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Action plan for management of LHHA in Kenya – Development of an action plan and conceptualization of a pilot project

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CTCN Technical Assistance Development of an action plan to improve the circularity of large household appliances in Kenya - Report on Activity 5: Development of an action plan and conceptualization of a pilot project for an improved and circular waste management infrastructure for LHHA

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Contents

1 Introduction

1.1 Objective of the study

The study aims to develop an action plan to improve the circularity of large household appliances (LHHA) in Kenya.

1.2 Scope of the study

The Technical Assistance Response Plan is clear about the broad scope concerning circularity: it stresses the importance of so-called Value Retention Processes (VRP's; Figure 1) as an important driver for economic development and for prevention of environmental degradation. Therefore, the scope of this study explicitly extends beyond 'waste management' which is often regarded as the main activity when it comes to circular policies.

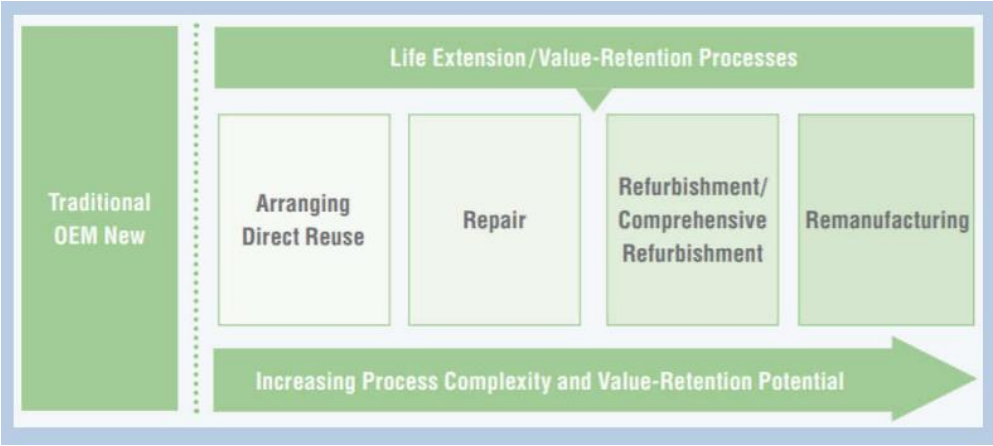


Figure 1 Overview of Value Retention Processes

The Technical Assistance Response Plan is also clear about the product scope, which covers the following Large Household Appliances (as a part of the broad category of EEE (Electric and Electronic Equipment)[1]: large cooling appliances, refrigerators, freezers, other large appliances used for refrigeration, conservation and storage of food, washing machines, clothes dryers, dish washing machines, electrical cooking equipment, electric stoves, electric hot plates, microwaves, other large appliances used for cooking and other food processors, electric heating appliances, electric radiators, other large appliances for heating rooms, beds, seating furniture, electric fans, air conditioner appliances and other fanning, exhaust ventilation and conditioning equipment.

1.3 Scope of this report

The terms of reference are documented in the Implementation plan. The implementation plan covers all activities up to the development of an action plan and conceptualization of a pilot project for an improved and circular waste management infrastructure for large household appliances.

This specific report concerns only the findings under Activity 5: Development of an action plan (also known as 'roadmap') and conceptualization of a pilot project for an improved and circular waste

[1] The categorization and composition is as per the stipulation of E-Waste Management Guidelines 2010.

management infrastructure for LHHA. It builds on the findings of previous reports on Activity 2 (description of the current status) and (combined) Activities 3 and 4 (Identification and definition of activities for an improved circular waste management infrastructure for large household appliances, describing practices in other countries).

2 Summary of conclusions and recommendations from previous activities

The purpose of this document is to suggest a way forward in optimizing the way the Kenyan society may deal with LHHA related e-waste that will definitely grow in the coming years. Furthermore, and in line with that 'roadmap' a pilot concept will be described that is meant to show feasibility of some relevant steps in bringing that roadmap further.

In previous reports we presented an overview of the current status of LHHA in Kenya, the practices found in other countries and of the discussions from stakeholder meetings. We shortly summarize the conclusions, recommendations (and gaps towards implementing them) that were reported earlier in the report on activities 2, 3 and 4, as far as these recommendations and observations form the basis under the roadmap and the pilot concept.

The report on activity 2 (Current status) observed and concluded the following:

- Though the consumption of LHHA will grow, the absolute level of LHHAs in society and therefore also the absolute level of discarded or otherwise end-of-life LHHAs is still low.
- The high value that LHHAs represent for consumers has resulted in an active repair sector and (partly) connected informal sector, that fulfills an appreciated function in dealing with goods and materials that are beyond repair. Households stick to their equipment, invest in repair activities and either give away or sell equipment that is no longer in need.
- All stakeholders acknowledge the fact that national and county government could play a more active role in implementing and enforcing regulations and mechanisms that increase circularity of EEE by, for example, investing in skills for repair, providing incentives for value retention processes, establishing modern infrastructure that encourage separation and collection of waste and enforcing specific laws for e-waste management which is lacking at the moment.
- The implementation of an EPR (amongst others) on LHHAs in 2022 may become an important driver for such changes. The funds that may become available as a consequence of implementing an EPR may be used for the much desired capacity building and for additional incentives for consumers to deal with worn out products more consciously.
- The scale of enterprises in the repair sector is generally small which hampers investments in equipment and knowledge building. From a business point of view, it will be advantageous to either increase volumes or (with the same goal) stimulate more intense cooperation between players in the value chain. This not only calls for collaboration among all stakeholders covering both the informal sector and the formal sector, but also for cooperation between and among counties, especially now that waste management is a responsibility at county level.
- Increased transparency with respect to available spare parts, available capacities and repair and test equipment may lead to an interesting cooperation and business model for the sector.
- Increased scale of operations and implementation of the EPR will lead to the required investment for costly environmentally benign technologies for treatment of (e.g.) cooling equipment.

The analysis of practices in other countries, reported in the joint report on Activities 3 and 4 led to the following conclusions:

- internet based platforms provide a great opportunity for value creating business activities in Kenya, that are also beneficial for the environment. Increased connectivity between and among repair and refurbishment shops and spare parts manufacturers to share materials and exchange knowledge will stimulate such circular activities.

- Additionally, training and education could be given to (in)formal workers to increase knowledge and safety in handling LHHAs. This helps to create more standardization in the processes.
- At the end of life, proper recycling of all components from LHHAs is required. Such recycling technologies may require significant investments. Considering the low volume of waste from LHHAs such an investment requires contributions from distributors and importers. The envisioned EPR is an essential instrument in providing the cash flow for such investments
- Recycling enabled by an EPR should be organized centrally and maybe combined with other recycling activities, such as recycling of electronic waste
- Scaling up value retention activities can be supported by providing incentives to consumers to hand in the used appliances.
- Communicating the availability of collection points and other aspects of waste management to households is important to set up.
- Involvement of manufacturers and importers is important for clear communication, since they can provide information to consumers on how to properly handle the appliance and offer guidance on how to do easy repairs.
- Examples from other countries show that it is important to include the informal sector in the transition process through (1) organizing the informal sector or (2) increasing the collaboration with the informal sector by the formal economy.

3 Development of an action plan for an improved management infrastructure for used large household appliances

3.1 Introduction: what is characteristic in the management of used and end-of-life LHHA?

This action plan focusses on enhancing value retention processes for Large Household Appliances (LHHAs) thus leading to a more circular economy. Dealing with LHHA during use and at the end-of-(first)-life is distinctly different from dealing with for instance municipal solid waste and its main constituents: organic waste and plastic waste. Organic and plastic waste:

- Are strongly mixed and often contaminated
- Represent little value and often require additional funds for proper disposal or recycling
- Cannot maintain value by undertaking value retention activities.

On the contrary, LHHAs and many of its constituents represent a high value for users. Value retention like repair and refurbishment are therefore well embedded in the current economy. Even at the end-of-life, many components and materials (like metals like copper, steel and aluminum) represent a positive and marketable value.

The existence of these commercial operations lead to a low level of funding and legislation concerning LHHAs in many countries. When the market takes up activities there is less need for government intervention.
However, the potential environmental hazards (and worldwide growing volumes) of ICT has led to regulation on WEEE. In all known regulations end-of-life LHHAs are dealt with under such regulations (in case the mentioned commercial activities are no longer sensible). A specific regulation or action plan solely focusing on LHHAs is therefore not likely to be developed, nor does it seem necessary, besides some specific regulations regarding for instance cooling agents in end-of-life of freezers, fridges and air conditioners which require specific (and costly) treatment.

Another specific aspect of dealing with LHHAs is the current relatively low volume of LHHAs in Kenya and therefore also the low volume of LHHA waste. The current volume in itself will have a negative impact on the commercial potential of initiating large scale value retention activities. But the action plan may contribute to the timely development of an infrastructure once volumes of LHHAs increase.

3.2 The action plan builds on existing policies on LHHAs

As with all initiatives aimed at improving waste management, policy development and setting up legislation for environmentally damaging product flows that are not dealt with commercially is essential. Policy development will therefore play a role in the action plan and roadmap detailed further below. However, at this moment there are already several policies in Kenya related to waste and ICT (WEEE) in general, in which LHHAs are not dealt with specifically. The action plan and roadmap is therefore not starting now, but is already on its way. Basically, we are already somewhere on the ‘road’ the roadmap has pointed out. Therefore, the roadmap is not aimed at developing new policies, but at the implementation and enforcement phases of these policies (besides technology related elements of the roadmap).

In the Report on Activity 2, describing the current status of WEEE policies and the management of LHHAs, these policies and regulations were already described. GSMA has also provided an overview

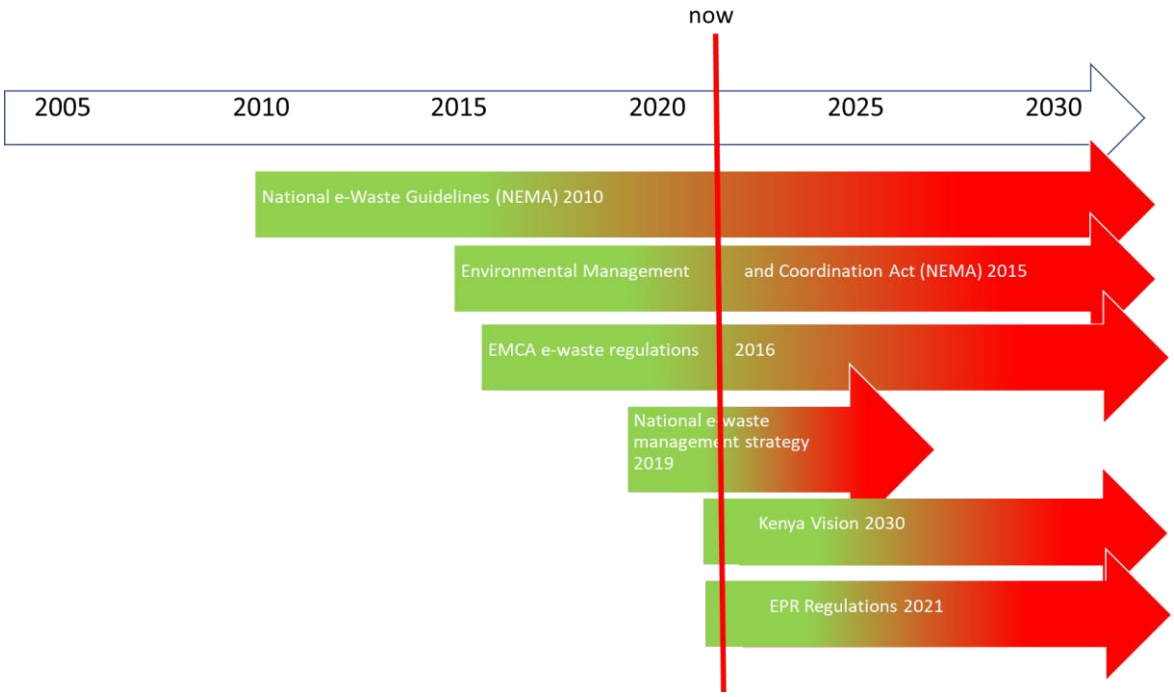
of WEEE-related rulings that are in place in Kenya[2]. This latter overview is added as Annex A in this report.

Some recent developments lead to additional barriers for the further development and robust implementation of e-waste management and the Extended Producer Responsibility that is so essential for development of new activities:

- The Environmental (Impact Assessment and Audit) Regulations (from 2019) provide that establishment of an e-waste recycling center is considered as a high-risk project which must undergo a comprehensive Environmental Impact Assessment (EIA). This adds to the barriers of setting up such facilities.
- Passing the EPR regulations[3] relies on the coming into force of the Sustainable waste management Bill 2021 which is yet to be passed into an Act by the Senate. The initial proposal to anchor the EPR regulation under the environment management and coordination (amendment) Act (EMCA) 2015 was shunned sighting inadequacy of EMCA to promote circular economy.
- The EPR Regulations 2022 are expected to experience implementation and enforcement bottlenecks. Additionally, some stakeholders have already identified gaps in the scope and provisions of EPR Regulations 2022. Some of these bottlenecks and gaps are the following:
    - The authority mandated to provide enforcement and monitoring role, NEMA, is already struggling with inadequate staff to enforce other roles under their mandate. The introduction of these new regulations will mean the existing staff will be overstretched with the authority's roles under the regulations.
    - Businesses will struggle as they have to synchronize the resource cycle, for example in product design. EPR requires businesses to adjust the design, shape, and materials of their products to ease collection and recycling.
    - There is lack of recycling technologies for LHHA waste.
    - Businesses are facing problems with databases and information systems. The collection of data required for setting national targets as well as reporting will be a challenge.
    - There is a risk of collusion amongst members since only one PRO can be registered. If the Authority receives more than one PRO application, the interim officials will be given one month to meet and reach consensus for one PRO to be registered and submit minutes of meeting and the joint resolution. If the multiple PRO applicants fail to agree, the authority shall choose one applicant to be registered as the PRO. Also, having one PRO per category of products will create a monopoly in the country and is subject to abuse by key industry players and defeat the purpose of the law.
    - EPR Regulations do not protect Vulnerable Groups (VGs) such as waste pickers. The informal waste economy is not yet formalized and hence remain unseen and non-inclusive.

[2] https://www.gsma.com/mobilefordevelopment/e-waste-legislative-framework-map/

[3] The EPR Regulations 2022 proposes the establishment of five categories of Producer Responsibility Organizations (PROs) to support producers, who are members of the PROs, in sustainably managing their products at their end-of-life. Under the five categories of waste, which corresponds to the PRO to be established, Waste electric and electronic equipment waste features as among products that are subject to compliance of EPR scheme under schedule 1 of the proposed EPR Regulations 2022. Producers are required to comply with the provisions of the regulations six months after coming into force of the Regulations.



3.3 Building blocks for a Kenyan roadmap on managing LHHA during and after use

Given the arguments above, the roadmap towards optimizing the current way in which LHHAs are dealt with during and after use should comprise the following elements:

- Policy development, implementation and enforcement
- Increasing knowledge, awareness and safety
- Increasing (inclusive) collaboration
- Enhance value retention processes

Besides policy development, the more concrete consequences of the steps in this roadmap will be corroborated in the next chapter in which we work out the pilot concept that should lead to enhanced value retention for LHHAs.

3.4 The LHHA roadmap: policy development, implementation and enforcement

3.4.1 Implementation of EPR policies: capacity building

Lead actors	Ministry of Environment and Forestry
Support	NEMA, Sellers, Distributors, CSOs, Kenya association of waste recyclers, Kenya Association of Manufacturers

During the various stakeholder meetings that were held during this project (July 2021, January 2022, March 2022) it was emphasized over and over again, that it is not the lack of policies that hamper improved circularity of LHHAs and waste management, but the implementation and enforcement. The most recent development concerns the EPR related to Electric and electronic appliances (EEE) (including ICT and LHHAs) . It is generally acknowledged as a key instrument towards a more circular economy, as this extends the responsibility of producers, importers and distributors beyond the sales phase to the end-of-life management of LHHAs. Functioning EPR schemes can provide incentives for better design aimed at repair/refurbishment and can provide the much required financing for circular

management of LHHAs. EPR is currently being discussed to be implemented in Kenya and it needs to be approved on in parliament. This does not only concern LHHAs but also plastic packaging and ICT in general. Specific inclusion of LHHAs in the EPR design is important. Additional, supporting policy instruments and enforcement of policies is also needed. As sketched in previous paragraphs (paragraph 3.2) the implementation of the EPR faces bottlenecks. The EPR reaches far beyond the management of LHHAs. Therefore, the action plan does not include all aspects that hamper the full implementation of the EPR: that would be far beyond the scope of this exploration. However, relevant actions are presented in the following sub-sections.

The first and foremost action to be taken in this roadmap is to enable the responsible Ministry and NEMA to address all the topics listed below. As was described in the previous paragraph, NEMA is already struggling with inadequate staff to enforce other roles under their mandate. The introduction of these new regulations will mean the existing staff will be overstretched with the authority's roles under the regulations. Further expanding the responsibilities will therefore potentially lead to more frustration and dissatisfaction instead of improving the situation with respect to management of WEEE and LHHAs especially. The following activities are recommended as a first and most essential part of this action plan:

- Assess the current activities of the responsible authorities and the outcome related to the available funds, staff and skills level of the staff
- Assess the additional demands for the governing and executive bodies when fully implementing the EPR (overall, but for this goal the EPR on WEEE including LHHAs)
- Assess to what extent the cooperation with the 47 counties is taken fully into account and what the demands for the counties will be.
- Set up budget and boundary conditions required for fully executing these activities.

Needless to say that without such essential boundary conditions being in place, many of the steps sketched in the following sections will not be as fruitful as they could be. It could even be considered whether the action plan can be useful at all if this step is not executed and if the results do not lead to the required support.

3.4.2 Designing an EPR scheme[4]

Though the EPR has already been developed to such an extent that it is only waiting a parliamentary decision, we will re-iterate here the steps that will be required for an EPR scheme to come into effect:

1. Enable the Ministry of Environment and Forestry and NEMA to set up and execute all steps required below.
2. Design the EPR scheme by including all actors that are involved with handling LHHAs and include their input
3. Clearly define actors, roles & responsibilities within the value chain of EEE in general, and analyse whether the specific actors related to (only) LHHAs are included
4. Establish a Producer Responsibility Organisation (PRO) for acquiring funding, creating awareness, selecting recyclers and other parties that are part of the circular value chain.
5. Calculate costs and fees for participating companies in the EPR system.
    a. The PRO should be the leading party in setting up the assessment of the funding needs. An example of the established costs for distributors and importers (from the Dutch situation where the OPEN Foundation has the responsibility of executing the EPR) is given in Annex C.
    b. It should be clear and agreed by all actors what activities fall under the EPR, and what type of activities will be funded once the EPR is in place.
    c. Ensure that the EPR funding does not only lead to enhanced waste management, but also include funding of (non-commercial) circular activities such as setting up and

[4] www.wwf.org.za/reports/EPR_policy_for_plastic_packaging_synthesis_report

administering inventories of used products, components and materials, essential for refurbishment activities

6. Clearly define ambitious EPR targets in a participative multi-stakeholder process.
    a. Ensure that these targets fit the Kenyan situation, in which a growth of consumption is expected the coming years: targets that relate to retrieving significant amounts of WEEE may not be appropriate for an economy in the development phase.
    b. Ensure that the targets are measurable, transparent, unambiguous, justified.
7. Organize a dedicated monitoring body that will be tasked with administrating and running EPR schemes, including evaluation and organizing compliance mechanisms such as reviews and penalties.

An essential part of the action plan should be to create trust among the participants in PROs that are set up: the risk of misuse and monopoly forming should be prevented at all times. Ensuring that -in the context of WEEE and LHHAs- all parties involved in importing and distribution are part of the PRO should be ensured.

3.4.3 Additional policy instruments to enhance circular activities and EPR[5]

For implementation of an EPR scheme to be successful additional supporting policy instruments are required. Therefore the following actions are part of the action plan:

- Set up and develop administrative instruments such as:
    - mandatory collection and/or take-back, facilitating households to return goods (and especially the large household appliances) to proper channels; such mandatory take-back can be organized while delivering newly purchased products.
    - Develop (potentially progressive) reuse and recycling targets, for instance describing minimum viable standards for dealing with waste streams
    - Work on product standards, like mandatory ingredients classification, the need for maintenance and repairing manuals, the ‘right to repair’, the mandatory availability of spare parts (by importers and distributors, that will facilitate repair shops in their circular activities
- Investigate whether economic instruments can be used to stimulate circular behavior; though these measures are usually complex[6] tasks, they have the potential of stimulating circular behavior and circular business creation. Examples of such policies would be:
    - Creating tax exemptions (like VAT exemptions) on circular activities like repairs and refurbishment
    - Provide subsidies for circular business and technologies and broaden the frame of such subsidies
- Develop informative instruments, such as:
    - Training and information provision to repair shops, distributors, recyclers;
    - Jointly set up a collection network in a public-private partnership, funded by the funds the PRO has collected;
    - Conduct workshops to create awareness on EPR Regulations and role of stakeholders under EPR Regulations

3.4.4 Enforcing and evaluating the EPR scheme and other policies[7]

The most common reaction from the stakeholder meetings is that policies are not enforced sufficiently, leading to a lack of tangible results in the last decade. The potential impact of an EPR scheme and other policies will only be reached when implementation is enforced and the policies are

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[5] Gupt, Y., & Sahay, S. (2015). Review of extended producer responsibility: A case study approach. *Waste Management & Research*, *33*(7), 595-611.

[6] Not just setting it up is complex, but especially the administrative burden that comes with providing evidence for such exemptions may be ‘heavier’ than the envisioned benefits.

[7] EPR Challenges in India - Recykal Blog

being evaluated regularly to analyze whether it is effective and/or whether the targets need readjustment. In order to do so the following actions need to be set up:

- Ensure funds for enforcement and inspection of the EPR and related policies (see also remarks under paragraph 3.4.1).
- Set up Inspection Bodies well equipped for their tasks.
- Develop rigorous data collection and monitoring, to be able to identify and evaluate the compliance and impact of the policy framework (including the EPR).
- Invest in digitization of processes, focusing on sharing knowledge and increasing efficiency.
- Continue to work on active and voluntary participation by key stakeholders, such as Producers, Brands, Importers, Recyclers, PROs, Government Authorities, and others.
- Invest in active benchmarking in the area of policies and technologies with other similar (or dissimilar) countries.

3.5 The LHHA roadmap: Increasing knowledge, awareness and safety

Lead actors	Ministry of Environment and Forestry and County governments
Support	NEMA, Sellers, Distributors, CSOs, Kenya association of waste recyclers, Kenya Association of Manufacturers

To allow for proper circular management the current knowledge and awareness level on handling LHHAs and sharing of knowledge between actors have to be increased. Furthermore, the implementation of certain technologies that enhance circular practices are important. The following activities can be undertaken by the (lead) actors mentioned above:

3.5.1 Improve awareness on LHHA management

Improving awareness on the hazardous impact of LHHAs helps to motivate households for separating these appliances from other waste streams and for handing them in at reliable facilities. To improve awareness the following actions can be taken:

- Develop a Communication and Stakeholder Engagement strategy on LHHA waste management
- Develop and disseminate information, education and communication (IEC) packages for each stakeholder category.
- Conduct workshops to create awareness on LHHA management for all stakeholder categories
- Provide information on the hazardous effects of LHHAs and on how to properly handle such appliances via an digital platform. A more elaborated explanation of this is given in the following chapter hat introduces the concept pilot.

3.5.2 Capacity building

Circular activities like repair and refurbishment require not only spare parts, but also skills to deal with -in cases- quickly changing technologies. Therefore capacity building needs attention from Ministries, employers organisations and the PRO. The following activities may be undertaken:

- Assess the skills and number of people needed for value retention processes for handling LHHAs Conduct trainings on handling LHHA waste for all stakeholders categories, have a focus on safety measurements that are important to take while handling LHHAs. For these trainings collaboration with NGOs, e.g. GIZ, or universities are relevant.
- Make working in the waste, reuse, refurbish or recycling sector attractive to both public servants and private enterprises through awards and incentive schemes (e.g., provide free health care to waste sector employees).

3.5.3 Knowledge sharing

In order to overcome the relatively small scale at which LHHA circular activities still take place, scaling up activities are required. Increasing capabilities through knowledge sharing is an important step. This can be achieved through:

- Establishing a national consortium for repairers, recyclers and other circular activities. Such a consortium allows to share knowledge between these parties on national level and learn from each other.
- Establishing county consortiums for repairers recyclers and other circular activities consortium in all 47 counties. Having a consortium on county level allows to stimulate circularity locally and share knowledge that is useful for the county context.
- Creating digital web-based platforms that will lower the barriers towards retrieving information and capabilities. Such a platform is an explicit goal of the concept pilot that will be introduced in the next chapter.
- Stimulate learning with international partners within or outside Africa.

3.6 The LHHA roadmap: Increasing (inclusive) collaboration

3.6.1 Increase collaboration and alignment between county and national governments

To properly implement, enforce and evaluate policies, as is suggested in section 3.4, collaboration between the county governments is important. Each of the 47 counties have to implement and enforce the necessary policies. Therefore, it is important that the national government improves efficiency and alignment and supports collaboration among these counties.

Given the relatively low level of penetration of LHHAs in the Kenyan society, it is advised to come into action step-by-step, and start with those counties where penetration of LHHAs is most advanced. The following action is part of the roadmap (action by NEMA):

- Organize exchange of information between federal and county level;
- Ensure common understanding of responsibilities at county and at federal level
- Select counties with highest penetration of LHHAs
- Establish working relationship with these selected counties and involve them through all steps of implementation of the roadmap and the execution of this action plan (including setting up the concept of a pilot introduced later).

3.6.2 Include the informal sector

The informal sector plays a crucial role in handling LHHAs. Involving the informal sector is thus important in proper handling of the appliances. The action plan for responsible authorities includes the following actions:

- Invite representatives of the informal sector at the table for policy dialogues on waste management.
- Stimulate the formalization of informal activities through digital platforms, to provide easy access to the formal network[8].
- Create social protection schemes for informal sector waste workers to improve their working conditions.
- Ensure the inclusion of the informal sector in the PRO around e-waste, ensuring that they will benefit from the means that should become available from setting up the PRO.

3.6.3 Create jobs for women and young entrepreneurs

A circular economy is inclusive. It is important to reduce the current hindrances and encourage the inclusion for youth and female entrepreneurs, enhancing creative solutions and ideas. This will benefit

[8] GIZ. (n.d.). <i>The Economics of the Informal Sector in Solid Waste Management: Economic Aspects of the Informal Sector in Solid Waste Management.

the circular handling of LHHAs and stimulate an inclusive society.

- Develop gender and inclusivity guidelines for mainstreaming existing and new policy areas.
- Set targets for the percentage of female entrepreneurs and workers active in the repair and recycling businesses.
- Foster training programs for female entrepreneurs in repair, recycling or other circularity businesses.
- Set up youth accelerator programs aimed at fostering young entrepreneurship in circular activities for LHHAs.

3.7 The LHHA roadmap: Enhance infrastructure and value retention processes

A physical infrastructure lies at the basis to be able to enhance value retention processes, such as reuse, repair/refurbishment and recycling. These will be mainly the topic of the next chapter where a concept for pilot activities is developed, but self-evidently, such ideas are an intrinsic part of the action plan as well. Therefore, those ideas will be shortly addressed here:

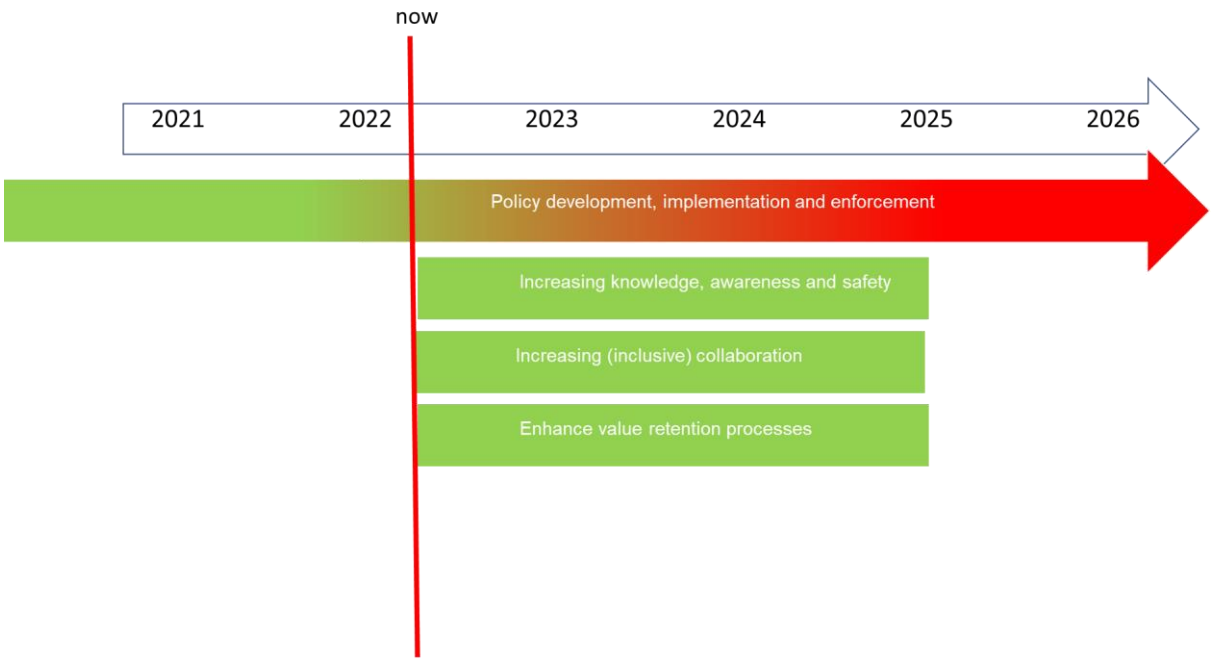
3.7.1 Enhance infrastructure

- Increase collection levels by stimulating households to hand in their appliances. This concept is further elaborated on in the next chapter, which dives into the concept pilot.
- Develop a data system that collects data on the product flow of the LHHAs to get an understanding of where the products are, if they are being resold or repaired and where they end up after use.
- Invest in the development of digital technology such as apps and online platforms to connect people or institutions with collectors or businesses operating in the value retention processes.

3.7.2 Enhance value retention processes

- Enhance reuse by establishing an online platform where households can easily re-sell LHHA by getting in touch with households that would like to buy these appliances. Such platforms would of course require data on geographical distance between buyer and seller as well.
- Enhance repair and refurbishment by establishing an online platform to facilitates the exchange of spare parts and available tools. This will increase the pool of spare parts needed to repair appliances and allows repairers to work with more tools that are not available for everyone due to high costs. Collaborations between repair shops could be relevant, or leasing contracts with universities or other institutions that have more tools.
- Enhance recycling by strengthening the following activities:
    - Increase the number of collection points: establish at least 1 LHHA waste collection centers in each of the 47 counties, starting with those counties with the highest penetration of LHHAs.
    - Learn from former activities done by the (amongst others) EnviroServe, WEEE Centre en EWIK, focusing on ICT and try to apply that to LHHAs.
    - Assess the required scale for setting up additional WEEE Centres in rural areas. Given the low density of WEEE (ICT and LHHAs) joint activities between various counties may be worthwhile to consider. In order to minimize transport costs, storage of WEEE should be provided for in order to collect a minimum volume of goods to be transported to joint WEEE Centres.
    - Invest in and establish LHHA recycling centers, with technologies that allow for safe handling of refrigerators and other cooling appliances; the costs for such operations should be part of the cost calculations the PRO would have to make as a consequence of the EPR. Safe handling of such goods is indeed not a commercial operation, but requires structural funding (see Annex C for an example of cost calculations made in a PRO in The Netherlands).

3.8 The LHHA roadmap: summary and overview



In this chapter we have discussed activities covering both policy making and implementation as well as more technologically oriented activities that may lead to an enhanced 'circular economy' in the area of LHHAs. As schematically depicted above, we feel that the policy development in this roadmap is a continuation of all the preparatory activities that have been initiated in the (sometimes recent) past. Further stakeholder consultation will have to dig deeper in the more fundamental roadblocks that have up to now prevented the developed legislations to come into full deployment. As discussed earlier, increased ambitions, actions and plans in this field should be accompanied by an increase in the capacities of the responsible ministries and executing agencies. Without that support the dissatisfaction with the implementation of policies in civil society and the business community will only grow.
Further development of policy measures will have to continue in the coming years, as the Kenyan society further develops its economic situation.

The other elements of the roadmap have a more concrete nature and may be set up in the coming years. In order to explore these elements (increasing knowledge, increasing collaboration, enhancing value retention processes) a pilot concept has been developed that will be introduced extensively in the next chapter.

4 Concept for a pilot project to increase circularity of large household appliances

4.1 Introduction

The development of a concrete pilot activity is aimed at addressing the main gaps identified in earlier reports. These gaps are:

- Low motivation from the households to give away their used appliances;
- Sub-optimal capacity building and knowledge sharing;
- Absence of a widespread collection infrastructure;
- Absence of adequate technology for LHHA repairing, refurbishing and waste recycling;
- Absence of spares for high quality repair activities

Examples from other countries discussed in a previous report on activities 3 and 4 served as inspiration for the concept of the pilot described in this chapter. The results from activities 3 and 4 show that worldwide practices for circular management of LHHA rely significantly on digitalization, therefore, the pilot concept is highly supported by the development of digital platforms.

The pilot consists of a set of three consecutive, digital platforms that focus on reducing the mentioned gaps and aim to address distinct aspects of the value retention process. The specific character of each platform and their implementation plan are described in the next section.

4.2 Description of the full pilot

In order to address the system gaps mentioned above, a 4-phase approach was designed. This approach acknowledges the fact that every step is complex and that every step is required to develop the next one. The phases are summarized by Figure 2.

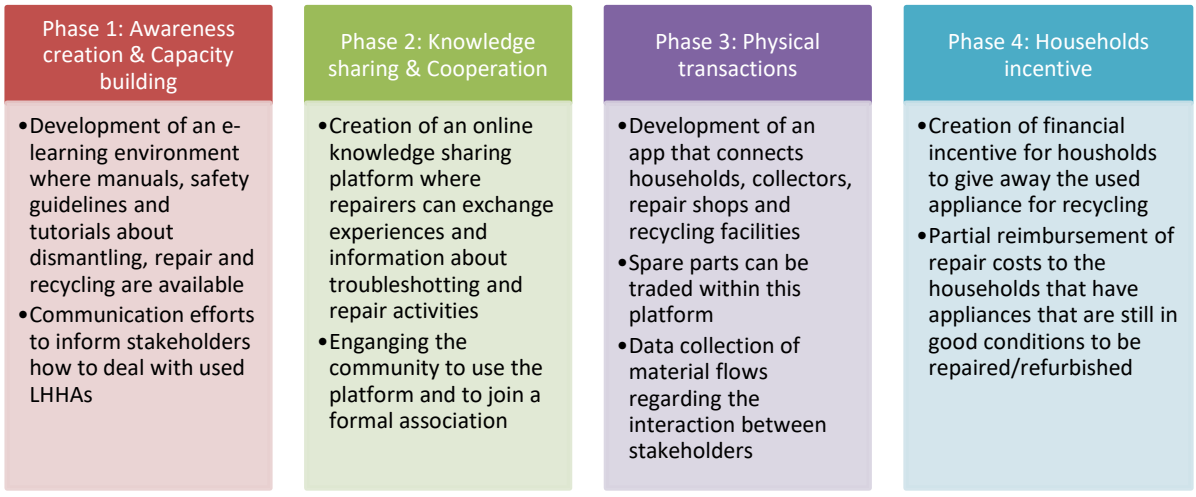


Figure 2 – Schematic overview of the 4 phases of the full pilot

Each phase is composed of different activities that target distinct stakeholders and elements of the overall value retention system. The subchapters 4.2.1 to 4.2.4 summarize the main aspects of the presented phases. For each phase a preliminary estimate of required manpower (staff) and of required out-of-pocket costs is given. Budget estimates, consisting of estimates of required staff and of out-of-pocket costs are given in these subchapters.

In item 4.5, a feasibility phase (*Phase-0*) is introduced, which aims at testing the feasibility of these 4 phases in a condensed time frame of 1 year.

4.2.1 Phase 1 – Awareness creation & Capacity building

The e-learning platform would allow professionals (such as entrepreneurs in repair shops) to access online trainings, manuals, safety guidelines, video tutorials for both repair and recycling activities. Information on how to troubleshoot and dismantle equipment could also be part of the content.

Certificates could become available for those who follow the training and this would serve as an incentive for repairers to use the e-learning environment. The website would contain a search engine by which the information regarding LHHAs and repair activities can be easily found. Such material could be offered in the format of educational videos and/or texts; they should be practical and easy to follow. Both households and repairers could benefit from such e-learning tool.

An additional format is that the platform can be designed and used in three varieties and applications:

i. An easily accessible and not too difficult course aiming at households level and general training for volunteers.
ii. A more advanced training for (in)formal employees active in the sector.
iii. A training aimed at awareness that can be used in school as educational material.

This platform would be a tool to raise awareness of the community around the hazardous effects when handling appliances unproperly. In this phase, interaction with manufacturers is essential to improve access to manuals and the standardization of repair procedures. Therefore, setting up and even financing such platforms may become part of the activities that a PRO may undertake as part of the EPR on WEEE.

A preliminary estimate of the staff required for executing this phase is as follows:

Table 4-1 Estimated staff for Phase 1

function	content	#staff
Project lead and coordination	including finance, organisation, contacts to stakeholders	1 fte
Knowledge broker	organizing contacts with knowledge providers such as importers	-2 fte in year 1 - 1fte in following years
Web-designer	Functional design and construction of online platform	2 x 0.5 fte in year 1 0.5 fte in following years
Course developers	design of the courses (Text and video tutorials)	-3 fte (year 1) -2 fte in following years
Communication manager	advertising and dissemination of the platform	0.5 fte
TOTAL		7.5 fte in year 1 5 fte in following years

Out-of-pocket costs for such a platform come from designing the platform, maintaining it and the constant development of relevant content. Updating of the content and maintaining the website requires competent staff. This phase does not require an extensive physical infrastructure. A general indication of the costs thus can be given by looking at designing the platform and designing the training programs.

Costs for designing and maintaining a platform: depending on what form of platform is being designed these costs vary. Depending on the size of the platform and the complexity the costs can vary. For developing a website yourself costs can range between 1,700 Ksh. (£12) and 31,400 Ksh[9]. (£220) per month. For designing a website with a web designer costs vary as well. For a basic website the upfront costs can range between 28,600 Ksh. (£200) to 71,500 Ksh. (£500).[10] Costs for a more advanced website can range between 357,700 Ksh. (£2.500) to 1,443,300 Ksh (£10.000). Besides the design costs, there are costs yearly costs related to the domain name and monthly costs for maintaining a website. The price range for this again depends on how advanced the website is. An overview of the costs found in literature are presented by Table 4-2 and Table 4-3.

Table 4-2 Costs for designing and maintaining a basic website. *Source;* How Much Does a Website Cost in 2022? (Full Breakdown) (websitebuilderexpert.com)

Costs for a basic website	
Upfront costs	
Design	28,600 - 71,500 Ksh.(£200 to £500)
Total upfront costs	28,600 - 71,500 Ksh. (£200 to £500)
Operating costs	
Domain	400 - 14,300 Ksh/ year (£3 to £100/year)
Hosting	400 - 6,400 Ksh/ month (£3 to £45 / month)
Content updates	0 - 1,400 Ksh/ month (£0 to £10 / month)
Total ongoing costs	5,200 - 107,900 Ksh/ year (£39 to £760 / year)

Table 4-3 Costs for designing and maintaining a bespoke website. *Source;* How Much Does a Website Cost in 2022? (Full Breakdown) (websitebuilderexpert.com)

Costs for an advanced website	
Upfront costs	
Design	357,700 - 1,430,900 Ksh. (£2,500 to £10,000)
Total upfront costs	357,700 - 1,430,900 Ksh. (£2,500 to £10,000)
Operating costs	
Domain	400 - 14,300 Ksh/ year (£3 to £100/year)
Hosting	1,400 - 50,100 Ksh/ month (£10 to £350 / month)
Content updates	0 - 8,600 Ksh/ month (£0 to £60 / month)
Total ongoing costs	17,200 – 718,700 Ksh/ year (£123 to £5,020/ month)

The estimate for the costs of phase 1 of the pilot are based mainly on the a basic website creation (**Error! Reference source not found.**). Due to the fact that such e-learning platform would require constant update, therefore, for the content maintenance it was assumed that the minimum cost would be the mid value from the range present in **Error! Reference source not found.**. The total estimates for phase one are presented in Table 4-4.

[9] It should be noted that these costs are based on the UK price information: prices are also given in British pounds and transferred to Kenyan shillings (Ksh).

[10] How Much Does a Website Cost in 2022? (Full Breakdown) (websitebuilderexpert.com)

Table 4-4 Costs estimate for Phase 1 of the pilot

Upfront costs Phase 1	
Web design	28,600 - 71,500 Ksh
Operational costs	
Domain	400 - 14,300 Ksh / year
Hosting	4,800 - 76,800 Ksh/ year
Content updates	8,400 – 16,800 Ksh/ year
Total operational costs	13,600 – 107,900 Ksh/ year

For comparison, costs for designing an online training is through a Massive Online Open Course (MOOC) were gathered. The costs for designing such a MOOC range between 4,523,600 Ksh[11]. ($38,980) and 37,754,500 Ksh. ($325,330).[12] Revenue can come from charging for the online trainings. For completing a MOOC, customers often pay between 8,600 Ksh. ($74) and 31,600 Ksh. ($272).[13]

As discussed previously, financing for this activity might come from the EPR scheme through PRO's. Another option is to charge for the trainings that are provided on the platform. The willingness to pay for such training might increase if completion certificates are given to those that follow the course. Repair shops can use such certificate to build trust between customers and repair shops, which would help enhancing the repairers business. Another way to pay for the platform is through funding. Funding options could come from government or NGO's. Also, it is possible to start with a low budget tool and when the number of customers reaches a certain level, the tool could be updated in a more professional format.

The main stakeholders for the implementation of such phase are: Informal workers, repair shops, and households, which are the main users of the platform (customers). Furthermore, to develop such a tool it might be important to increase collaboration with manufacturers to get a hold of manuals. Additionally, universities or NGO's might have more experience in developing an online course/training, so consulting or collaborating them could be beneficial to develop a proper tool. Figure 3 highlights the main characteristics of this phase of the pilot.

[11] These numbers are based on designing a MOOC in America and initially the costs are given in American dollar but transferred to Ksh.

[12] Hollands, F. M., & Tirthali, D. (n.d.). *Resource Requirements and Costs of Developing and Delivering MOOCs (SNn OnlineCourses*.

[13] Hollands, F. M., & Tirthali, D. (n.d.). *Resource Requirements and Costs of Developing and Delivering MOOCs (SNn OnlineCourses*.

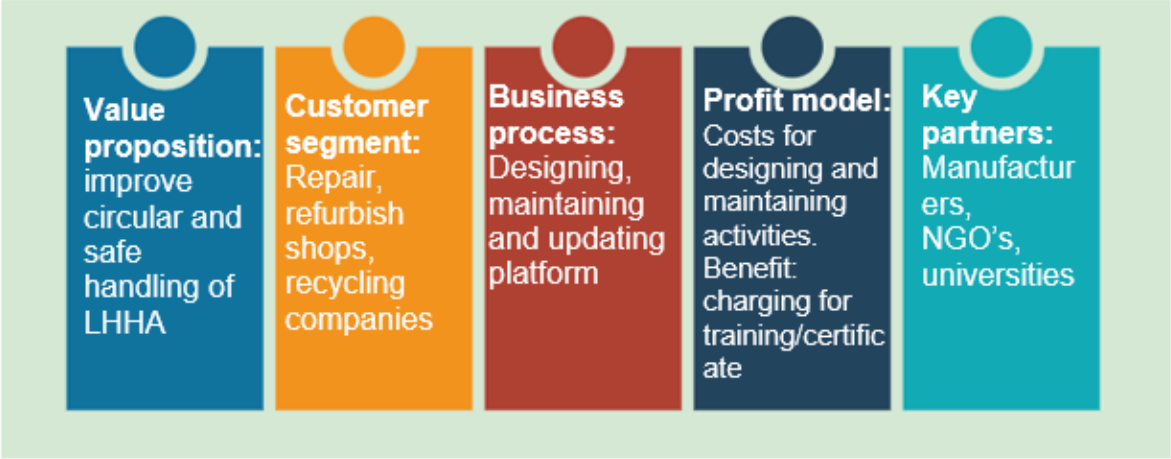


Figure 3 - Summary of main aspects of phase 1

4.2.2 Phase 2: Knowledge sharing & Cooperation

A second and subsequent online platform would serve as a communication channel between repair shops, where they can exchange knowledge on troubleshooting and repair/refurbishment activities. A formal association for repairers, refurbishers and recyclers (RRR) could be created and the platform would be accessible to those that join the association (potentially those entrepreneurs who have obtained a certificate as suggested in Phase 1) aiming to boost cooperation among the mentioned stakeholders. Therefore, this platform could be developed complementary to the awareness and knowledge creating platform and allow to create a common understanding within the association and a more standardized way of handling the appliances.

A preliminary estimate of the staff required for executing this phase is as follows:

Table 4-5 Estimated staff for phase 2

function	content	#staff
Project lead and coordination	including finance, organisation,marketing, contacts to stakeholders	1 fte
Liaison officer	organizing contacts with (formal and informal) repairers, refurbishers and recyclers	1fte
Web-designer	Functional design and construction of online platform; maintenance and improved after year 1	0.5 fte
Moderators	Moderating exchange of information between RRR	-1 fte (year 1) -growing to 3 fte in following years
TOTAL		3.5 fte in year 1 To 5.5 fte in following years

Costs in this phase come from designing a platform where the repair shops can find each other and ask questions and facilitating the repair shops with the questions they have. The costs for designing a website will be similar as described in the section above, the main difference is the fact that the content might not require constant update as the e-learning tool. It was assumed that the content maintenance cost would be in the lower half of the range for this activity present in **Error! Reference**

source not found.. Table 4-6 presents the estimated ranges for the implementation of the online platform from phase 2.

Table 4-6 Costs estimate for Phase 2 of the pilot

Upfront costs	**Phase 2**
Web design	28,600 - 71,500 Ksh
Operational costs	
Domain	400 - 14,300 Ksh / year
Hosting	4,800 - 76,800 Ksh/ year
Content updates	0 – 8,400 Ksh/ year
Total operational costs	5,200 – 99,500 Ksh/ year

A small member fee could be used to partially cover the costs of the platform and the administration of the association. Additionally, funding might be generated by including community organisations, NGO's or other development organisations in the association.

Important stakeholders in this phase are: repair, refurbishment shops and recycling companies. Additionally, (in)formal waste collectors/pickers or other companies active in value retention processes such as reuse are important to consider.

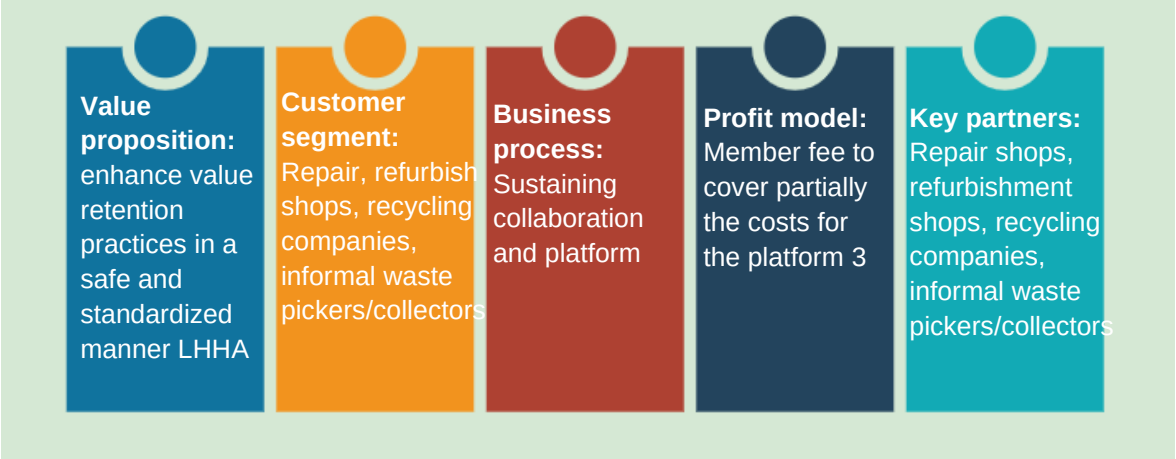


Figure 4 - Summary of main aspects of phase 2 of the pilot

4.2.3 Phase 3: Physical transactions

The third phase focuses on creating the possibilities for exchange of goods and for financial transactions between different stakeholders including the (both formal and informal) entrepreneurs active in value retention processes.

As with previous phases, Phase 3 focusses on web-based applications that facilitate value retention processes. These applications can be aimed at the interaction between households and repair shops/recyclers, or between repair shops and organizations within the recycling value chain. Aimed at households, web-based apps can direct customers towards repair shops by showing a map of the nearby repair shops or recycling centers that the appliance can be sent to. Once the user selects to which location he/she wishes to send the appliance, a notification is sent to the selected

service and to nearby collectors. The collectors can accept/reject the notification, if he/she accepts, he/she selects date/time for the appliance to be picked up and delivered to the shop/recycling center.

Aimed at professionals in the repair and refurbishment sector, web-based platforms can be set up in such a way that enable the exchange of information (about availability, condition, price, etc.) of spare parts for further trading among repair shops and recycling centers. Information on the exchange of material flows in the system can be stored which is useful to build a database for future analysis. In order to such application be fruitful, physical storage of appliances or spares may have to be considered, since space is an issue in the (in)formal repair sector. Central locations, for instance provided by the WEEE Centre may act as a warehouse for spares. A classification system for spares and appliances will have to be set up for transparent and efficient trade.

A preliminary estimate of the staff required for executing this phase is as follows:

Table 4-7 Estimated staff for phase 3

function	content	#staff
Project lead and coordination	including finance, organisation,marketing, contacts to stakeholders	1 fte
Designer-researcher	Setting up system and taxonomy of spares	-2 fte in year 1 -1 fte in following years
Operations and logistics	Supporting physical transactions of spares	2 fte
Web-designer	Functional design and construction of online platform	0.5 fte
communication	Communication with (in)formal workers in the sectors and manufactures for spare parts inventory	-1 fte in year 1 -2 fte in following years
TOTAL		6.5 fte

The costs estimate for creating such web-based application are based on the figures present in Table 4-3, which reflect the implementation and maintenance of a more advanced website. The costs for the advanced web design were considered because it is expected that his platform will be more complex than the other two described in phases 1 and 2, mainly due to the dynamic aspect on tracking goods. Table 4-8 presents the estimated figures.

Table 4-8 - Costs estimate for Phase 3 of the pilot

Upfront costs	**Phase 3**
Web design	357,700 - 1,430,900 Ksh
Operational costs	
Domain	400 - 14,300 Ksh. / year
Hosting	16,800 – 601,200 Ksh/ year
Content updates	51,600 – 103,200 Ksh/ year
Total operational costs	68,800 – 718,700 Ksh/ year

To design a profit model for this phase, the Kenya Association of Manufacturers (KAM) can be taken as an example. The business model of KAM is designed around the payment of membership fee. The height of this fee is based on the annual turnover of the participating company (see Figure 5). A similar scheme can be used for determining the fee for membership in a repair/reuse association. Additionally, the contribution fee for members might depend on the costs that are made in the association.

The key stakeholders for this phase are: repair shops, recycling centers, collectors and households.

Annual Turnover	Annual Subs Fee VAT Inclusive (Ksh.)	New Members Entrance Fees	Total Payable by New members
1	2	3	4
Below 20 Million	26,796.00	14,036.00	40,832.00
20-50 Million	40,194.00	21,054.00	61,248.00
51-100 Million	60,291.00	31,581.00	91,872.00
101-250 Million	100,485.00	52,635.00	153,120.00
251-500 Million	159,726.08	83,666.04	243,392.13
501-1 Billion	207,669.00	108,779.00	316,448.00
1-3 Billion	308,154.00	161,414.00	469,568.00
3-5 Billion	335,790.42	175,890.22	511,680.64
5-10 Billion	401,940.00	210,540.00	612,480.00
Over 10 Billion	468,930.00	245,630.00	714,560.00

Figure 5: Structure of payment for annual member fee of KAM[14]

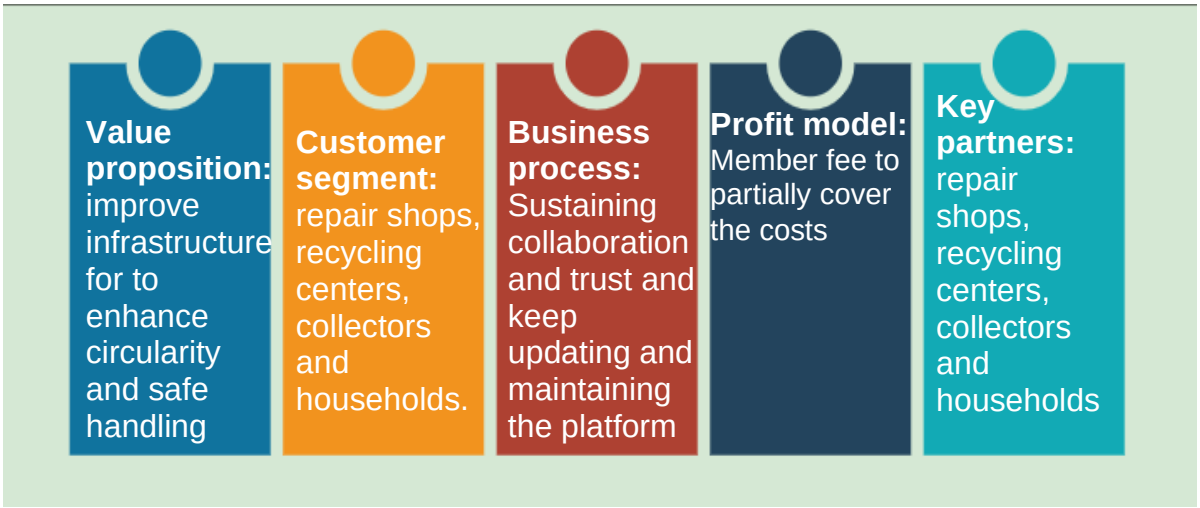


Figure 6 - Summary of main aspects of phase 3 of the pilot

4.2.4 Phase 4: Households incentive

A future prospect is to incentivize households to hand in used appliances for dismantling operations (as facilitated in Phase 3). A low collection level is a known barrier for scaling up repair activities. A partial reimbursement for handing in older equipment (which may take the shape of a discount on next purchases, or a bonus system system) may overcome such barriers. Another option is to develop non-financial incentives for the community, as for example, providing points as a reward for

[14] KAM/APP/FORM/ORD/JAN/2010

collection and issuing community building activities (such as planting trees in the neighborhood) after the neighborhood has reached a specific number of points.

Because this option requires a lot of financial support, this would only be introduced towards the end of the pilot, opening up the possibility that the funding can be associated with PROs within the EPR scheme. At the first year of this phase at least 2 FTE would be needed for the coordination, the advertising among households and setting up the procedure of reimbursement. A total of 2 FTEs is estimated at this moment.
No costs were addressed to this phase, considering that it is only possible to execute such phase once the EPR scheme is stablished and it is very dependent on how the incentive will be done (either via bonus for next purchase or points collection).

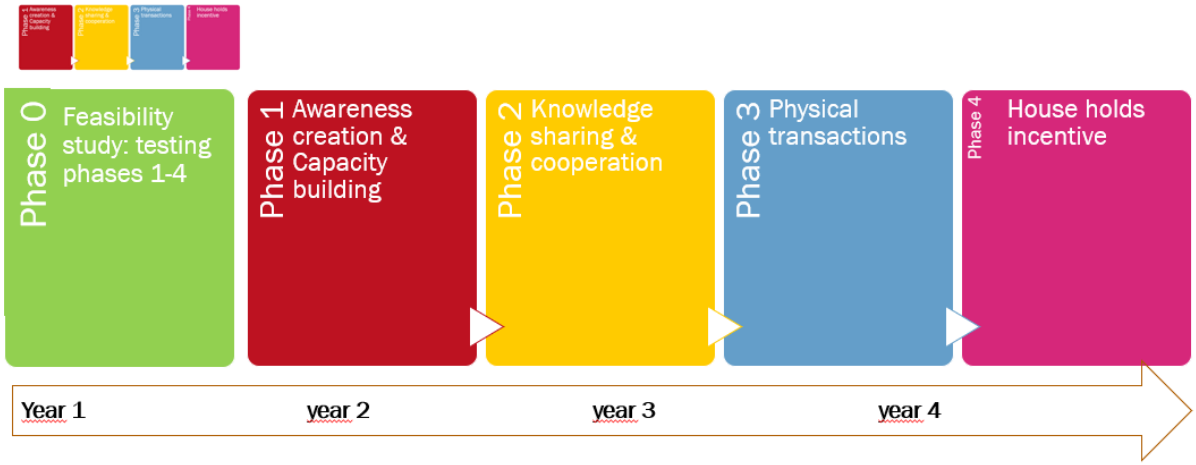
This phase involves mainly the following stakeholders: households, manufacturers assembled in the PRO and the government.

4.3 Phase 0: the feasibility phase

The described phases are designed based on the information found in previous activities and collected during stakeholder meetings. They are mainly meant to address the gaps mentioned in this Chapter's introduction. Implementation of all activities at a practical scale will take at least 3 years. However, before larger scale implementation of the different phases can be considered, the feasibility of the entire phased approach should be understood better. For instance, a better understanding of the existing dynamics and structures in the LHHAs handling and management of different actors is required before scaling up can be considered.

Therefore, it is suggested to test these phases in a shorter time frame (1 year) with a very small group of stakeholders. This allows to get feedback from the involved stakeholders based on their experiences and their needs. The group of stakeholders could consist of the WEEE center, 2 formal repair shops, 2 informal repair shops, a distributor, a representative from the local county government and a civil society organization or NGO. For such a group, insights can in particular be gained on the first three phases.

The proposed feasibility, so-called *phase 0,* could be set up as a concrete project, that could run for about one year. In contrast, the complete 4-phased approach sketched above could easily require 3-4 years before reaching completion. Though the order of implementation of the complete 4-phase approach is fixed, the project-based execution of phase-0 could enable the project team to run the different steps in parallel. Regular meetings between the limited group that undertakes phase-0 ensures an open communication about the learnings from the various aspects of this feasibility phase.



4.3.1 ***Phase 0-1*** *Awareness creation & Capacity building.*

To start this phase a clear division of tasks should be agreed upon. One stakeholder should get the mandate of designing the platform. The mandating stakeholder is responsible for the maintenance and updating of the platform, based on the other participants feedback. In this phase 0 it is important to work with information that is already available, since this phase has a short-term focus and acquiring detailed information takes time. The following approach in steps is suggested:

1. Determine the most suitable type of platform and design this platform based on the available information on handling LHHAs
2. Spread the platform amongst the participating companies.
3. Receive feedback and update the platform accordingly
4. Assess what is needed to further expand the platform and which costs are involved

For the phase 0 the costs mainly consists of setting up the website, which is this phase can be done without hiring an external web designer and therefore the costs can range between 1,700 Ksh. (£12) and 31,400 Ksh. (£220) per month, as is indicated in section 4.2.1. Working with already available information and manuals does not result in extra costs. Discussing options to finance for this platform, e.g. through PRO's, funding or fees (as discussed in section 4.2.1) is an intrinsic part of this feasibility phase.

4.3.2 ***Phase 0-2*** *Knowledge sharing & Cooperation*

As mentioned section 4.3, the different phases can be implemented more freely and there is less need for earlier phases to be fully developed. Therefore, phase 0-2 can be initiated in the same period as phase 0-1. For *phase 0*-2 knowledge sharing can start immediately after the design of the platform from phase 0-1. It is important to build trust among the small group of participating companies to stimulate interaction. To get an understanding of how to design a platform for knowledge sharing and cooperation it is important to discuss with the selected participants the following topics[15]:

1. The objective for each stakeholder for the platform to develop a mutual objective
2. The division of roles and tasks of the participants
3. What knowledge do companies want to share with each other
4. What is an effective way to expand the collaboration, and which number of participants seems feasible to collaborate with (digitalisation plays a key role here)

[15] The World Bank. (2016). *Becoming a knowledge-sharing organization*. https://openknowledge.worldbank.org/bitstream/handle/10986/25320/9781464809439.pdf

5. How will the cost structure look like (depending on the participants and the activities that are decide upon to be taken up by the association)
6. Time that has to be put into developing such a platform by participating stakeholders. Often the amount of time it takes to develop a knowledge sharing platform is underestimated.
7. Make sure that the chosen platform has familiarity with all the stakeholders, so everyone is able to properly use the platform.
8. Get an understanding of the people that want to be involved, e.g. what is their role, willingness to participate, and familiarity with the subject.

A physical overview of these topics can be seen in Figure 7. These topics are important to discuss since otherwise they can form a barrier for implementation. It is important to communicate to potential investors and future members the agreements made on the vision and mission of the association and on the issues mentioned above.

Costs for initiating this phase 0-2 are negligible. Most important in this phase is the commitment of time from the small group of participants The exact time commitment of the participants has to be decided upon by themselves.

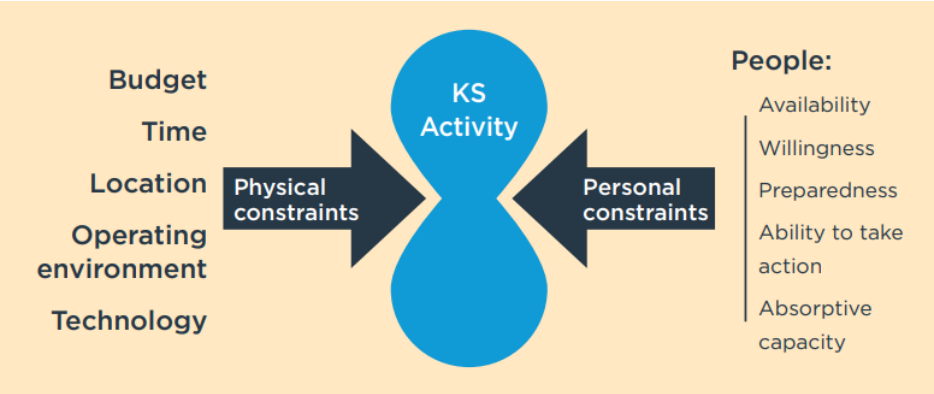


Figure 7 Physical and personal constraints on knowledge sharing (KS). *Source: The World Bank. (2016). Becoming a knowledge-sharing organization [14]f*

*4.3.3 **Phase 0-3** Physical transactions*

In this phase, collaboration will be further expanded from knowledge sharing to physical transactions. Again, this requires input from the small group of stakeholders to discuss some topics:

1. Which services have to be commonly addressed e.g. buying equipment together, sharing equipment, sharing spare-parts, investing together in other infrastructure
2. Based on the service provision, decide which partners are relevant to include
3. Determine the costs for a membership based on the amount of stakeholders and activities.
4. Assess how long exchange of physical transactions might take, how much they can cost and for which distance this is applicable.

Costs for a first implementation do not have to be large, since in the short-time the platform remains small and focusses on a proper design of the platform, which is functional but basic. It is, however, important to assess costs and revenues for scaling up, section 4.2.3 gives an indication of costs and benefits for the larger scale implementation.

*4.3.4 **Phase 0-4** Household incentives*

In contrast with the other phases, which are focusing on businesses, this phase focusses on household participation. As indicated in section 4.2.4, implementation of this phase depends on

funding coming from an EPR scheme and PRO. However, in this feasibility phase research can be done on what effectives ways are to stimulate households to hand in their appliances. Additionally, this aspects should be considered in designing the EPR.

4.3.5 Estimate of investment for Phase-0: The feasibility phase

Phase-0 is meant to be set up as a concrete feasibility project for which the minimum staff is estimated as follows:

- 1 Project lead/researcher
- 1 Innovator/researcher
- 1 Web-designer

In total 3 fte in this one year is required.

The overall out-of-pocket costs for phase 0 reflect the creation of the three online platforms in a small scale. The estimate was based on a basic website costs (**Error! Reference source not found.**) increased by 30%, due to the fact that the platform for phase 0-3 is more complex when compared to those included in phases 0-1 and 0-2. Table 4-9 shows the calculated figures. However, it is important to note that due to the nature of this test phase, the costs might vary significantly compared to the presented ranges. For instance, if partnerships with universities are stablished for the creation of the online tools, the costs can be closer to the ranges for a do-it-yourself platform (range between 1,700 Ksh. (£12) and 31,400 Ksh[16]. (£220) per month).

Table 4-9 Costs estimate for Phase 0 of the pilot

Upfront costs	**Phase 0**
Web design	37,180 – 92,950 Ksh
Operational costs	
Domain	400 - 14,300 Ksh / year
Hosting	6,240 – 99,840 Ksh/year
Content updates	10,920 – 21,840 Ksh/year
Total operational costs	17,560 – 135,980 Ksh/year

4.4 Estimate of effort for the complete pilot (phase 0 – phase 4)

The staff that is estimated for the 5 phases is given in Table 4-10 and Figure 8.
Given the step-wise development of the whole pilot the effort per phase is distributed over the 5 years of the pilot.

[16] It should be noted that these costs are based on the UK price information: prices are also given in British pounds and transferred to Kenyan shillings (Ksh).

Table 4-10 Estimated staff for the complete pilot concept

	year 0	year 1	year 2	year 3	year 4	TOTAL
phase 0	3					3
phase 1		7,5	5	5	5	22,5
phase 2			3,5	4,5	5,5	13,5
phase 3				2	6,5	8,5
phase 4					2	2
TOTAL	3	7,5	8,5	11,5	19	49,5

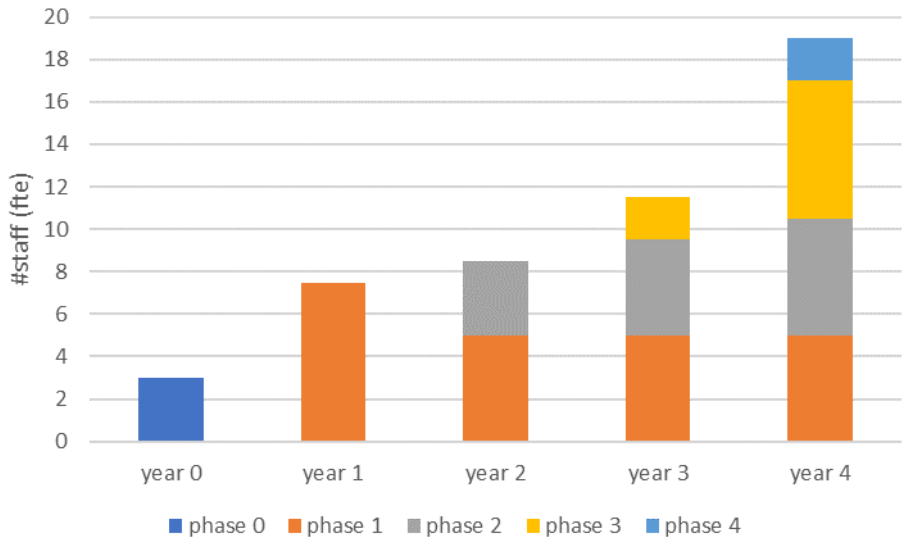


Figure 8 Estimated staff for the compete pilot concept

In the final year of the pilot an estimated 19 fte are required for the execution of all the 4 phases that are then in effect. The feasibility phase-0 is only operational in year 1.

Considering the costs presented in the previous sections for the creation of the proposed online platforms, a total cost was calculated (Table 4-11 and Figure 9). These costs reflect the creation and maintenance of the web-based tools. Potential income, such as any possible charging fees from the users of each phase of the pilot (e.g. payment for e-learning training and membership fees for the accessing the knowledge sharing system), is not included in this budget. The income from the fees are not included because there are very dependent on the number of people using the platforms, which can vary along the years, therefore, difficult to estimate. However, the values in Table 4-11 can serve as an initial indication on the resources needed to execute all phases of the pilot. The figures in this overview are based on the highest values in case ranges were indicated in the costs for each separate project phase.

Table 4-11 Total costs for the implementation of all phases of the pilot concept

	year 0	year 1	year 2	year 3	year 4	
phase 0	228.000					228.000
phase 1		1.430.900	718.700	718.700	718.700	3.587.000
phase 2			71.500	99.500	99.500	270.500
phase 3				1.430.900	718.700	2.149.600
phase 4						
TOTAL	228.000	1.430.900	790.200	2.249.100	1.536.900	6.235.100

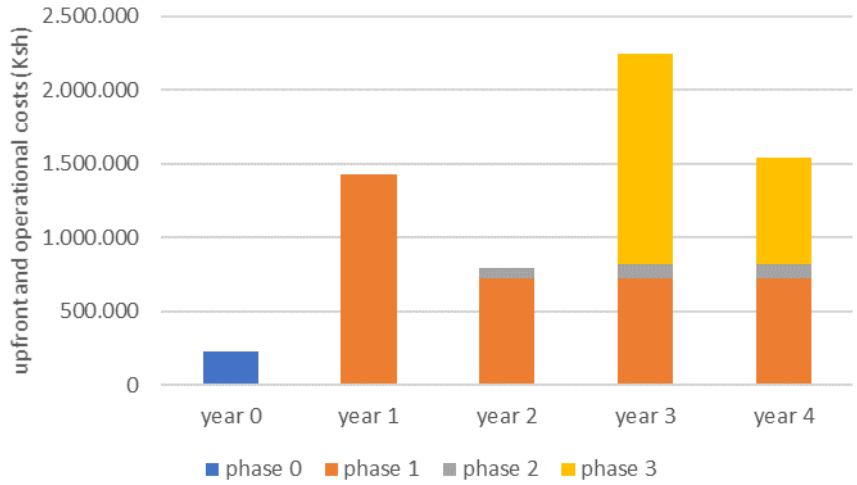


Figure 9 Total costs for the implementation of all phases of the pilot concept

4.5 Benefits and challenges

There several benefits related to the pilot proposal and each of those relates to different stakeholders and elements of the value retention process (Figure 10).

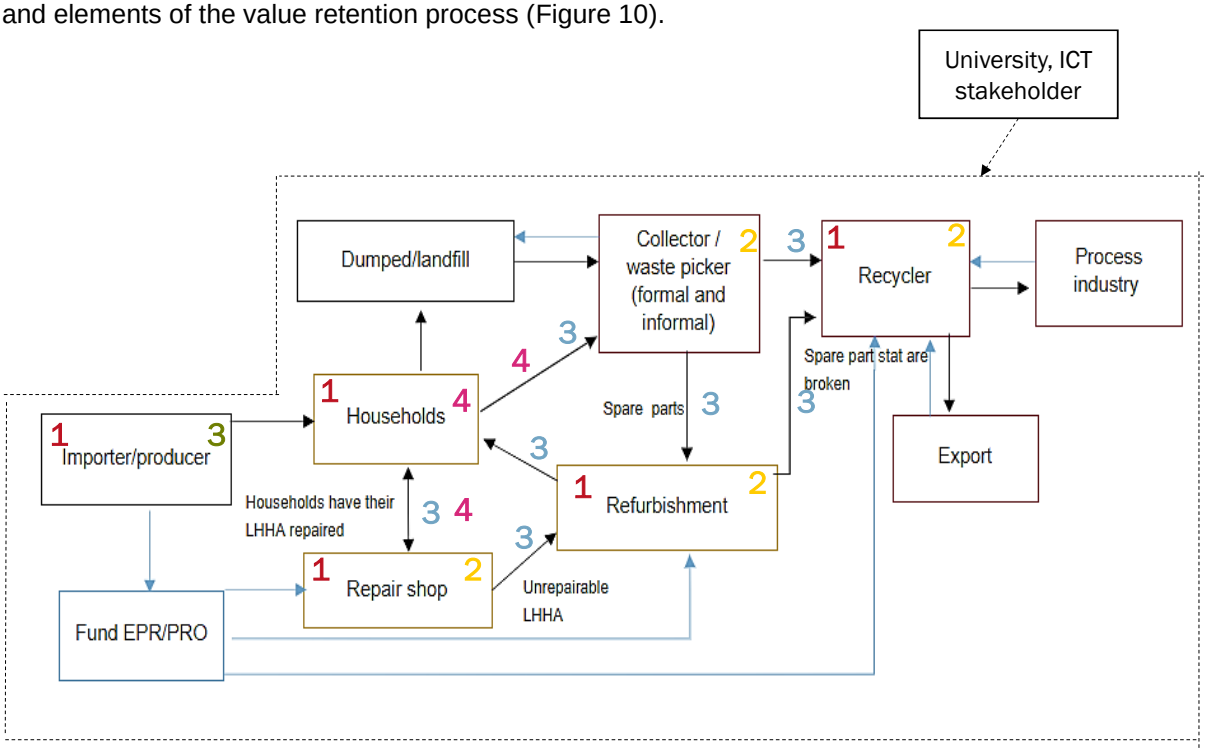


Figure 10 - Value retention system and the relationships with the pilot phases

Phase	Benefits for each phase	Challenges for each phase
1	• Safer LHHA handling • Standardization of activities (increase trust) • Since the training would be available online, the platform would be an opportunity for allowing more women to work in the field (training could be followed at home) • Less hazardous waste in the environment • In Kenya, certificates are valued extensively. Therefore, this would provide an incentive to follow such a course/training	• The current scope (LHHAs) is rather narrow. However, it is possible to broaden it. This could be in terms of appliances included, e.g. expand to ICT or maybe even general waste. • For designing manuals it is important to collaborate with manufacturers, since they know best how the product is designed and how it can be safely dismantled. However, for some international brands it is difficult to get manuals and spare parts, especially the less wide spread brands.
2	• Strengthen network among repairers, refurbishers and recyclers • Inclusion of informal workers in the system	• Competition between shops
3	• Reduce improper disposal of LHHA waste • Extended product lifetime • Inclusion of informal workers in the system • More data collection • Improve accessibility to spare parts	• Availability of recycling centers in the neighborhoods could limit the use of the app included in phase 3 • It is not sure whether the scope of LHHAs is broad enough to convince stakeholders to make use of such a digital platform. Maybe the scope should be expanded.
4	• Increase volumes of LHHA waste in recycling facilities • Reduce improper disposal of LHHA waste	• Engaging households can be a lengthy process • The procedure for the household to request the reimbursement/ give away bonus has the risk of

	• Improve participation of households in the value retention system	becoming too bureaucratic and demotivates the households to apply for it • Funding for the implementation of such activities might be challenging

4.6 Performance indicators

In order to assess the impacts of each phase of the pilot throughout the execution, some key performance indicators (KIP) are suggested:

- Stakeholders feedback: ask detailed feedback from the users of the digital platforms regarding how useful the tools are and which functionalities could be improved.
- Stakeholders engagement: monitor the amount of people using the digital platforms and the hours spent by each user
- Cooperation assessment: evaluate the progress on the number of members joining the formal association of recyclers, repairers and refurbishers
- LHHAs flows: monitor the amount of used LHHAs being collected for repairing and recycling via the APP, compare the numbers to assess any progress, especially during phase 3 execution.
- Inclusion assessment: ask feedback from informal workers on whether the use of the digital platforms support them to improve their work conditions and how this process is perceived by them.

4.7 Estimate for prevented CO_2 emissions by roll out of the pilot

TNO has analyzed the environmental footprint of Large Household Appliances (and ICT equipment) using the following methodologies:

- Computational methodology: SimaPro 8.5.2.0
- Using the Ecoinvent 3.4 cut-off by classification & economic allocation.

The data show that the CO_2-footprint of these devices is high and strongly differs as well.
Since the scope of this project is Large Household Appliances, the figure for washing machines, 7 kg CO_2 per kg product, is relevant for assessing the impact of repairing LHHAs.

From Rufeng Xiao et al.[17] detailed data about the CO_2-footprint of refrigerators was retrieved. Given a total of 1.67 ton CO_2/unit, with a 15% contribution from the manufacturing stage and an estimated 61 kg per unit, the resulted value is 15 kg CO_2 per kg of refrigerator or 250 kg CO_2 per unit. Since refrigerators are the items that represent the highest import value in the Kenyan situation the figure 15 kg CO_2/kg of LHHA was used as a proxy.

[17] Rufeng Xiao, You Zhang, Xin Liu, Zengwei Yuan, A life-cycle assessment of household refrigerators in China, Journal of Cleaner Production, Volume 95, 15 May 2015, Pages 301-310

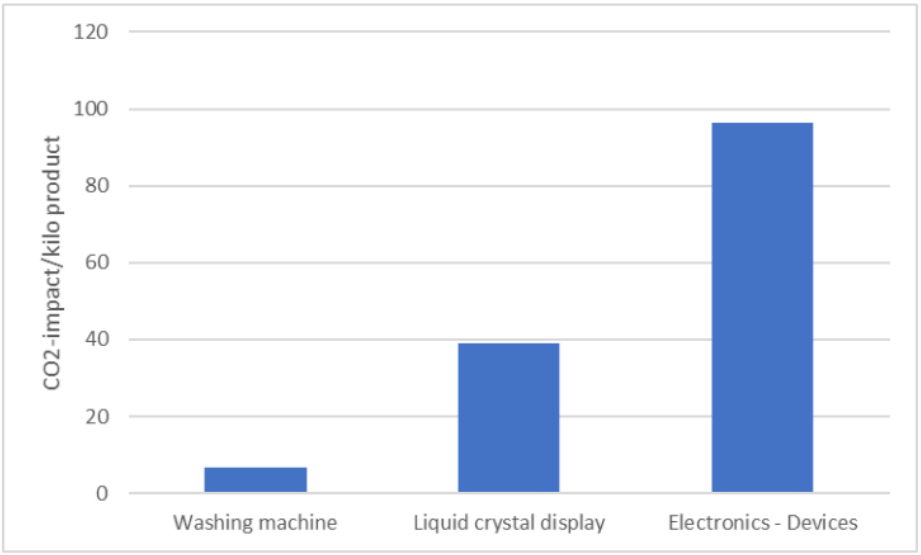


Figure 11 CO_2 footprint of washing machines and some electronic appliances

The pilot project is aimed at stimulating value retention processes for LHHAs. In essence, this comes down to stimulating repairs and refurbishment. In both cases, the availability of spare parts and insights in availability of technology will be crucial. The use of internet platforms can provide the opportunity to improve on this.

Although it is hard to assess the impact of the absolute scale of improved maintenance of LHHAs, the following assumptions were considered:

- Value of LHHAs: the average value of imported refrigerators in Kenya in between 2000 (10 M$) and 2020 (50M$) with no further growth in this volume
- Value per unit refrigerator: 300$
- Average number of refrigerators: 30M$ each year or 100,000 units per year
- Extension of lifetime (i.e. lower need for new units) could lead to a reduction of 5% (a net figure including the lifetime improvement per unit and the number of units offered for repair) refrigerators on a yearly basis
- The maximum amount of CO_2 emission prevented would then be: 100,000 x 5% x 250 kg CO_2 = 1250 ton CO_2 per year.
- The pilot itself would of course only cover a part of this figure since it would involve only part of the total volume of LHHAs. At the most, the pilot would lead to 20% of this figure, i.e. 250 ton CO_2 per year.

Based on the analysis described, Table 4-12 summarizes the estimated figures for prevented CO_2 emissions as a result of the pilot proposed in this report.

Table 4-12 Estimate of CO_{2eq} avoided or reduced based on the pilot idea

Core indicator 1	Anticipated metric tons of CO_2 equivalent (CO_2e) emissions reduced or avoided as a result of the proejct	
	Anticipated metric tons of CO_2e reduced or avoided as a result of the TA **on annual basis (In case the TA is implemented)**	Anticipated metric tons of CO_2e reduced or avoided as a result of the TA **in total**

Quantitative value *(emissions reductions)*	**Based on the analysis above, the pilot itself could lead to a consumption-based reduction of 250 tCO_2/yr**	**A complete rollout of the consequences could lead to a reduction of (consumption based, i.e. in the chain) of 1250 tCO_{2eq}**

A Overview of Kenyan Environmental regulations (source: GSMA)

Title of regulation	Description	Status	Legally binding	Legislation naming convention
Environmental Management and Co-ordination Act (EMCA - 1999) - revised in 2015	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[18].	In force	Yes	KEN01 & KEN02
National Environment Policy, 2013	Better quality of life for present and future generations through sustainable management and use of the environment and natural resources. One of the goals was to develop a national waste management strategy.	In force	No	KEN03
Environmental Management and Co-Ordination Draft E-waste Regulations, 2013	Regulations to manage e-waste, in accordance to EMCA. A producer who intends to introduce new or used EEE into Kenya shall apply for registration from the authority. Every producer operating in Kenya must register with the authority within 60 days of the coming into force of this regulation. Wants to develop an extended producer responsibility for sustainable management of e-waste.	Draft	Not yet	KEN04
E-Waste Guidelines Kenya, 2010	The 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: • To enhance environmental protection from e-waste. • To establish a basis for a policy and regulatory frameworks on e-waste management. • To raise public awareness on sustainable management of e-waste in Kenya.	In force	No	KEN05

[18] E–waste is currently categorized as hazardous waste under EMCA.

Title of regulation	Description	Status	Legally binding	Legislation naming convention
National E-waste Management Strategy, 2019	The purpose of the strategy will help to analyse the current situation of E-Waste in the country, with the aim of helping the government and stakeholders at all levels to understand the need to come up with regulations on e-waste management through collaborative process. The National E-Waste Management Strategy is a five-year plan covering the period 2019/20 to 2023/24. On the legal aspect, it 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 model guiding the national strategy.	Draft	No	KEN06
National Sustainable Waste Management Policy, 2017 (revised in 2019)	The Policy also 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, which have been a major source of pollution, contaminating rivers and positing serious health and environmental threats.	Draft	No	KEN07
Sustainable Waste Management Bill, 2019	Overarching bill to establish appropriate legal and institutional framework for waste management in Kenya including establishment of a Waste Management Directorate Explicitly mentions EPR for electronic products including establishing a registry. Proposed timeline: within a period of eighteen months from the entry into force of the act.[19]	Draft	Not yet	KEN08

[19] At the time of completing this assessment the sustainable waste management Bill 2021, had been passed by the National Assembly and currently at the Senate for deliberations. The Sustainable Waste management Bill 2021 proposes enactment of Extended Producer Responsibility. The Bill seeks to promote sustainable management of waste and enhance circularity of waste management in Kenya. If passed into law, organic and inorganic waste will be divided into three categories during disposal indicated by green, blue and yellow bins. Green dustbins will hold organic waste as blue bins carry re-usable waste. Hazardous waste, which comprises LHHA waste, will be disposed of in yellow bins .

Title of regulation	Description	Status	Legally binding	Legislation naming convention
Machakos County E-Waste Management Act, 2015	This act is to establish an institutional framework necessary for purposes of ensuring an efficient e-waste management in the county as well as to establish appropriate strategies for end-of-life management of EEE.	In force	Yes	KEN09
The 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 that are in line with an Integrated Solid Waste Management Plan	In force	No	KEN16
Waste Management Regulations, 2006	The Minister for Environment and Natural Resources, on the recommendation of the National Environment Management Authority and upon consultation with the relevant lead agencies wrote these regulations on the backhand of the 1999 EMCA act. These regulations apply to all categories of waste. Main points are: any person whose activities generate waste, shall segregate such waste by separating hazardous waste from non-hazardous waste, any person who owns or controls a facility or premises which generates waste shall minimize the waste generated, no person shall be granted a license under the Act to transport waste unless such person operates a transportation vehicle approved by the authority. These regulations also define hazardous waste. No specific mention of e-waste per se, but can be considered under general definition of waste.	In force	Yes	KEN17
National information & communications (ICT) policy, 2016	The ICT policy includes provisions for e-waste management calling for appropriate recycling and disposal facilities as requirements for the renewal of communications licenses. It is based on the Kenya Vision 2030, which aims to provide the national long-term development blue-print to create a globally competitive and prosperous nation, transforming Kenya into a newly industrializing, middle-income country providing a high quality of life to all its citizens by 2030 in a clean and secure environment. The strategy of Vision 2030 is to undertake reforms in	Draft	No	KEN12

Title of regulation	Description	Status	Legally binding	Legislation naming convention
	eight key sectors that form the foundation of society for socio-political and economic growth, one of them being ICT.			
The Environmental Management and Co-Ordination (Extended Producer Responsibility) Regulations 2020	The object and purpose of these regulations is to provide for mandatory extended producer responsibility schemes for all products and packaging in all phases of their life cycle to enhance environmental sustainability. In the regulations, it is stated that “no person or entity shall produce, import, market or distribute a product unless they have obtained producer responsibility registration from the Authority”. EEE and packaging are in the list of products and packaging subject to extended producer responsibility compliance scheme, defined in Schedule 1 of the regulations. The main EPR regulations are: every producer, shall take financial and or physical responsibility for the management, treatment and disposal of their post-consumer products and end-of-life treatment for the waste generated by their products; the producers shall fulfil their obligations by setting up individual enterprise-based extended producer responsibility compliance scheme; or collectively through a pooled compliance scheme. A producer can transfer part or their full obligations subject to membership agreement to a collective compliance scheme through a producer responsibility organisation, in which they take membership.	Draft	Not yet	KEN18

B Remarks from stakeholders regarding pilot concept

The relevance of the options has been assessed with a small group of stakeholders, including representatives from the WEEE centre and representatives from the local government. In general, there was agreement that using digital tools is relevant to enhance a circular way of handling LHHAs. Additionally, it was agreed that the proposed options for a certain element (e.g. capacity building; awareness creation; etc.) are suitable to strengthen that specific element. Some remarks were given that can be taken into account in further developing the pilot.

Capacity building via e-learning platform
Barrier: for designing manuals it is important to collaborate with manufacturers, since they know best how the product is designed and how it can be safely dismantled. However, for some international brands it is difficult to get manuals and spare parts, especially the less wide spread brands.
Opportunity: the training programs could be connected to certificates. In Kenya certificates are valued extensively. Therefore, this would provide an incentive to follow such a course/training.

An additional opportunity is that the platform can be designed three folded: (1) An easily accessible and not too difficult course aiming at households level and general training for volunteers. (2) A more advanced training for (in)formal employees active in the sector. (3) A training aimed at awareness that can be used in school as educational material.

Business model potential: A form of financing could be to charge for the courses, especially when a certificate is coupled to the course. Before charging, it could be a strategy to offer the courses for free to increase the familiarity with the platform.

Suggested partners/stakeholders: National Industrial Training Authority, partner for the training activities; WEEE center, could mandate partners to follow the course and get the certificate; GIZ, could use such a tool for educational purposes for schools.

Households incentive via give away bonus/ repair reimbursement
Opportunity: Incentives that could work is to give stars and points. E.g. with a certain amount of points it could be possible to have 5 trees planted in your community – to make it a community effort. Such initiatives could work as well.

Philips are also setting up specific models to stimulate the return of their products, e.g. by giving a discount for a new appliance when disposing an old one.

Physical interactions via digital platform for collection
Barrier: It is not sure whether the scope of LHHAs is broad enough to convince households to make use of such a digital platform. Maybe the scope should be broadened.
Opportunity: A subsidy can be a good incentive for repair shops to participate in such a platform.

Knowledge sharing via digital platform
Opportunity: Further enhance such collaboration by setting up an association of repair, refurbish and reuse (RRR association). Such an association does not currently exist in Kenya. This could help to more concretely identify the needs of businesses in such a sector and collaboratively aim for this. Licensing of these participants by doing the courses in option A, is again relevant. Also combining this with option C is useful to have an outlet for the repaired, refurbished or reusable appliances.

Scope

The scope of the different options is relatively small, to be able to assess some concrete steps to address the different gaps. However, it is possible to broaden this scope. This could be in terms of appliances included, e.g. expand to ICT or maybe even general waste. Another possibility is to combine different options. First, the latter option will be elaborated on.

Combing the options helps to address multiple gaps for circular handling of LHHAs. As initiated by the stakeholders feedback, combining options A, C and E can give a fruitful interaction.

C Tariffs for importers and distributors in the Dutch system

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Product and tariff list 2022

The mentioned fees are excluding VAT.
version 29-03-2022

Note, if there is a * behind the product name, you can find an additional explanation for this product on the last page.

1. Temperature exchange equipment

Code	Name	Fee
E1/01	Cooling and freezing appliances (household)	€ 0.370/kg
E1/02	Tumble dryers (with heat pump)	€ 0.040/kg
E1/03	Air conditioners (separate)	€ 0.160/kg
E1/04	Air conditioners (built-in) and heat pumps	€ 0.020/kg
E1/05	Cooling and freezing appliances (professional)	€ 0.100/kg
E1/06	Vending machines (refrigerated)	€ 0.300/kg

2. Screens, monitors, and equipment containing screens having a surface greater than 100 cm²

Code	Name	Fee
E2/01	TVs and displays (flatscreen)	€ 0.280/kg
E2/02	Monitors (flatscreen)	€ 0.180/kg
E2/03	Laptops*	€ 0.060/kg
E2/04	Tablets and navigation systems*	€ 0.060/kg

3. Lamps

Code	Name	Foundation	Fee
E3/01	LED lamps (incl. LED TL)	LightRec	€ 0.050/piece
E3/02	Energy saving and gas discharge lamps	LightRec	€ 0.140/piece
E3/03	Fluorescent lamps	LightRec	€ 0.140/piece

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4. Large equipment (any external dimension more than 50 cm)

Code	Name	Fee
E4/01	Extractor hoods	€ 0.130/kg
E4/02	Barbecues, grills and cooking plates (> 50 cm)	€ 0.130/kg
E4/03	Microwaves and ovens (> 50 cm)	€ 0.130/kg
E4/04	Stoves	€ 0.130/kg
E4/05	Dishwashers	€ 0.130/kg
E4/06	Washing machines	€ 0.130/kg
E4/07	Tumble dryers (without heat pump)	€ 0.130/kg
E4/08	Household, kitchen and personal care appliances (> 50 cm)	€ 0.130/kg
E4/09	Vacuum and floor cleaners (> 50 cm)	€ 0.130/kg
E4/10	Central heating, boilers and geysers (> 50 cm)	€ 0.030/kg
E4/11	Sunbeds	€ 0.130/kg
E4/12	Ventilation, recirculation and air treatment appliances (> 50 cm | >150 m³/hour)*	€ 0.050/kg
E4/13	Ventilation, recirculation and air treatment appliances (> 50 cm | ≤ 150 m³/hour)	€ 0.130/kg
E4/14	Ventilation, recirculation and heating appliances (> 50 cm | separate)	€ 0.130/kg
E4/15	Hot water and heating appliances (> 50 cm | built-in)	€ 0.080/kg
E4/16	Professional kitchen appliances (non-refrigerated)	€ 0.050/kg
E4/17	Vending machines (non-refrigerated)	€ 0.080/kg
E4/18	Fabric processing appliances (> 50 cm)	€ 1.000/kg
E4/19	Electric musical instruments (> 50 cm)	€ 0.180/kg
E4/20	Electric toys, leisure and sports appliances (> 50 cm)	€ 0.160/kg
E4/21	Medical appliances (> 50 cm)	€ 0.150/kg
E4/22	Measuring and control appliances (> 50 cm)*	€ 0.040/kg
E4/23	Audio and video appliances (> 50 cm)	€ 0.280/kg
E4/24	IT and office appliances (> 50 cm | household)*	€ 0.060/kg
E4/25	IT and office appliances (> 50 cm | professional)	€ 0.010/kg
E4/26	Luminaires for fluorescent, energy saving, gas discharge lamps (> 750 grams)*	€ 0.260/piece
E4/27	Luminaires with integrated LED (> 750 grams)*	€ 0.260/piece
E4/28	Luminaires for convertible LED (> 750 grams)*	€ 0.260/piece
E4/29	Electric tools (> 50 cm)*	€ 0.110/kg
E4/32	Solar panels	€ 0.0065/kg
E4/33	E-bikes*	€ 0.010/kg
E4/34	Open Scope equipment (> 50 cm | without a primary electrical function)*	€ 0.010/kg

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5. Small equipment (no external dimension more than 50 cm)

Code	Name	Fee
E5/01	Barbecues, grills and cooking plates (≤ 50 cm)	€ 0.180/kg
E5/02	Microwaves and ovens (≤ 50 cm)	€ 0.180/kg
E5/03	Household, kitchen and personal care appliances (≤ 50 cm)	€ 0.180/kg
E5/04	Vacuum and floor cleaners (≤ 50 cm)	€ 0.180/kg
E5/05	Central heating, boilers and geysers (≤ 50 cm)	€ 0.120/kg
E5/06	Ventilation, recirculation and air treatment appliances (≤ 50 cm | ≤ 150 m³/hour)	€ 0.130/kg
E5/07	Ventilation, recirculation and air treatment appliances (≤ 50 cm | > 150 m³/hour)*	€ 0.050/kg
E5/08	Ventilation, recirculation and heating appliances (≤ 50 cm | separate)	€ 0.180/kg
E5/09	Hot water and heating appliances (≤ 50 cm | built-in)	€ 0.080/kg
E5/10	Fabric processing appliances (≤ 50 cm)	€ 0.650/kg
E5/11	Electric musical instruments (≤ 50 cm)	€ 0.600/kg
E5/12	Game computers	€ 0.080/kg
E5/13	Electric toys, leisure and sports appliances (≤ 50 cm)	€ 0.190/kg
E5/14	Medical appliances (≤ 50 cm)	€ 0.370/kg
E5/15	Measuring and control appliances incl. detectors, sensors and switches (≤ 50 cm)*	€ 0.060/kg
E5/16	Audio and video appliances (≤ 50 cm)	€ 0.280/kg
E5/17	Luminaires for fluorescent, energy saving, gas discharge lamps (≤ 750 grams)*	€ 0.060/piece
E5/18	Luminaires with integrated LED (≤ 750 grams)*	€ 0.050/piece
E5/19	Luminaires for convertible LED (≤ 750 grams)*	€ 0.050/piece
E5/20	Electric tools (≤ 50 cm)*	€ 0.110/kg
E5/22	Open Scope equipment (≤ 50 cm | without a primary electrical function)*	€ 1.000/kg

6. Small IT and telecommunication equipment (no external dimension more than 50 cm)

Code	Name	Fee
E6/01	Mobile phones*	€ 0.060/kg
E6/02	Desktop computers*	€ 0.060/kg
E6/03	Printers and scanners*	€ 0.060/kg
E6/04	I(C)T and office appliances (≤ 50 cm | household)*	€ 0.060/kg
E6/05	I(C)T and office appliances (≤ 50 cm | professional)	€ 0.010/kg