, "down here, one can easily step on it." For Kenneth, recycling these devices had not been a consideration.

Research has concluded that some consider selling or giving products to ambulant scrap buyers, but are unhappy with how little they would earn, so hold onto them instead. The same study finds that Kenneth's scenario is not unusual, and consumers of off-grid solar products frequently reported that parts and whole products as missing, lost or stolen.

SOURCE: The Afterlives of solar power



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# Consumer perspectives and practices with off-grid solar waste

Briefing Note 3 of this the E-waste Toolkit set out the sales-lifespan model as a common methodology for forecasting the number of products that will reach EoL in a given period: Waste volume (kg) = Product sales x weight x lifespan.

This model also underpins the most prominent data on off-grid solar e-waste<sup>4</sup>. As discussed here however, the long hibernation period and complex journeys products take to EoL offers a difference perspective of how and when e-waste is generated, that goes beyond existing scientific methodology. Companies, recyclers and regulators should use the sales-lifespan model with caution as it risks overestimating the volumes of waste. This model also risks promoting the narrative that waste is a problem to be fixed. In reality, there are options for repair, refurbishment and re-use that offer value for consumers and the informal economy where they are embraced and supported.

## Consumer sentiment to e-waste

When a consumer electronic reaches the end of its useful life it is common for consumers to store it for a period of time. This is known as hibernation. It is a significant barrier to the effective flow of value within the circular economic model<sup>5</sup>.

Taking the mobile phone market as an example, a study on UK-based mobile phone users' habits showed that only 34% of EoL mobile phones have been returned or disposed of by consumers. On average, mobile phones are kept in hibernation for longer than they are used as a primary device with figures showing three years of hibernation for just under two years of use<sup>6</sup>. The typical hibernation period of off-grid solar products has not been researched; but presents an interesting and important knowledge gap to be addressed.

A simple explanation for the tranches of obsolete electronics sitting in drawers, cupboards, garages and bedrooms is lack of consumer awareness about how to dispose of or recycle electronics<sup>7</sup>.

Waste electronic products may also be considered a status symbol for low-income consumers; it is common to find an array of stereos, radios, lights and chargers lined up in a house. Irrespective of the functionality, ownership represents a purchasing power and consumerist lifestyle for the owner.

Further, we often develop an emotional attachment to the objects that enter our homes and enrich our lives. Some social scientists also attribute a deeper symbolic and psychological explanation for storing e-waste that is consistent with cultural approaches to death. As we grieve our dead relatives and friends, we may also grieve in some way for our dead things by keeping them close until we feel that their presence and meaning to us has decreased sufficiently that we can 'let go' with physical distance. Keeping old electronics in a drawer retains their physical closeness – out of sight but still on-hand – before enough time passes that we feel less attached and able to discard it without significant distress<sup>8</sup>.

## Perceived value and desired incentives

Understanding how customers value their products is key to ensuring that company take-back and collection schemes engage and offer motivating incentives to the end-user. Recovery of e-waste is currently a negative-value activity for companies – meaning that it is an area of expense rather than profit. Yet to overcome the perception of value consumers attach to their products, companies will have to employ smart incentive tactics to at least compensate for the burden of travel or time spent by the consumer in order to return EoL products.

Research carried out by the Resilient Africa Network (RAN<sup>9</sup>) in Uganda and Senegal showed that off-grid solar users would place a high value on their equipment even if it would break. Owners of name-brand systems typically valued broken SHS twice as high as owners of off-brand systems, and were more aware of opportunities to profit from old products, such as resale or scrap value and disposal incentives associated

4 Cost Benefit Analysis and Capacity Assessment for the Management of Electronic Waste(E-waste) in the Off-Grid Renewable Energy Sector in Kenya. (Magalini, Sinha Khatriwal, & Munyambu, 2017)

5 Adapted from (Wilson, et al., 2017)

6 The hibernating mobile phone, (Wilson, et al., 2017)

7 WEF; A new Circular vision for electronics, (World Economic Forum, 2019)

8 The Afterlives of Solar power (Cross & Murray, 2018)

9 The Resilient Africa Network (RAN) funded by USAID is a partnership of 20 African universities in 13 countries. It is led by Makerere University with the Initiative for Disaster Resilience and Humanitarian Affairs Elliott School of International Affairs at George Washington University, Stanford University and the Center for Strategic and International Studies (CSIS) as partners. More at [www.ranlab.org](http://www.ranlab.org).



## Consumer perspectives and practices with off-grid solar waste

with EoL batteries<sup>10</sup>. The same study also found that consumers stated they would travel up to 25km in order to return the SHS and receive a cash-value incentive. This data concludes off-grid solar system customers believe there is some benefit to trading in a broken product, and can be incentivised to do so – but the onus is on the companies to provide the incentive. More research and pilot projects are needed to establish exactly how significant this incentive would need to be to be effective.

### Perceived health and environmental risk

Off-grid solar products significantly reduce health risks for consumers by displacing common lighting and power sources like kerosene lamps, diesel generators or candles. Nevertheless, despite being much safer and longer-lasting, even quality-verified products can have harmful effects if not properly handled at EoL.

Briefing Note 1 of the GOGLA e-waste toolkit details a technical introduction to the recycling of off-grid solar components; including lead acid batteries which contain toxic elements and are the only hazardous component of off-grid solar products, as lithium-based batteries are benign<sup>11</sup>.

This has not been effectively communicated to customers and does not appear to be well understood as a result. Studies that ask people about the dangers of storing EoL solar products in or around their homes record mixed results in levels of awareness, especially concerning batteries. Participants mentioned a number of risks in the study, including: ‘acid in the battery is not safe’, ‘dangerous for children’, ‘emits fumes’, ‘affects soil fertility’, ‘contains harmful chemicals’, ‘batteries can explode or break and cut someone’<sup>12</sup>. Whilst some of these are true for lead acid batteries, in the most part, solar lanterns or Solar Home Systems do not entail these risks.

Communicating how to handle and dispose of products is a responsibility that lands on the shoulders of companies. E-waste management processes will be strengthened by making sure that customers have up-to-date, accessible, clear and factual information about the risks and hazards involved with their solar products, and how they should dispose of them in a safe and environmentally friendly way. Communicating these key messages should be woven into touch-points along the customer journey, starting from point of sale.



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10 RAN/USAID study, 2019 ((RAN), 2019)

11 Technical Introduction to Recycling of Off-Grid Solar Components (GOGLA, 2019)

12 Sustainable Solar E-waste and Battery Technology Management: A Qualitative Study of Off-Grid Solar Markets Across Uganda and Senegal, Resilient Africa Network (RAN, 2019). ((RAN), 2019)



# Consumer perspectives and practices with off-grid solar waste

## GOGLA Consumer Protection Code

The GOGLA Consumer Protection Code has 37 indicators for companies to self-assess their performance across on consumer finance, product and service, including one related to e-waste:



The consumer is made aware of the disposal requirements of the product at end-of-life, with particular attention to the battery. As appropriate, the provider implements a collection scheme or informs consumers about other collection options (e.g. from other agencies).

## Product labelling and disposal information

Labels and markings are an effective and accessible means of product messaging. Currently, off-grid solar companies have few protocols to inform customers on product handling and repair after warranty expiration. The GOGLA e-Waste Working Group has plans to define and adopt a standard format for product labelling on disposal requirements, similar to the EU directive for WEEE marking.

The advantages of this are that information will be clearly and consistently communicated on all off-grid solar products. Individual company awareness campaigns may then include general information that is not company specific, so having a greater impact in communities and a wider reach in the off-grid market. Brands which include such labelling are also showing customers that they take responsible waste practices seriously and may increase brand perception and customer loyalty.

## The WEEE marking

The WEEE marking is a requirement of the EU WEEE Directive<sup>13</sup>. The symbol indicates that collection of electrical and electronic equipment must not take place together with ordinary domestic waste and that it must be treated as WEEE. The name or brand of the producer must also be placed on the product in a way that allows for clear identification. In the case of small products, the symbol can be printed in the warranty text or instructions and not in the product itself, but it must in all cases be printed visibly, legibly and indelibly.



Aside from including the symbol and making sure customers understand its meaning, the Directive also requires producers to inform users about:

- The requirement not to dispose of WEEE as unsorted municipal waste and to collect such WEEE separately.
- The return and collection systems available to them, encouraging the coordination of information on the available collection points irrespective of the producers or other operators which have set them up.
- Their role in contributing to re-use, recycling and other forms of recovery of WEEE.
- The potential effects on the environment and human health as a result of the presence of hazardous substances in EEE.

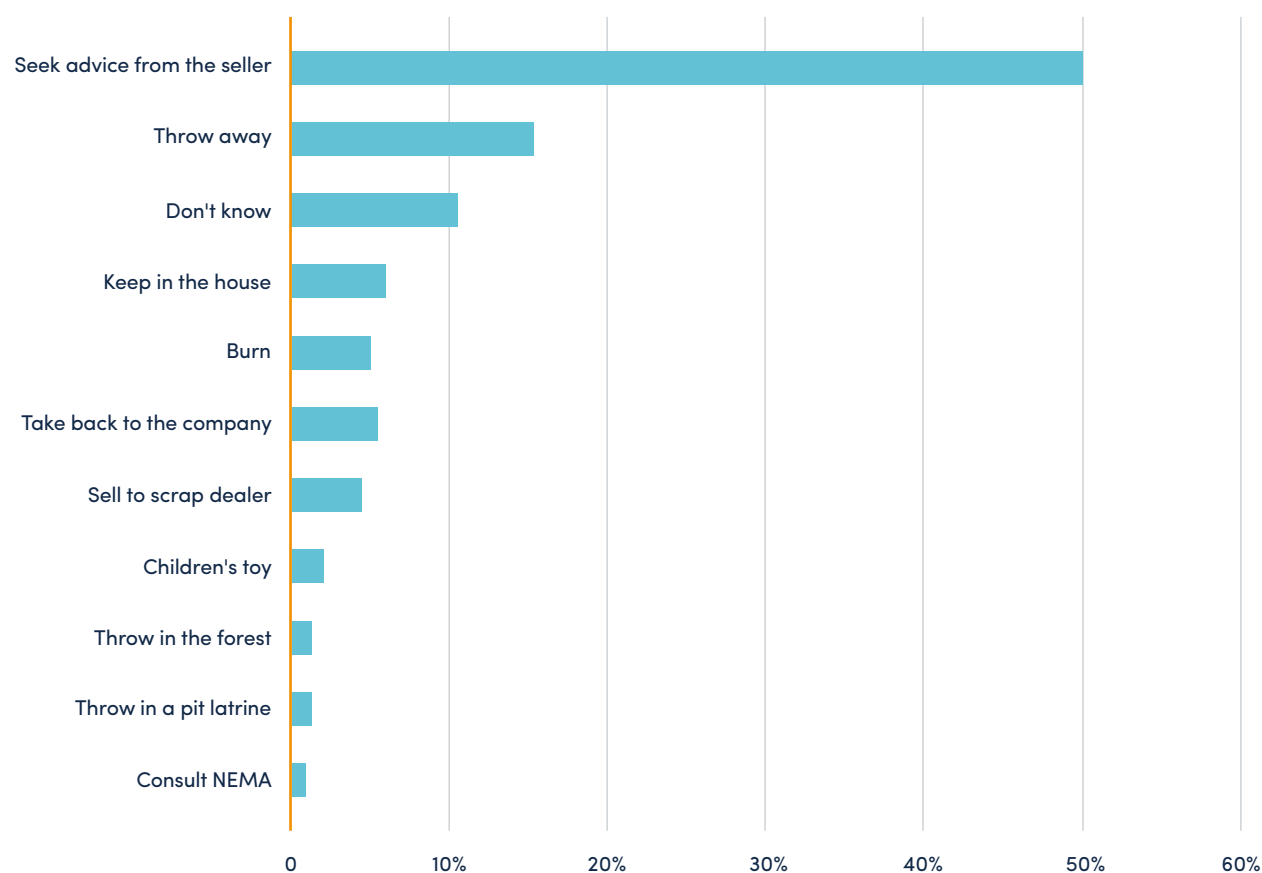
# Consumer perspectives and practices with off-grid solar waste

## Repair and disposal behaviour

When an off-grid solar product stops working, consumers are most likely to seek to repair it<sup>14</sup> – either with the help of a company-employed technician, at home or by a local expert. Research carried out by RAN in Uganda shows that name-brand system owners are significantly less likely to discard or throw away their systems, and in most cases, reach out to their supplier to arrange pick-up. This finding is corroborated by Solibrium Solar, who as part of their REWMOS project conducted a household survey of Solar Home System users in Kakamega, western Kenya, to shed light on how customers use, maintain, repair and dispose of their products<sup>15</sup>. Typically, half of SHS owners seek advice from the seller before disposing of their systems, while around 17% would throw them away, and close to 7% would keep them in the house.

According to this study, a significant majority – more than 85% – of people who owned a SHS were not aware of its expected lifespan and the lifespan of its components. Only 2% of the respondents were aware of any recycling companies or facilities active in their region. Whilst there is clearly much work to be done to educate and engage with customers about EoL products, these studies suggest that trusted brands are well positioned to inform and influence their customer base. Increased take-back is possible by identifying and addressing the customer barriers to relinquish off-grid solar waste.

**Figure 1 - How people intend to dispose their SHS**



SOURCE: REWMOS/Solibrium-Solar (2018)

SHS users (percentage)

14 Sustainable Solar E-waste and Battery Technology Management: A Qualitative Study of Off-Grid Solar Markets Across Uganda and Senegal, Resilient Africa Network (RAN, 2019). ((RAN), 2019)

15 Resource Efficiency and Waste Management for Off-grid Solar products (REWMOS), Solibrium-Solar (in partnership with REPIC and Myclimate). (REWMOS, 2018)

# Consumer perspectives and practices with off-grid solar waste

## Summary of customer barriers to relinquish solar products at end-of-life

Figure 2 - Barriers to relinquish solar products at end-of-life<sup>16</sup>



- 1. Lack of awareness of risks and disposal options.** Studies have shown that there is a lack of understanding and awareness of the risks posed by e-waste to health and the environment, and knowledge of appropriate methods of disposal.
- 2. Waste collection is not common practice in many off-grid communities.** Cultural and behavioural norms are a significant obstacle to implementing new practice. In many off-grid communities, due to lack of public services or facilities waste collection is not the norm. Rather, typical waste-management behaviour is to dump or burn waste.
- 3. A perceived value of solar products at end-of-life.** Often, this is driven by informal collectors who may use harmful methods to extract a small amount of valuable metal from the waste, or re-use component parts for other means.
- 4. Cost of disposal.** For off-grid consumers living far from an urban or peri-urban centre, there may be significant transportation costs involved in travelling to a collection facility of service centre to return a product.
- 5. Lack of take-back schemes or collection facilities.** In many off-grid communities and rural areas, there may simply be no companies that practice take back or e-waste collection facilities.
- 6. Emotional attachment to the product.** We often develop an emotional attachment to the objects that enter our homes and enrich our lives that can make it hard to relinquish until the time feels right. Furthermore, consumers of off-grid solar may have made a significant financial investment in the product, and so it may still be thought of as a status symbol even if no longer functional.

<sup>16</sup> Adapted from: Comprehensive assessment of the End-of-life management of Solar Home Systems in Kenya: Challenges and Opportunities (Maria Vicente, Master thesis, September 2019). (Vicente, 2019)



# Take-back and collection models

A mature e-waste ecosystem entails three primary channels to retrieve end-of-life off-grid solar products from consumers: company take-back, third-party collection facilities, and the informal refuse or repair sector. This section describes these three channels as they relate to the off-grid solar sector, and the strategies and tactics companies can implement to optimise these.

Off-grid solar companies should consider the holistic e-waste landscape when modelling an EoL product strategy. The following framework is useful for companies carrying out this process – based on de Brito’s **five basic dimensions of reverse**

**logistics: Why, Who, What and How** (Brito, 2004).

**Why Receiving?** the forces driving companies and institutions towards reverse logistics.

**Why Returning?** the reasons why products are returned.

**What is being returned?** product characteristics and product types.

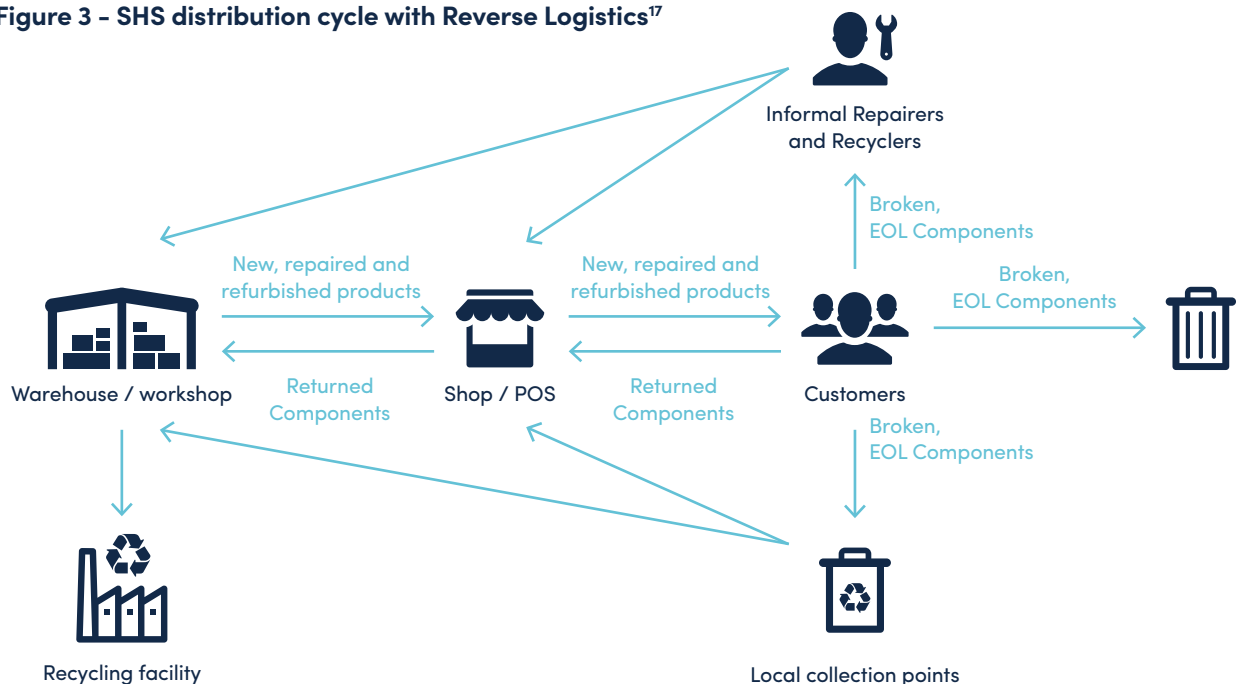
**How products are recovered?** processes and recovery options.

**Who?** the actors and their roles.

Using the framework, we can model the reverse logistics for off-grid solar as follows:

Why receiving?	Why returning?	What?	How?	Who?
<ul style="list-style-type: none"> <li>Warranty process</li> <li>Customer retention / as sales tool</li> <li>Environmental and social risk management</li> <li>Compliance with EPR legislation</li> <li>Investor incentivisation</li> </ul>	<ul style="list-style-type: none"> <li>In-Warranty</li> <li>Upgrading product</li> <li>Incentivisation</li> <li>Education or Awareness campaign</li> </ul>	<ul style="list-style-type: none"> <li>Faulty Product</li> <li>End-of-life Product</li> <li>Complete or incomplete system</li> <li>Own brand or any brand</li> </ul>	<ul style="list-style-type: none"> <li>Agent pick-up</li> <li>Point of Sale Drop-off</li> <li>Third Party collection point</li> <li>Via informal collectors</li> <li>Swap, repair or dispose</li> </ul>	<ul style="list-style-type: none"> <li>Customers (old or new)</li> <li>Agents and technicians</li> <li>Third party recycling facilities</li> <li>Community organisations</li> <li>Informal collectors, repairers and 'recyclers'</li> </ul>

Figure 3 - SHS distribution cycle with Reverse Logistics<sup>17</sup>



SOURCE: adaption from Maria Vincente Garcia, 2019

17 Adapted from Comprehensive Assessment of End-of-life SHS in Kenya; Challenges and Opportunities, Maria Vincente Garcia, 2018, (Vincente, 2019)

# Take-back and collection models

**Table 1 - Methods for the recovery of solar e-waste**

Take-Back Scheme	Third-Party Collection	Informal Sector
An initiative organized by a manufacturer or distributor to collect used, end of life products or components from consumers to either a) reintroduce them to the market through repair and refurbishment or b) ensure that they are safely and appropriately recycled or disposed of.	An activity to collect and process e-waste carried out by a third party such as a national WEEE recycling facility, or a Producer Responsibility Organisation (PRO) acting on behalf of the original equipment manufacturer. Retail outlets, filling stations or government agencies' buildings are also possible options for collection.	Covers many different type of actors including informal repair shops (often known as a 'fundi'), recyclers, or collectors to cover an entire informal waste-management process. E-waste in this stream often ends up either in informal land-fill, or being burnt so that components can be extracted – posing risks to both the environment and health of those involved.

## Company take-back

Logistics is the pillar of last-mile distribution in off-grid communities. Similarly, a successful e-waste take-back scheme is dependent on reverse logistic with the focus being on collection rather than distribution<sup>18</sup>. Off-grid solar companies often have an extensive logistics networks across hard-to-reach geographies, and so the implementation of reverse logistics should be seen as an extension of these in order to close the loop.

Beyond incentivisation and messaging, companies should consider at which point reverse logistics begins, as well as what products or components they will accept within the take-back programme. Take-back can occur at several points in the value chain. Depending on the distribution model, take-back might occur at the customer's home, a shop, point of sale, or a community facility such as school or religious centre. Extending agents' or technicians' responsibilities to include an 'at home' take-back service during their normal visits may increase collections as the effort required of consumers is low.

Links with community based facilities can also increase trust and reduce the level of effort required on the part of the consumer which could boost the number of returns. Companies utilising such links will need to consider that any community-based facility used to collect and store e-waste before it is transported to central sorting and processing warehouses, will need adequate measures in place for safe storage and security to avoid risk of theft.

Company take-back schemes are dual purpose in their impact. They can reduce the potentially harmful presence of e-waste in off-grid

communities and also encourage consumers to replace EoL products, even when out of warranty, rather than returning to unhealthy, expensive traditional fuels or cheaper, poor quality solar alternatives.

## Awareness & Messaging

Raising awareness through targeted communications is the cornerstone of any successful behavioural change campaign. Well integrated messaging throughout the customer journey can increase the effectiveness of an EoL management strategy, and result in more engaged and happy customers, with greater retention and acquisition.



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# Take-back and collection models

## What

Key messaging around the responsible disposal of e-waste is often related to curbing pollution and detrimental effects on health and the environment. But it is also important to avoid creating negative consumer perceptions around life-changing electronic goods, as this is counterproductive to environmental and social goals. Considering this, a cautious approach should be taken when including information about health and environmental hazards in e-waste messaging, especially when related to off-grid solar products that largely contain no toxic materials - with the exception of products containing lead-acid batteries.

Considering what motivates consumers to recycle e-waste is key to creating effective awareness campaigns. Marketing campaigns that are clear and focused are more impactful than those that try to achieve multiple objectives with various messages that become diluted. Emphasising the incentive - if there are any - rather than health risks, or highlighting the environmental impact as a whole rather than specific toxicity implications are more positively balanced approaches. The messaging should also be adapted to the target audience and take into account specific motivations. This may mean taking gender into consideration. For instance, repair and disposal may be seen as a more typically male activity but women are more likely to be the end users of off-grid solar products.

## When & How

Engagement with consumers around e-waste can be done at multiple points along the customer journey. Companies should identify touch-points that provide an opportunity to communicate to customers about:

- Proper use and maintenance
- Troubleshooting in case of fault
- Hazardous materials
- Disposal recommendations
- Company contact details

By presenting this information at various points in a clear and consistent manner, the message is reinforced and may increase consumer awareness.

It is important to recognise the differing dynamics between cash sale and PAYGo consumers when planning e-waste awareness campaigns. A cash

sale provides minimal interaction, is completed in a single transaction and companies often do not collect personal information of the customer. With PAYGo sales a deeper, often long term relationship is built and provides multiple business-to-customer touch-points for messaging. Companies will need to consider how they can reach non-PAYGo customers that are not listed in their Customer Relationship Management database, such as through community meetings, schools and religious groups. They may also consider starting to collect basic customer data for all sales in order to enable effective EoL management.

## Incentivisation

Companies implementing a take-back scheme should consider how they can best motivate consumers to give up their EoL solar products, or components, to overcome barriers such as attachment and the perceived monetary value.

It is recommended that direct cash incentives should not be used, to avoid distorting the market of EoL products by over-inflating their perceived value. However, non-cash incentives can be effectively employed to encourage customers to part with EoL solar product, and may include:

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

This approach is being piloted in Kenya by We Tu and d.light, and in Zambia by Sunny Money. These pilots offer customers a discount on new products if they return an equivalent EoL solar system. Learnings about where best to set the financial value of incentives are yet to be explored, but initial considerations have factored in the value of e-waste in the informal sector as well as the cost of travel for a typical customer returning products to centralised take-back or collection points.

Discounts on new products ensure that consumers retain the benefits of good quality solar products by encouraging consumers to replace broken, out of warranty products rather than returning to traditional lighting methods, or low-quality, cheaper solar options. This has a greater overall impact for the sector. Companies should, however consider the cost of implementing long-term incentive schemes and how they impact unit-



## Take-back and collection models

### How to promote, and what to accept in a take-back scheme – d.light, Kenya

As a Global LEAP Solar E-Waste Challenge winner, d.light has developed a pilot dubbed PICO-I aimed at incentivising customers to return end-of-life (EoL) and out of warranty (OOW) solar lanterns to their retail outlets. Customers are being offered new solar products at a discounted rate if they return EoL products – encouraging customers to dispose of e-waste appropriately, but also to purchase new solar lanterns rather than returning to traditional energy sources.

To promote the take-back scheme, d.light focused their messaging wholly on the incentive to the customer, and in doing so turned it into a positive marketing campaign – the price reduction was deemed to be clear and engaging, and intentionally avoided negative messaging about environmental and health hazards. To size the price discount available to customers, d.light took into account the distance their average customer would travel to reach a collection point (usually a retail outlet).

For the pilot, d.light has decided to accept any solar products, regardless of manufacturer. In doing so, they aim to ensure continued access to quality solar electricity as well as building awareness of the need to dispose of e-waste responsibly. One caveat to the take-back is that the returned solar products must include a battery to be considered a complete system – to ensure that the potentially most hazardous component of the solar product is processed appropriately.

SOURCE: Global LEAP, 2019

economics and affect the overall affordability of off-grid solar products for low-income consumers<sup>19</sup>.

### Third Party Collection

There are a variety of organisations that may collect e-waste from consumers, including waste management companies, a producer responsibility organisation (PRO), local government facilities, retailers and fuel stations.

Dedicated PROs or e-waste management services can present effective solutions to both recovery and processing of off-grid solar e-waste, and can achieve economies of scale through increased volumes. Further to this, specialised waste collection services may have existing, large scale awareness campaigns which an off-grid solar company can tap into, and join forces in order to reach solar consumers. However, such service providers are only currently active in a few off-grid solar markets, including India, Kenya, Rwanda, Nigeria and Ghana. With a growing need for such services, off-grid solar companies could collaboratively establish specialised PROs to manage waste on their behalf. The PRO model and demonstrative case of Karo Sambhav was described in Briefing Note 4 of this toolkit<sup>20</sup>.

In Rwanda, Enviroserve is establishing e-waste collection points in every district<sup>21</sup> alongside community-wide awareness campaigns to familiarise the public with the health and environmental risks caused by improper e-waste disposal. Whilst they already had partnerships in place for the disposal of e-waste directly from SHS companies, usually in-warranty system components that cannot be repaired or refurbished, including community collection points in the partnership means that EoL systems that are no longer in warranty are now also actively recovered from end-users. Enviroserve Rwanda is using the customer networks of partners such as BBOX, Engie Mobisol and Ignite to build on their existing awareness raising campaigns and include SHS users.

### Benefits to using third party collection methods include:

- Greater reach is possible as third party collectors may not be limited to Solar e-waste only, and so can achieve significant volumes for economies of scale much faster.
- Off-grid solar companies with limited resources do not have to invest in compliance and licensing for storage and transportation of e-waste, as the third party service will have this covered.

19 More information about this can be found in the GOGLA E-Waste Briefing Note 3 on The Financials of E-Waste.

20 More information about this can be found in the GOGLA E-Waste Briefing Note 4 on Policy and Regulation.

21 Reported in the New Times, Rwanda (Umurengezi, 2020)

## Take-back and collection models

- Awareness raising campaigns can be more impactful due to pooling of resources and building on existing networks to reach more people.

### However, there are also some challenges to working with third party collection services:

- Depending on the market, such services may be unavailable or have a limited capacity to deal with off-grid solar waste. Where the facilities are available but still in their infancy, the footprint of existing collection points might not adequately serve the off-grid community.
- Third-party collection points may be unable to assess warranty claims and diagnose faulty equipment. Where PAYGo products are concerned, mechanisms may need to be put in place to ensure that in-warranty, and potentially viable company-owned products are not sent directly to recycling facilities. Companies should ensure the partnership allows for sorting and validating serial numbers, for instance.
- Commercially sensitive data may be lost in the process. For example, product design, failure and swap rates and common repair needs are considered sensitive data and companies might want to use it to improve product design and set after sales KPIs.

- The public awareness messages of e-waste management companies may not align with the brand and marketing style of companies.

As part of the GOGLA E-Waste Toolkit, we have created a **Catalogue of E-waste Service Providers**, including collection facilities that off-grid solar companies could potentially establish partnerships with. If doing so, it is recommended to ensure the provider meets appropriate health and

Collaboration between companies and collection services operating take-back schemes in off-grid markets will be key to successful initiatives. Customers could easily return products of one brand via a take-back scheme of another, or to a centralised mixed-waste collection point.

GOGLA members can lead the sector in such initiatives. Companies in Kenya are piloting a Solar Waste Collective, which will include a B2B swap-scheme to ensure mixed-returns end up with the original producer to be appropriately processed.



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## Take-back and collection models

environmental standards for the collection and transport of e-waste, through an initial assessment and periodical audits. Briefing Note 1 includes a decision tree and benchmarking method to assist companies in the iterative steps required to assess and select suitable partners in each of their markets of operation.

### Partnerships with the informal sector

When their product stops working, many consumers' preferred action is to seek to repair it, and in many cases they will go first to the informal sector. It is important to note that in off-grid solar markets, the informal economic activity around repair, reworking, and 'recycling' is significant in terms of scale and coverage, and consists of repairers (fundis), collectors (often urban waste pickers, or roaming door to door) and recyclers (typically extract precious metals through poor, unsafe practice).

Typically, off-grid solar companies are cautious of engaging with the informal sector as it is difficult to ensure quality of service and may pose risks to IP and brand image. However, there may be value in engaging these networks rather than competing with them. Given the multitude of repair clinics

that exist, with collective access to large volumes of EoL products and an expansive footprint in off-grid communities, there is an opportunity to tap into this as part of a wider collection programme. Where Extended Producer Responsibility (EPR) is regulated, this can help companies meet collection targets<sup>22</sup>. Furthermore, training groups of informal repairers and creating a 'certification scheme' could decrease the risk of poor quality repairs and protect brand image. Doing so could also help companies enhance CSR programmes or improve brand perception through the demonstration of an inclusive value chain.

Engaging the informal refuse and repair sector will be easier for component products with value such as cables and lead acid batteries, than negative value items. As a profit driven sector, they will only act if they have an incentive to do so. To further encourage them to work with off-grid solar companies, non-financial incentives can be considered. These incentives may take a number of forms including:

- the provision of training and certifications;
- issuing formal ID cards to approved partners;
- franchising.

### Engaging informal 'Fundis' in Zambia, Sunny Money

In Zambia, off-grid solar social enterprise Sunny Money is engaging the informal repair sector with a pilot project, funded by the Global LEAP Solar E-Waste challenge. By working with an already established network of local fundis - informal, local repair shops - they aim to strengthen the circular economy and ensure that solar lanterns can be repaired locally so that consumers have continued access to high quality solar lighting.

The project includes building open source training manuals and videos to be released on an accessible app to help repairers diagnose and repair issues with broken solar products. Alongside the provision of training and certification to a pilot group of fundis, the project is also trying to overcome the issue of accessibility of good quality spare parts within the informal sector.

SOURCE: Global LEAP, 2019



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22 Partnerships between the informal and the formal sector for sustainable e-waste management (Solving the E-Waste Problem (StEP), 2020)



## Take-back and collection models

Providing digital payments for retrieved products could also be seen as a benefit by informal actors, who are often at the mercy of unreliable middlemen and insecure, unpredictable cash payments<sup>23</sup>.

Figure 4 below shows one example of how an arrangement with informal collectors might work, in the case of producers using a Producer Responsibility Organisation (PRO). Partnerships between formal and informal actors should be specifically tailored to the local conditions, reflecting the diversity of value chain structures in different countries<sup>24</sup>.

Understanding the ecosystem of the local informal sector is key for any company wishing to engage. In some markets, this may have been done by an NGO, PRO or e-waste management organisation with social and environmental objectives – and can help off-grid solar companies to map the product journeys and access key actors in the space. **The E-Waste Initiative Kenya (EWIK)**, for

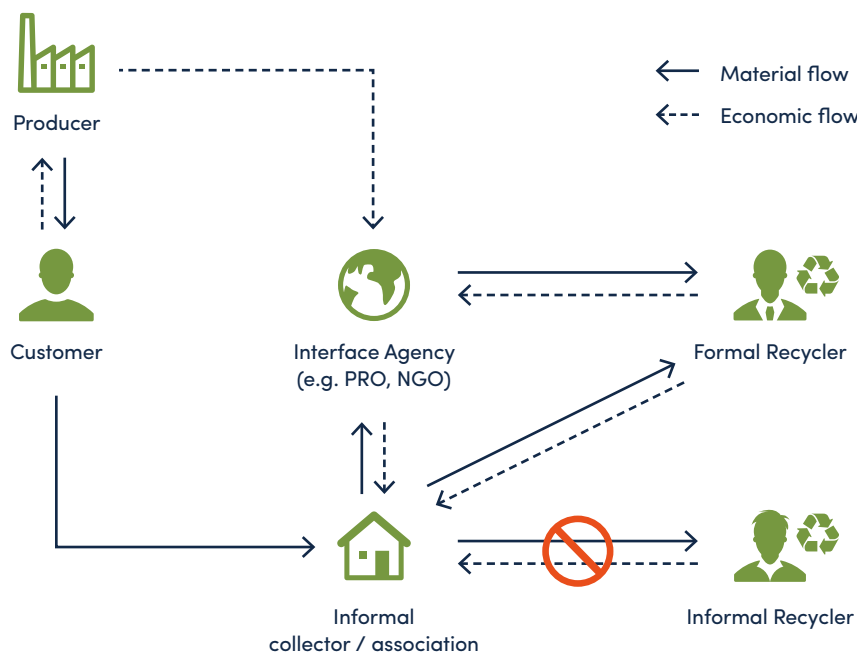
example, is one such NGO that works with the informal e-waste sector to coordinate and improve their activities through engagement, training, and provision of equipment.

### Who are the Informal Sector?

Generally considered to be subsistence based workers or businesses **not officially registered, without legally concluded contracts, outside of tax control and social and labour market protection provisions.**

The informal waste-management sector consists of various forms and activities, including collection, sorting, dismantling or recycling, as well as repair and 'refurbishing.' They may act as individuals, unofficial businesses, or even form an organised group of workers.

**Figure 4 - Systematic illustration of informal-formal partnerships in India**



SOURCE: StEP, 2020

23 From GIZ, during Webinar for E-Waste Toolkit Module 6 (GOGLA, 2019)

24 [http://www.step-initiative.org/files/\\_documents/publications/Partnerships-between-the-informal-and-the-formal-sector-for-sustainable-e-waste-management.pdf](http://www.step-initiative.org/files/_documents/publications/Partnerships-between-the-informal-and-the-formal-sector-for-sustainable-e-waste-management.pdf) (Solving the E-Waste Problem (StEP), 2020)

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